

ANTHRACITE IN THE LEHIGH REGION
OF PENNSYLVANIA, 1820-45

John N. Hoffman

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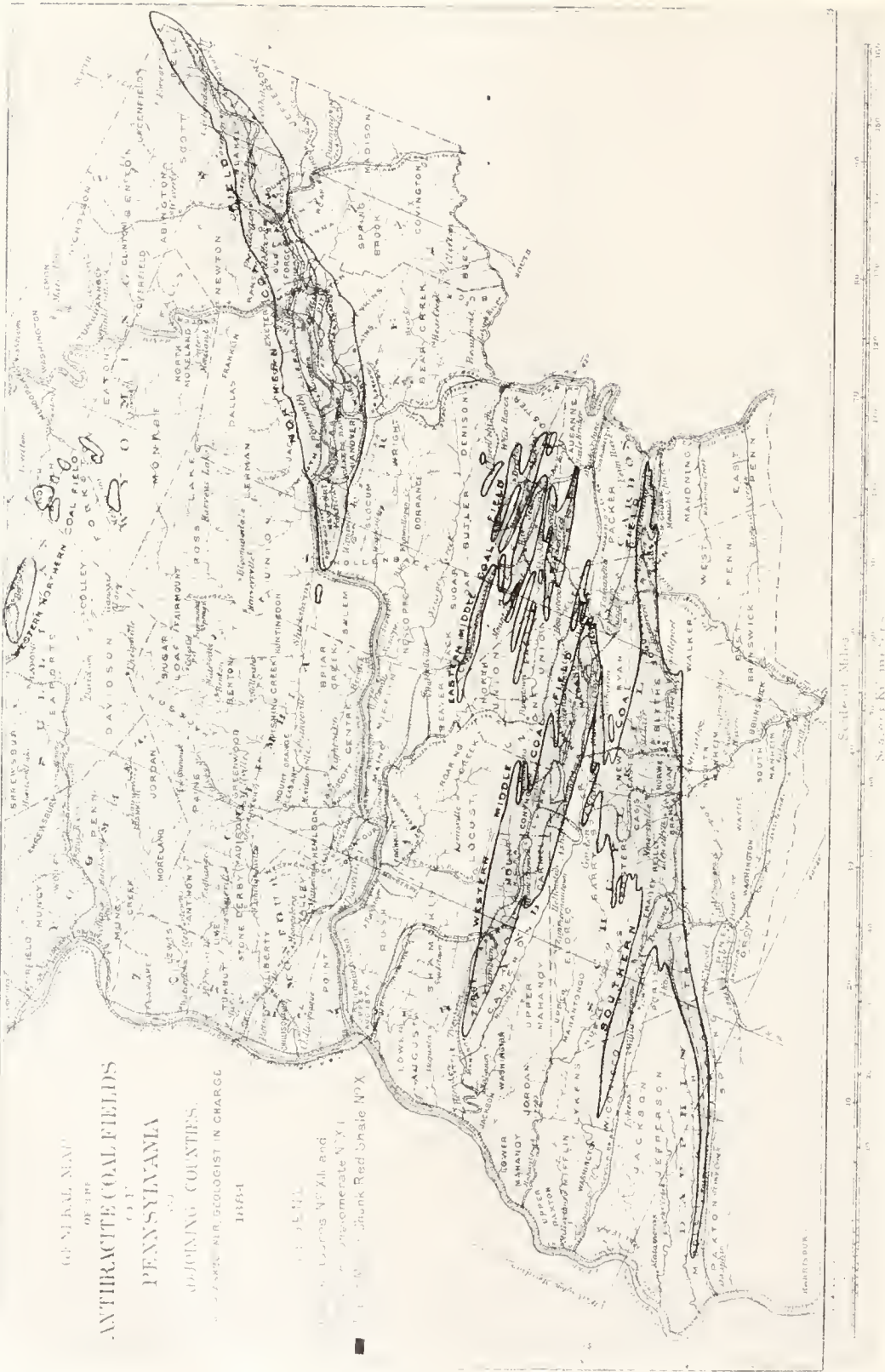


Figure 1.—ANTHRACITE COAL FIELDS OF PENNSYLVANIA and adjoining counties, 1884. Mauch Chunk is located at the eastern tip of the Southern coal field. (Engineers Club of Philadelphia, *Proceedings*, 1884, vol. 4, no. 3, pl. 11.)

ANTHRACITE

In the Lehigh Valley of Pennsylvania 1820-45

This monograph presents the historical and technological developments of the anthracite industry in the Lehigh region of Pennsylvania from 1820 to 1845. The first constructive effort to develop this region began in 1818 with the enactment of a law by the Legislature of Pennsylvania granting "unlimited powers" to three individuals to improve the navigation of the Lehigh River. Regular shipments of anthracite from the Lehigh region began in 1820.

The development of the industry during this period was achieved through the combined efforts of the Lehigh Coal and Navigation Company and its former companies, who operated the only navigation facility from the region and engaged in mining operations. During the first 25 years of the industry, 17 additional companies were chartered by the Pennsylvania Legislature to take advantage of the navigational improvements constructed on the Lehigh River. These companies were authorized to engage in mining and railroad operations, but none was given "unlimited powers."

Large amounts of capital were required to develop the coal-bearing properties and to bring the coal to market, with most of the money being invested in the construction of transportation facilities. Approximately \$12.2 million was invested by the various companies to develop this industry during the period 1820 to 1845.

THE AUTHOR: John N. Hoffman is associate curator, division of manufactures and heavy industries, in the Smithsonian Institution's Museum of History and Technology.

Introduction

THE ANTHRACITE DEPOSITS of Northern Pennsylvania are found in the counties of: Carbon, Columbia, Dauphin, Lackawanna, Lebanon, Luzerne, Northumberland, Schuylkill, Sullivan, Susquehanna, and Wayne. The coal-bearing formations cover a surface area of approximately 484 square miles and are divided into four fields: northern (176 square miles); eastern middle (33 square miles); western middle (94 square miles); and southern (181 square miles).

In anthracite trade circles, the four fields are regarded as three producing areas: The Schuylkill (the western middle field and the southern field west of Tamaqua); The Lehigh (the eastern middle field and the southern field east of Tamaqua); and The Wyoming (the northern field).

The topography of the area in the pioneer days of the Commonwealth excluded the use of turnpikes and the construction of new roads for the transportation of bulky commodities from the hinterland to the highly populated east-coast areas. The entire anthracite area was drained by three large streams, but none was navigable with safety in its natural state.

The Lehigh River was early recognized as being a natural route for the transportation of materials to market. The Pennsylvania Legislature passed a Lehigh River improvement act in 1771, and other programs followed in 1791, 1794, 1798, 1810, 1814, and 1816.¹ Several of the acts included the appointment of commissioners to supervise the river improvements and moderate appropriations to help finance the work. In every case the money was undoubtedly spent, but the construction efforts, if any, did not materially improve the navigation of the river.

Discovery of Coal in the Lehigh Region

The discovery of coal in the Lehigh area is credited to Philip Ginder² who, in 1791, found coal on Mauch

¹ ERSKINE HAZARD, "History of the Introduction of Anthracite Coal into Philadelphia" (*Historical Society of Pennsylvania Memoirs*, vol. 2, pt. 1; Philadelphia: Carey, Lea, and Carey, 1827), p. 157.

² THOMAS C. JAMES, "A Brief Account of the Discovery of Anthracite Coal on the Lehigh" (*Historical Society of Pennsylvania Memoirs*, vol. 1, pt. 2; Philadelphia: Carey, Lea, and Carey, 1826), p. 318. Dr. James used the family name as Ginder, but the monument erected at Summit Hill, Pa., commemorating the 150th anniversary (1941) of the discovery of anthracite was inscribed "Ginler."

Chunk (Sharp) Mountain where the town of Summit Hill is now located, about nine miles west of the town of Mauch Chunk.³ Ginder gave some specimens of his find to Col. Jacob Weiss at Fort Allen (Weissport). The Colonel sent the specimens to Philadelphia for examination. Sometime later Colonel Weiss was informed that the specimens were found to be "Stone Coal."

On February 13, 1792, Colonel Weiss and several friends from Philadelphia formed the unincorporated Lehigh Coal Mine Company.⁴ This organization obtained from Colonel Weiss the land upon which the discovery was made (Weiss had obtained the land previously from Ginder) and, therefore, obtained additional warrants. The total land holdings in this area subsequently totaled approximately 8,000 acres.

The organization commenced mining operations and produced several tons, having little difficulty in digging the coal from the ground. They were then confronted with the problem of what to do with the coal. Mining operations were suspended for the time being and their efforts were concentrated on proving anthracite's value by arousing public interest in their product. The public, however, was reluctant to accept this new fuel. Another problem faced the owners; that of transporting their mined coal out of the primitive forests to the landings along the Lehigh River. Six wooden arks were constructed on the river above Mauch Chunk, loaded with coal, and made ready for high water (freshets) to float them down to Philadelphia, via the Lehigh and Delaware Rivers. Each ark held approximately ten tons of coal and had a crew of six men. After a perilous trip down the rivers in the spring of 1803, two of the six arks finally reached Philadelphia. No ready buyer could be found but, after much effort by the owners, the coal was sold to the city for use as a fuel for a steam engine at the city's waterworks. This experiment was a failure as the fireman was not successful in getting the coal to burn.⁵ The organization's hope of prosperity was lost.

In December 1807, the owners granted a lease to Rowland and Butland to remove coal from one of the veins exposed on the mining property. The partnership was disbanded and the lease forfeited during the next

³ Mauch Chunk and East Mauch Chunk became Jim Thorpe by referendum in 1954.

⁴ JAMES, *op. cit.*, p. 319.

⁵ *Ibid.*



Figure 2.—Left: Josiah White. Right: Erskine Hazard. Both lithographs were by A. Newsam, ca. 1840. (M. S. Henry, *History of the Lehigh Valley*, 1860.)

year as they failed to mine any coal from the property.⁶

In December 1813, the owners, still desirous of developing their holdings, granted a lease for 10 years to Charles Miner, Jacob Cist, and John W. Robinson.⁷ As an additional incentive, the owners gave this new group the right to cut timber on their property and use the timber for constructing riverboats for moving the coal down the river. In return for the lease, the lessees agreed to market a minimum of 10,000 bushels of coal annually. Revenues from the sale of the coal went to the new organization.

The owners received nothing from the lease, but hoped that by the time the lease expired, and with a public more accustomed to burning anthracite, the mines would be a valuable asset.

This new group in the spring of 1814, managed to load and send five arks of coal from the landing at Mauch Chunk. Two arks finally reached Philadelphia, but three arks were wrecked in passage down the Lehigh River. Most of the coal that survived the trip was purchased by Josiah White and Erskine Hazard for \$21 a ton for use in their wire manufacturing plant located at the Falls of the Schuylkill.⁸ This price did not compensate the new partnership for the mining costs, the transportation costs from mine to the river, and the losses incurred in transporting the coal down the river. Cost of the operation as given by Charles Miner in his testimony before the Packer Commission's study of the coal trade in 1834, showed that \$330.77 was expended for each ark containing 24 tons of anthracite.⁹

⁶ *History of the Lehigh Coal and Navigation Company* (Philadelphia: W. S. Young, 1840), p. 3. Hereafter referred to as *Lehigh History*.

⁷ HAZARD, *op. cit.*, p. 158.

⁸ *Lehigh History*, *op. cit.*, p. 4.

⁹ S. J. PACKER, "Senate Committee Report on the Coal Trade" (*Senate Journal*, vol. 2, 1833-34; Harrisburg: H. Welsh, 1834), p. 540. Hereafter referred to as *Packer Report*.

Mining coal @ \$1 per ton-----	\$24. 00
Transportation 9 miles @ \$4 per ton----	96. 00
Loading ark-----	5. 00
Ark construction-----	130. 00
Crew's wages-----	28. 27
Pilot wages-----	47. 50
Total -----	\$330. 77

This expenditure was required whether or not the ark arrived safely in Philadelphia. As a result of this one venture, this group, like its predecessors, was compelled to abandon the operation and forfeit the lease.

During November 1817, Josiah White and Erskine Hazard, being in need of coal for their wire plant, turned their attentions to the coal lands located along the Lehigh River. Josiah White was one of the commissioners named in the act of incorporation of the Schuylkill Navigation Company in 1815. At the election of managers by the stockholders, White was not elected due to his ownership of the wire manufacturing plant at the Falls of the Schuylkill and his possible conflict of interest.¹⁰ White's unpleasant associations with the managers of the Schuylkill Navigation Company also contributed to his searching for a new source of fuel.

Mr. White and George F. Hauto visited the mining operations on Mauch Chunk (Sharp) Mountain and the Lehigh River southward from Mauch Chunk during December 1817.¹¹ Josiah White's report on his trip to the region was quite favorable as he was convinced that coal could be obtained cheaper from this area. His investigation also revealed that the lease of the coal lands by the third partnership had been forfeited and the most recent law which had been passed by the legislature to improve the navigation of the Lehigh River had not been carried out to completion.

Messrs. White, Hauto, and Hazard, upon application to the original owners, were granted a 20-year lease on the mine holdings. Their lease allowed 3 years for preparation of the property and required that they deliver at least 40,000 bushels of coal annually to Phila-

delphia. Annual rent for the property was one ear of corn payable on demand.¹²

Lehigh Navigation

After White, Hauto, and Hazard had obtained the lease for the coal lands, they turned to the Pennsylvania Legislature for an act to authorize them to improve the navigation of the Lehigh River. Their plans were presented to the legislature and strong opposition was encountered; the navigation plan for the Lehigh River was considered impractical because of the failure of previous plans to accomplish the same purpose. On March 20, 1818, the legislature gave this new group, as individuals, "the privilege of ruining themselves" (Appendix 1).¹³ Major provisions of the act were: (1) the division of the Lehigh River into two sections; (2) the locks to be at least 18 feet wide and 80 feet long; (3) downward navigation to be accomplished at least once every 3 days (except during the winter); and (4) the retention by the legislature of the right to purchase the navigation and all improvements at any time after the expiration of 36 years.¹⁴

The Lehigh Navigation Company came into existence on August 10, 1818, when the money subscribed by stockholders had been obtained. Subscriptions amounted to \$50,000 with 25 percent of the profits from the operations reserved for the stockholders. The balance was to go to the three original founders who, in addition, had the exclusive control of the company. Work commenced immediately on the project.

Another organization, the Lehigh Coal Company, was being formed by the owners of the Navigation Company to mine the coal, to build a road from the mines to the river, and to bring the coal to market by the river navigation. On October 21, 1818, this organization was completed with a subscription of \$55,000.¹⁵ Subscription was similar to the Navigation Company with the percentage of profits retained for the stockholders being 20 percent instead of 25 percent.

The mine wagon road was laid out in 1818, and completed in 1819. It was a descending road designed

¹⁰ CHARLES V. HAGNER, *Early History of the Falls of the Schuylkill* (Philadelphia: Chaxton, Remsen, and Haffelfinger, 1869), p. 45.

¹¹ RICHARD RICHARDSON, *Memoir of Josiah White* (Philadelphia: J. B. Lippincott and Company, 1873), p. 40.

¹² *Lehigh History*, op. cit., p. 5.

¹³ See Appendix I; *Pennsylvania Legislative Acts, 1818* (Harrisburg: C. Gleim, 1818), p. 205.

¹⁴ Pennsylvania claimed ownership of the Lehigh River on July 19, 1965.

¹⁵ *Lehigh History*, op. cit., p. 9.

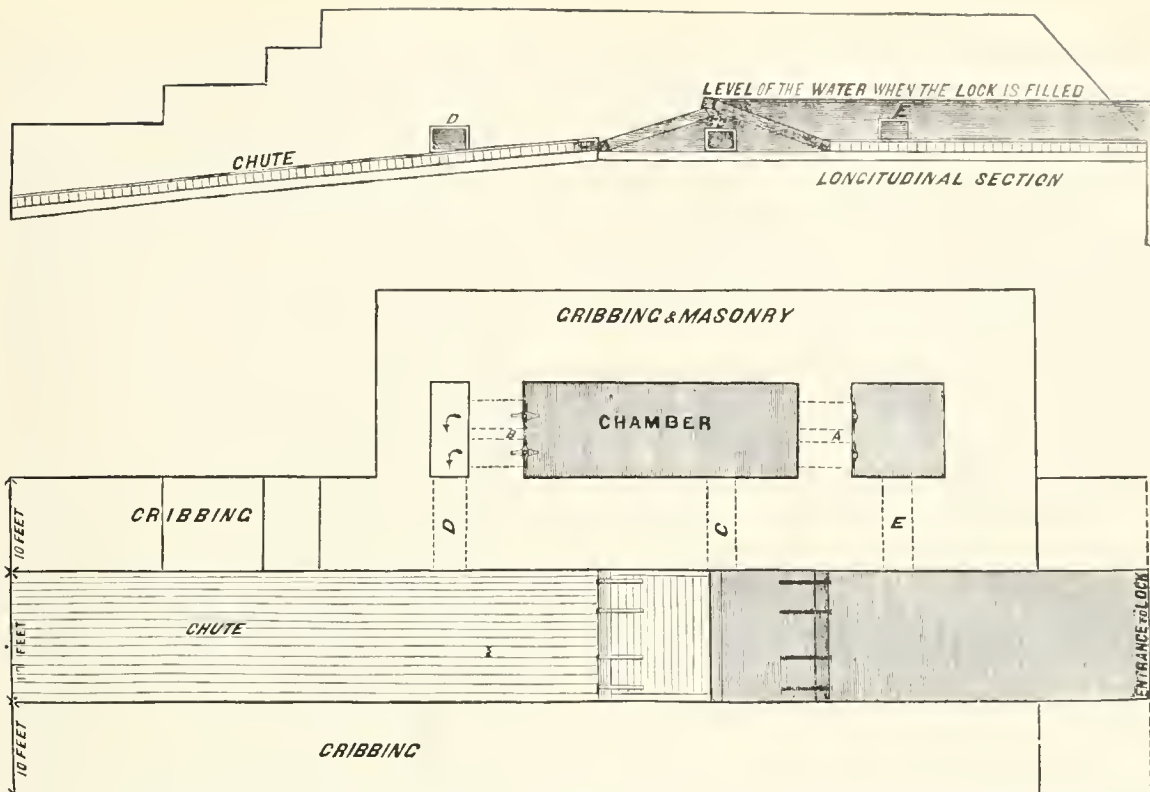


Figure 3.—PLAN OF THE BEAR TRAP LOCKS. To fill the locks: close wickets at B; open wickets at A; water passes through sluices E and A into water chamber, then through sluice C underneath gates; gates elevated; water collects back of gates and forms pool upstream. To empty the locks: close wickets at A; open wickets at B; water passes from water chamber and under gates through sluices B and D; gates lowered; water passes over lowered gates carrying the boat downstream. Chute length-gate to downstream end: 68 feet. Chute length-gate to upstream end: 38 feet. Chute width: 17 feet. Gates length: 27 feet. Water chamber length: 33 feet. Water chamber width: 10 feet. (Richard Richardson. *Memoir of Josiah White*, 1873, pp. 128-129.)

to accommodate a railroad; the rails could be placed when business would warrant this additional expense. This wagon road was the first in the Commonwealth ever laid out using surveying instruments and employed the principle of spreading out the difference in elevation from the beginning to the end over the entire distance as evenly as the topography would permit.

A drought occurred late in 1818 and the water level of the Lehigh River fell 12 inches below what, up to that time, had been considered the lowest water level. This required the storage of make-up water by constructing additional dams near Mauch Chunk. Josiah White introduced a lock and dam with sluice gates to provide an adequate water level for the passage of the canalboats as required. The workmen on the naviga-

tion called the locks the "Bear Trap," to elude the curiosity of persons who were inquiring about the purpose of their construction efforts. Twelve of these locks and dams were installed during 1818 and all proved to be workable. Josiah White obtained a patent for the design of the locks on October 19, 1819.¹⁶ This new construction delayed the opening of the waterway as additional capital proved difficult to obtain.

On March 7, 1820, Hazard and White bought out G. Hauto's interests after some disagreement among them as to the conduct of the operations. The claims of Hauto against the company were not settled until 1830.

The Lehigh Navigation and Coal Company was

¹⁶ RICHARDSON, *op. cit.*, p. 58. Richardson cites December, but the U.S. Patent Office records indicate October

formed on April 21, 1820, by the merger of the Lehigh Coal Company and the Lehigh Navigation Company (Appendix II). White and Hazard subscribed to approximately three-fifths of the additional amount of capital required to effect this reorganization. With this additional capital the navigation was placed in operation after repairing some dams that had been destroyed during the winter of 1819. Three hundred and sixty-five tons of coal were sent to Philadelphia in 1820, and so began the first regular shipment of coal from the Lehigh region via the navigation.¹⁷

The organization was completely reorganized by the directors on May 1, 1821, with an accompanying increase in stock. The name of the new amalgamation was "The Lehigh Coal and Navigation Company." All the operations became more closely aligned and Josiah White and Erskine Hazard gave up their special rights and became ordinary stockholders. The management became the responsibility of five managers, with two (White and Hazard) located in Mauch Chunk and three in Philadelphia.¹⁸

Financial problems still confronted this new organization with investors being reluctant to purchase more stock and the stockholders being concerned about their personal liability as the organization was not incorporated. To overcome these difficulties, an application was submitted to the legislature, which, on February 13, 1822, approved an act of incorporation. This act also enabled the company to increase its capital stock with new subscriptions amounting to \$83,950.¹⁹ Later in the same year, the descending route of the Lehigh Navigation was inspected by commissioners appointed by the Governor for this purpose. The commissioners' report was favorable and on January 17, 1823, the Governor granted the company a license to take tolls, but no toll was charged until 1827.²⁰

The boats, or arks, on the navigation were designed as flat bottomed shallow boxes, from 16 to 18 feet wide and from 20 to 25 feet long. Two of these boats were connected by "hinges" to allow them flexibility when passing through the dams. As the boatmen became experienced in handling the arks in pairs, the number of sections in one ark was increased until overall lengths of 180 feet were obtained. These arks were steered with long oars, similar to those used on rafts. The arks were

¹⁷ *Lehigh History*, op. cit., p. 11.

¹⁸ *Ibid.*, p. 12.

¹⁹ *Ibid.*, p. 13.

²⁰ *Ibid.*, p. 15.

SWINGLE TOW.—Two cents a pound will be paid for good clean Swingle Tow at Mauch Chunk. J. WHITE, A. M.

THE BOARD OF MANAGERS of the Lehigh Coal and Navigation Company have resolved that for the year 1830, the Toll on **SLATE** be 1½ cents per ton six feet lift or fall.

On Coal 1¼ cents per ton per six feet or fall (equal to 104 cents a ton from Mauch Chunk to the Delaware, being a lockage of 310 feet.)

The Toll on all other articles the same as last year Viz:

Three fourths of a cent per ton for every six feet lift or fall, on Limestone, Gypsum, Manure, Clay, Iron Ore, Stone, Firewood, Sand, Earth, and Hydraulic Lime.

14 cents per ton for every six feet lift or fall on Bricks, Lime Marble, Bark, Vegetables, Hay, Straw Salt, and Lumber in Boats.

1½ of a cent per ton for every six feet lift or fall, on Grain and Seeds of all sorts, Flour, Cider, Fruit, Oysters, Beer, Porter and Pig-Iron.

2 cents per ton for every six feet lift or fall, on Beef, Pork, Fish, Lard, Butter and Whiskey.

On Lumber in rafts, and all articles not enumerated, 2½ cents per ton for every six feet fall or lift.

On Boats and vessels made and used for the transportation of passengers—10 cents for every six feet lift or fall.

On boats or vessels passing by, except boats for passengers,—2 cents for every six feet lift or fall.

List of quantities which are to be deemed and estimated as a ton in collecting the tolls, viz:

FLOUR—104 barrels; **Whiskey**—8 barrels, or 2 hogsheads; **Wheat, Rye, Indian Corn, and Flaxseed**—40 bushels; **Oats**—20 bushels; **Barley**, 50 bushels. **Stone**, four fifths of one perch; **Salt Fish**, 7½ barrels, or 14 half barrels; **Lumber**, 1600 feet board measure, 2000 3 feet shingles, 3000 2 feet do; 5000 1 foot 6 inch do; 1000 barrel staves and heading, 700 hoghead do; 110 rails or posts, 1000 Hoop-poles; **Cordwood**, half a cord; **Bricks**, 50,000; **Salt**, Liverpool fine, 43 bushels; all other descriptions, 32 bushels; **Lar**, 7 barrels; **Kosm**, 8 barrels; **Oysters**, 4000; **Lime**, 28 bushels; **Window Glass**, 2500 feet.

The Offices of collection are at Mauch Chunk, Lehigh Gap, Allentown, Bethlehem, and South-easton, at which places on receipt of the toll, permits will be granted (with a reduction of 2½ per cent) to the place of destination. The tolls always to be paid before the boat or craft passes the **LOCK**.

The price of **COAL**, at Mauch Chunk, by the canal to descend the canal subject to the above toll, two dollars and 25 cents per ton.

The prices of coal at other places on the Lehigh the same as last year.

JOSIAH WHITE,
Acting Manager.

NOTICE.—The subscriber hereby gives notice, that he will

Figure 4.—LEHIGH NAVIGATION RATES OF TOLL, January 28, 1830. (*Mauch Chunk Courier*.)

built by hand and five men could fabricate one section in 45 minutes.²¹ These arks made only one downward trip, and upon reaching Philadelphia were broken up and the lumber sold. The hardware was returned by the boatmen to Mauch Chunk and reused in the construction of new arks. This type of boat was in use on the navigation until 1833, when the Delaware Division of the Pennsylvania Canal was opened and permitted up-and-down river passage.

The wooden arks were constructed mainly of pine lumber obtained from nearby forests. The boards were placed in cross courses and fastened together with nails. To ensure tight fitting joints, a joiner's plane was drawn along the edge (lengthwise) of the board to produce a continuous even surface. In the boat yards at Laurel Run (18 miles above Mauch Chunk), the plane was driven by waterpower and at Mauch Chunk

²¹ *Ibid.*, p. 14.

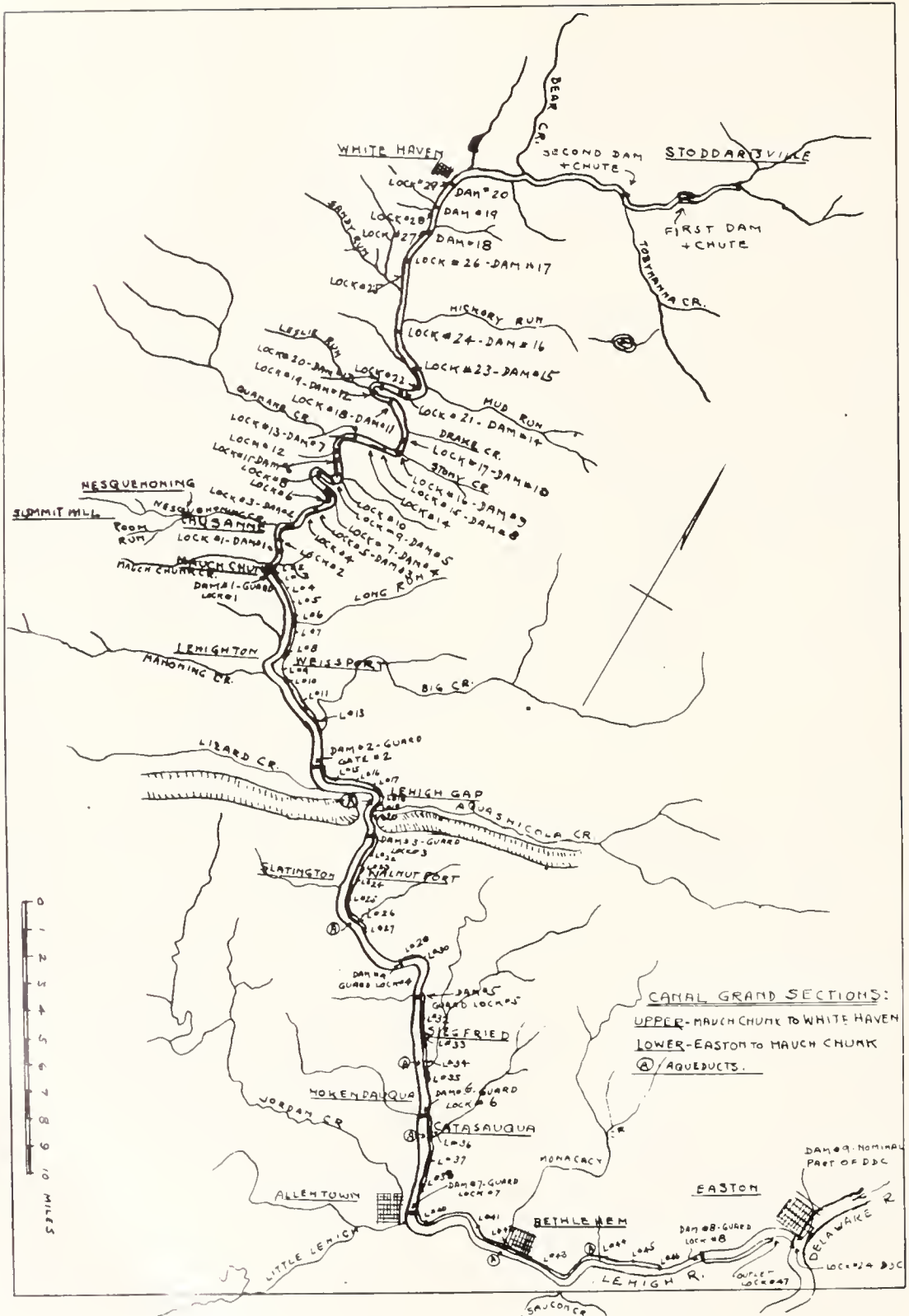


Figure 6.—THE CANAL SYSTEM of the Lehigh Coal and Navigation Company, ca. 1867. (L.C.N.C.)

by crank and manpower. Caulking was done with white pine strips, half an inch square, placed into grooves made for this purpose in the plank. Rushes were also used at times for caulking operations.²² The consumption of large quantities of lumber in the construction of these temporary boats soon became apparent and additional timber resources were of utmost importance. In 1823, navigation was extended up the Lehigh River approximately 16 miles to procure additional supplies of lumber.²³

Public acceptance of anthracite seemed to emerge during the 1824–25 season. In the previous 3 years, the supply exceeded the demand and a quantity of coal remained on hand at the end of each winter. However, the entire stock of anthracite in 1825 was sold by the 31st of December.²⁴ Shipments of anthracite down the Lehigh River tripled between 1824 and 1825.

During 1825, the company circulated a pamphlet containing facts illustrative of the character of Lehigh coal (Appendix III). Signed statements from blacksmiths, foundries, rolling mills, distilleries, and home and industrial users were included to indicate the various and efficient uses of Lehigh coal.²⁵

The variety of industries presented is an indication of the extensive efforts by the company to prove the value of their product. Grates and furnaces for burning anthracite were also being manufactured by this time. Jacob F. Walter, a grate manufacturer in Philadelphia, was instrumental in this promotional effort.²⁶ Walter received a patent on his grate design on June 8, 1827.

By 1826, the wagon road from the mines to the river landing at Mauch Chunk was in need of improvements to handle the increased demand for coal. As this road

had always presented a constant maintenance problem, the managers decided to construct the railroad.

The railroad from Mauch Chunk to the mines at Summit Hill was started in January 1827, and was in operation by May.²⁷ Total length was 9 miles with gravity descent from the mines to the river. This railroad was the first in the country constructed for the movement of coal.²⁸ Some characteristics of the Mauch Chunk railroad were:

1. The cross ties were laid 4 feet apart on a stone foundation. The rails, from England, were rolled iron bars, three eighths of an inch thick, one and one-half inches wide and mounted on wooden timbers.
2. The cars carried one and one-half tons of coal and descended the road usually in groups of fourteen. Each group was attended by two men who regulated the rate of descent. The empty cars weighed 1,600 pounds.
3. The descending trip took 30 minutes and the ascending trip took 3 hours.
4. Cost of the road amounted to \$38,726 or about \$3,050 per mile.²⁹

During 1827, the managers had the Lehigh Navigation surveyed by Canvas White³⁰ to estimate the cost of enlargement and the conversion of the present system to canal and slackwater navigation between Mauch Chunk and Easton. As a result, the dimensions of the navigation were fixed at 60 feet wide on the surface and 5 feet deep; the locks were to be 100 feet long and 22 feet wide adapted to handle boats with a capacity of 120 tons.

The Pennsylvania Canal Commissioners met in the fall of 1827 for the purpose of proceeding with the construction of the Delaware Division of the Pennsylvania Canal. The managers of the Lehigh Navigation tried to convince the commissioners to follow the Lehigh's design, but the commissioners were convinced

²² *Hazard's Register of Pennsylvania* (vol. 6, no. 18, October 30, 1830; Philadelphia: W. F. Geddes, 1830), p. 275.

²³ *Lehigh History*, op. cit., p. 14.

²⁴ Anthracite shipments from the Schuylkill field began with the completion of the Schuylkill Navigation in 1825.

²⁵ LYMAN AND RALSTON, *Facts Illustrative of the Character of the Anthracite* (Boston: T. R. Marvin, 1825), p. 9. "We have used the Lehigh coal several years past to heat bar iron for our rolling mill at Bridgetown, Cumberland county, New Jersey; prior to the introduction of this, we used the Richmond coal for the same purpose, and from experience thus obtained, we are satisfied that for this purpose, one bushel of the former is worth at least two of the latter." "Philadelphia, May 19, 1824, Benjamin and David Reeves."

²⁶ RICHARDSON, op. cit., p. 66. Throughout the literature, this surname is given both as "Walter" and "Walters"; the former predominates.

²⁷ THE LEHIGH COAL AND NAVIGATION COMPANY, *Annual Report for 1827* (Philadelphia: S. W. Conrad, 1828), p. 4. Hereafter referred to as L.C.N.C.

²⁸ One earlier road, 3 miles in length, was in use by the Quincy Railroad in Massachusetts for hauling granite from their quarry to loading docks on the Neponset River. DAVID STEVENSON, *Sketch of the Civil Engineering of North America* (London: John Weale, 1838), p. 238.

²⁹ L.C.N.C., *Annual Report for 1827* (Philadelphia: S. W. Conrad, 1828), p. 7.

³⁰ A prominent engineer previously employed in the construction of the Erie Canal.



Figure 7.—LEHIGH NAVIGATION above Mauch Chunk and the railroad from White Haven to the Susquehanna River, 1840.
(History of the Lehigh Coal and Navigation Company, 1840.)

that European experience, in using 25-ton boats, was more applicable and decided to make the locks half the width but the same length as those of the Lehigh Navigation.³¹

The Lehigh slackwater navigation between Mauch Chunk and Easton was opened for use in June 1829.³² The Delaware Division improvements, started 4 months after the Lehigh, were not completed until 1832. To ensure the Delaware's completion, Josiah White was impressed as a consultant to design and construct a useful navigational system.³³ The delay in the construction of the Delaware Division caused the Lehigh managers to pass eight semiannual dividend payments. The company was required to use temporary arks which were the only kind of boats that could be used in the downward navigation on the Delaware.

The Lehigh Company expended all of its authorized capital while engaged in improving and enlarging their facilities and, in 1828, applied to the legislature for an increase of capital.³⁴ The attitude of the public toward this venture changed as the managers had proven that the Lehigh was navigable, but now there were many objections to the concessions granted under the original charter. The increase in capital was denied as the Lehigh managers refused to relinquish their valuable concessions. With the denial by the legislature for an increase in capital, the company's first private loan was negotiated during 1828 (details remain unknown).

During the next 6 years, the coal traffic continued to grow despite the necessity of continual improvements to keep the navigation operational. The capacities of the boats were gradually increased and the *Mauch Chunk Courier* announced, near the end of the 1833 season, the use of a 100-ton boat on the navigation.³⁵ Shipments of coal decreased in 1834, as the result of slack business conditions throughout the country, but an increase in the coal trade was noted in the following year.

In 1835, with public attention being directed to the Beaver Meadows coal region and the deadline approaching for the completion of the navigation on the

upper section, the Lehigh managers decided to extend the navigation up to Stoddartsville. This work was begun in 1835 and completed on September 26, 1837.³⁶

The prejudices against the company had subsided by then and on March 13, 1837, the legislature authorized the company to build the Lehigh and Susquehanna Railroad, 19 miles long, to connect the northern anthracite field with the Lehigh Navigation (Wilkes-Barre to White Haven).³⁷ Under the same authority, the company was permitted to increase its capital to \$1.6 million from the previous limit of \$1 million.

The Governor's commission inspected the Stoddartsville section of the navigation and recommended the issuance of a warrant to collect tolls beginning November 2, 1837 (Appendix IV).³⁸ The managers reported to the Governor that the railroad was completed on March 19, 1838, and on June 19, 1838, received a warrant to charge tolls on that property.³⁹ With the completion of the railroad, a shorter line of communication was obtained to the west by use of the Pennsylvania canal system which was completed in 1835. Total construction costs of the Lehigh and Susquehanna Railroad amounted to \$1,326,700.

As early as 1834, the company offered to any iron manufacturer who successfully used Lehigh anthracite in his furnace special privileges—coal at a reduced rate, grants of waterpower, and reduced canal rates for shipments to market.⁴⁰

No offers were received until July 1839, when the owners of the Lehigh Crane Iron Company accepted the company's longstanding offer.⁴¹ The Company, incorporated on May 20, 1839, for the manufacture of iron from coke or mineral fuel, was formed through the efforts of three of the managers of the Lehigh Coal and Navigation Company.⁴²

As superintendent of their operations, David Thomas, an ironmaster from Wales, was employed. Thomas was an associate of George Crane, who had

³¹ L.C.N.C., *Annual Report for 1838* (Philadelphia: James Kay, 1839), p. 37.

³² *Pennsylvania Legislative Acts, 1836-37* (Harrisburg: T. Fenn, 1837), pp. 52-57.

³³ L.C.N.C., *Annual Report for 1838* (Philadelphia: James Kay, 1839), p. 45.

³⁴ *Ibid.*, p. 53.

³⁵ RICHARDSON, *op. cit.*, p. 100.

³⁶ L.C.N.C., *Annual Report for 1837* (Philadelphia: W. S. Young, 1840), p. 27.

³⁷ Josiah White, Erskine Hazard and Thomas Earp.

³¹ *Lehigh History*, *op. cit.*, p. 20.

³² L.C.N.C., *Annual Report for 1829* (Philadelphia: T. A. Conrad, 1830), p. 12.

³³ Josiah White resigned his office of Acting Manager at Mauch Chunk during 1831 and moved to Philadelphia. *Hazard's Register of Pennsylvania*, *op. cit.* (vol. 8 no. 8, August 20, 1831), p. 128.

³⁴ *Lehigh History*, *op. cit.*, p. 22.

³⁵ *Mauch Chunk Courier*, November 9, 1833.

LEHIGH CRANE IRON FURNACE

Furnace Design

Stack height	40 feet
Bosh diameter	12 feet
Number of tuyeres	3
Water wheel diameter	12 feet
Temperature	600° F.
Hearth area	3½ feet square

Capacity (week)

104	tons of iron ore
69⅓	tons of anthracite
52	tons of limestone
50	tons of pig metal produced



Figure 8.—DAVID THOMAS. Lithograph by A. Newsam.
(M. S. Henry, *History of the Lehigh Valley*, 1860.)

invented and patented a process of iron making using anthracite in Wales in 1837.⁴³ In 1838, Crane purchased the American rights for a similar process from the executors of Dr. F. W. Geissenhainer, who had received a patent on December 19, 1833, after successfully using anthracite at Valley Furnace (Pottsville). Crane was later granted an American patent for smelting iron with anthracite.⁴⁴

A blast furnace was built at Craneville (Catasauqua) and on July 4, 1840, the first successful blast using Lehigh coal was made.⁴⁵

Anthracite furnaces were built throughout the East as a result of this (and later) experiments conducted by Thomas.

⁴³ WALTER R. JOHNSON, *Notes on the Use of Anthracite in the Manufacture of Iron* (Boston: C. C. Little and J. Brown, 1841), p. 12.

⁴⁴ RICHARDSON, *op. cit.*, p. 102.

⁴⁵ *Mauch Chunk Courier*, July 25, 1840. Previously, an experimental water-powered furnace built in Mauch Chunk used Lehigh coal during 1838–39. Mechanical problems forced the furnace to close down.

Business conditions were satisfactory for several years until a flood occurred on January 10, 1841.⁴⁶ As a result, coal could not be sent to market, and all the resources of the company had to be called up to restore the damage to the canal. A mortgage was negotiated on the coal lands in the vicinity of Mauch Chunk to obtain the funds required for reconstruction. The navigation was again opened to traffic on July 10, 1841.⁴⁷

The managers acted with great speed during this reconstruction period and made a request to the legislature for an increase in capital funds. The managers presented their case on the premise that a few years of prosperity would bring the company out of debt. An amending act which was passed on March 13, 1841, stated "that it shall be lawful for the Lehigh Coal and Navigation Company to increase their capital stock by the sale of shares or otherwise to an amount which shall not exceed the actual cost of the navigation and railroad . . . provided the capital stock . . . shall not exceed six million dollars."⁴⁸

The period from the reconstruction of the flood damage, 1842 to 1845, again showed an increase in coal traffic. The navigation was adequate in size, consistent with the demand, and the company possessed a monopoly on the trade from the region. The coal traffic increased both from the company's mines and from

⁴⁶ L.C.N.C., *Annual Report for 1840* (Philadelphia: W. S. Young, 1841), p. 17.

⁴⁷ L.C.N.C., *Annual Report for 1841* (Philadelphia: Brown, Bicking and Guilbert, 1842), p. 7.

⁴⁸ *Pennsylvania Legislative Acts*, 1841 (Harrisburg: Peacock and McKinley, 1841), pp. 36–37.



Figure 9.—EARLY ANTHRACITE IRON-FURNACE at Catsauqua. (*Pop. Sci. Monthly*, 1891, vol. 38, no. 4, p. 451.)

other mines under development, by Beaver Meadows, Hazleton, Sugar Loaf, and Buck Mountain Coal Companies. (See description of companies, pp. 110–114.) The coal trade was the main source of revenue for the company. Competition from the railroad did not begin until 1855.⁴⁹

Also showing an increase in this period were two classes of traffic; lumber and materials involved in the manufacture of iron. Iron ore and limestone was carried up the canal to the blast furnaces and later came back down in the form of pig iron. Lumber shipments continued to grow until 1850 and then began to decrease.

The general trade classification, including flour, whiskey, grain, bricks, etc., never became a major source of revenue. When railroad connections became available, this traffic disappeared more rapidly from the navigation than did the heavier class of traffic.

⁴⁹ The Delaware, Lehigh, Schuylkill and Susquehanna Railroad (changed to the Lehigh Valley Railroad in January 1853) was incorporated on April 23, 1846.

Lehigh Company Coal Properties

The coal lands belonging to the company totaled approximately 8,000 acres and comprised the entire eastern end of the southern anthracite field. These lands begin on the east, on the top of Broad Mountain (Mount Pisgah) a half mile from the Lehigh River near Mauch Chunk, and extend 14 miles to Tamaqua on the Little Schuylkill River. On the northern side of this coal basin, nine coal beds ranging from 5 to 28 feet in thickness are found, and in some places extend up to 111 feet. On the southern side of the basin four major seams of coal are found measuring 9, 15, 20, and 50 feet, for a total thickness of 94 feet.⁵⁰

At the great mine at Mauch Chunk (Sharp Mountain the seams were located near the surface, and mining operations were greatly simplified during the early days. The working force primarily consisted of hand laborers, and open-pit quarry-type operations

⁵⁰ *Lehigh History*, op. cit., p. 23

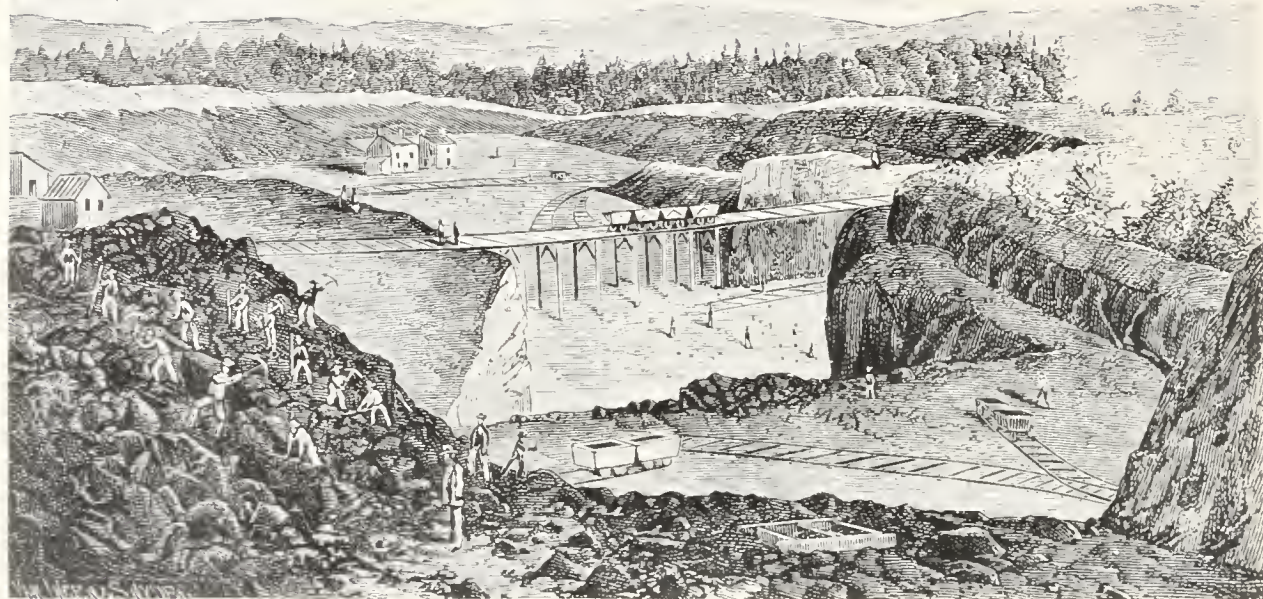


Figure 10.—COAL MINE AT SUMMIT HILL, 1821. (Richard Richardson, *Memoir of Josiah White*, 1873, p. 48.)

were used.⁵¹ The overburden was relatively light and varied from 3 to 15 feet. The exposed area was entered in many locations by roads cut around and through the coal seams.

The exposed coal was removed by using hand picks in the natural joints and by driving wedges in the seams running parallel with the host strata. A few blows by these tools were usually required to free the coal. For ease in handling, sledges were sometimes used to break the larger pieces before loading into wagons.

In some cases, when the coal was interrupted by slate and rock, it was necessary to drill holes by hand and separate the strata by blasting. Large pieces of material resulting from the blast were reduced in size by sledging. Refuse material from the quarry was hauled away and dumped over an adjacent hill where it would not interfere with mining operations.

⁵¹ Laborers were furnished with daily rations of whiskey, at a reduced pay scale, if so desired. *Hazard's Register of Pennsylvania* (vol. 1, no. 20; Philadelphia: W. F. Geddes, 1828), p. 312.

The company, with high hopes of discovering additional coal deposits nearer the navigation, began on March 1, 1824, to excavate a tunnel about two and one-half miles west of Mauch Chunk. This "Hacklebernie" tunnel was the first large mining tunnel driven in the United States. It measured 16 feet wide and 8 feet high and was extended some 790 feet before the operations were temporarily suspended on June 9, 1827.

Coal was found in the tunnel but, at the time the company suspended operations, it was decided that the continuance of the operation was not essential for current production requirements. The company anticipated the need in later years for a drainage tunnel in mining the coalbeds above, and this tunnel could then be continued to serve that purpose.⁵²

During the 3 years of tunnel operations, the company expended \$26,812 to remove approximately 3,745

⁵² Work on the tunnel was resumed in 1846 and driven for a total length of 2,200 feet.

M A P
Showing the position of Coal beds now exposed
 in the
MAUCH CHUNK COAL REGION.
 Part of Broad Mountain

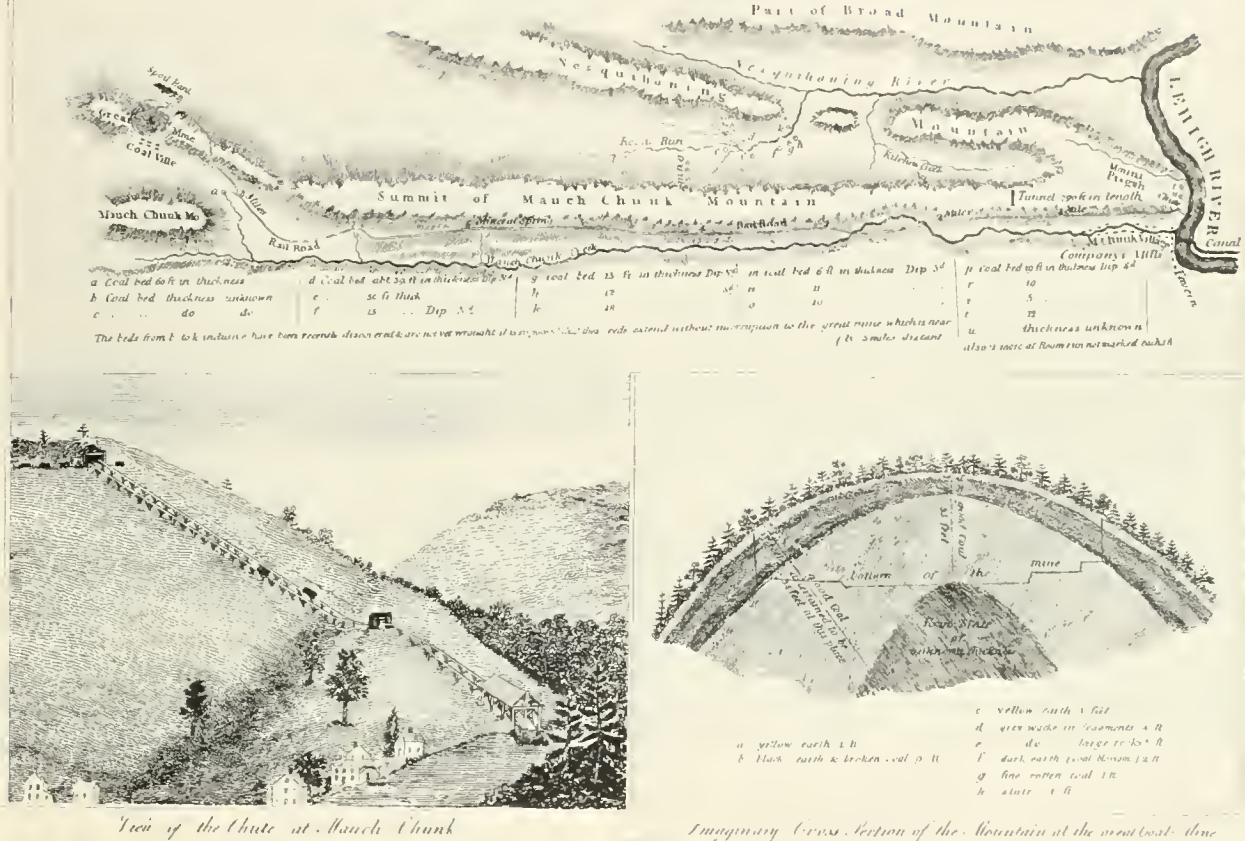


Figure 11.—THE MAUCH CHUNK COAL REGION, The "Hacklebernie" tunnel is shown in the upper right. (Benjamin Silliman, *The American Journal of Science and Arts*, 1831, vol. 19, no. 1, pl. 1.)

cubic yards of hard conglomerate at a unit cost of \$7.16 per cubic yard. The following costs were charged to the operation: ⁵³

Labor—23,129¾ days-----	\$18,697.09
Tools and materials-----	3,785.86
Powder—521 kegs-----	1,831.00
Candles and oil for lights-----	812.71
Lumber, including pipes for air-----	508.54
One horse blowing wind for 268 days--	196.80
Superintendence -----	980.00
Total -----	\$26,812.00

⁵³ I. DANIEL RUPP, *History of Northampton, Lehigh, Monroe, Carbon, and Schuylkill Counties* (Harrisburg: Hickock and Cantine, 1845), pp. 202–203.

The working day at the mines began at sunrise and ended at 4:30 p.m. According to a news item that was given wide circulation by the press, the average number of tons of coal quarried each working day totaled 268. This quantity of coal was loaded at the mines, transported on the railroad, unloaded from the wagons at the chute, and loaded into boats. The news item ended "we not only load the vessels, but create the freight, and also build the vessels to carry it all on the same day!" ⁵⁴

During 1830, a deposit of coal was discovered on the north side of Mount Pisgah near Rhume (Room) Run. (Nesquehoning) only 4 miles from the Lehigh River.

⁵⁴ *Hazard's Register of Pennsylvania* vol. 5, no. 24, June 12, 1830), p. 384.

Mauch Chunk, 3 month. 12, 1831.

PROPOSALS.

WILL be received at the office of the Lehigh Coal and Navigation Company, (at this place) on or before the 25th inst. for performing the following work, viz.

- For quarrying coal at the great mine.
- Do hauling do to summit.
- Do building box boats.
- Do rigging do do complete.
- Do making scoops, oar pins, cabins, &c.
- Do hauling out rafts of lumber and piling.
- Do supplying rail road wagons for coal.
- Do do do do for dirt.
- Do transporting coal from Mauch Chunk to South Easton &c. in the Company's box boats.

None need apply but those who can satisfy the Acting Manager that they are able and willing to fulfil their contracts themselves, and not by sub-contractors.

All particulars will be made known relating to the works, by applying to the Company's Agent at the mines, or to the Acting Manager at Mauch Chunk.

JOSEPH WHITE, Acting Manager.

March 15, 1831.—It.

N. B. Printed blanks for proposals will be furnished at the Company's office



Figure 13.—DESCENDING COAL AND MULE WAGONS. The artist has added two mules to the usual complement of four per wagon. (T. L. Mumford, *The Switzerland of America*, 1883, p. 15.)

Figure 12.—ADVERTISEMENT REQUESTING BIDS, March 28, 1831. (*Mauch Chunk Courier*.)

Benjamin Silliman, reporting on the quality and quantity of the coal at this new deposit, stated that “the coal appears to be of the finest quality, and some of it, in the high lustre and perfection of its fracture, exceeds anything I have elsewhere seen.” He estimated that “when all the beds are perforated there can be no doubt that the entire thickness will exceed two hundred feet, which is about three times that of the great mine at Mauch Chunk.”⁵⁵

The managers immediately started plans to locate a railroad from this new deposit to the landing at Mauch Chunk. The road, completed in 1833, included three inclined planes and the entire road from the mine was descending.⁵⁶ The design of the self-acting planes was such that the descending loaded wagons returned the empty ones to the top of the plane.

During 1831, the company began to negotiate contracts for the mining and transporting of coal to the

landing at Mauch Chunk. Advertisements appeared requesting that proposals be submitted to the company to perform other needed services, such as sorting the coal before loading, loading into wagons, and loading the boats at Mauch Chunk.⁵⁷

The location of coal deposits near the surface permitted the mine operators to hold down labor costs. Quarry operations permitted the use of common laborers at a wage rate lower than that paid to the underground miners required in the Schuylkill field. The wage differential during this period ranged from a low of approximately 18 cents per day in 1831, to a high of 33 cents per day in 1845. Calculations using this labor differential on a per ton basis revealed that a reduction of from 10 to 25 cents per ton could be effected by employing common labor.

An inventory, conducted by the acting manager, of equipment at the company mines in 1831 contained the following items:⁵⁸

<i>Total Company</i>	
9 Oxen	33 Horses
30 Canalboats	115 Mules

⁵⁵ *Mauch Chunk Courier*, March 15, 1831.

⁵⁸ L.C.N.C., *Annual Report for 1831* (Philadelphia: W. F. Geddes, 1832), p. 9.

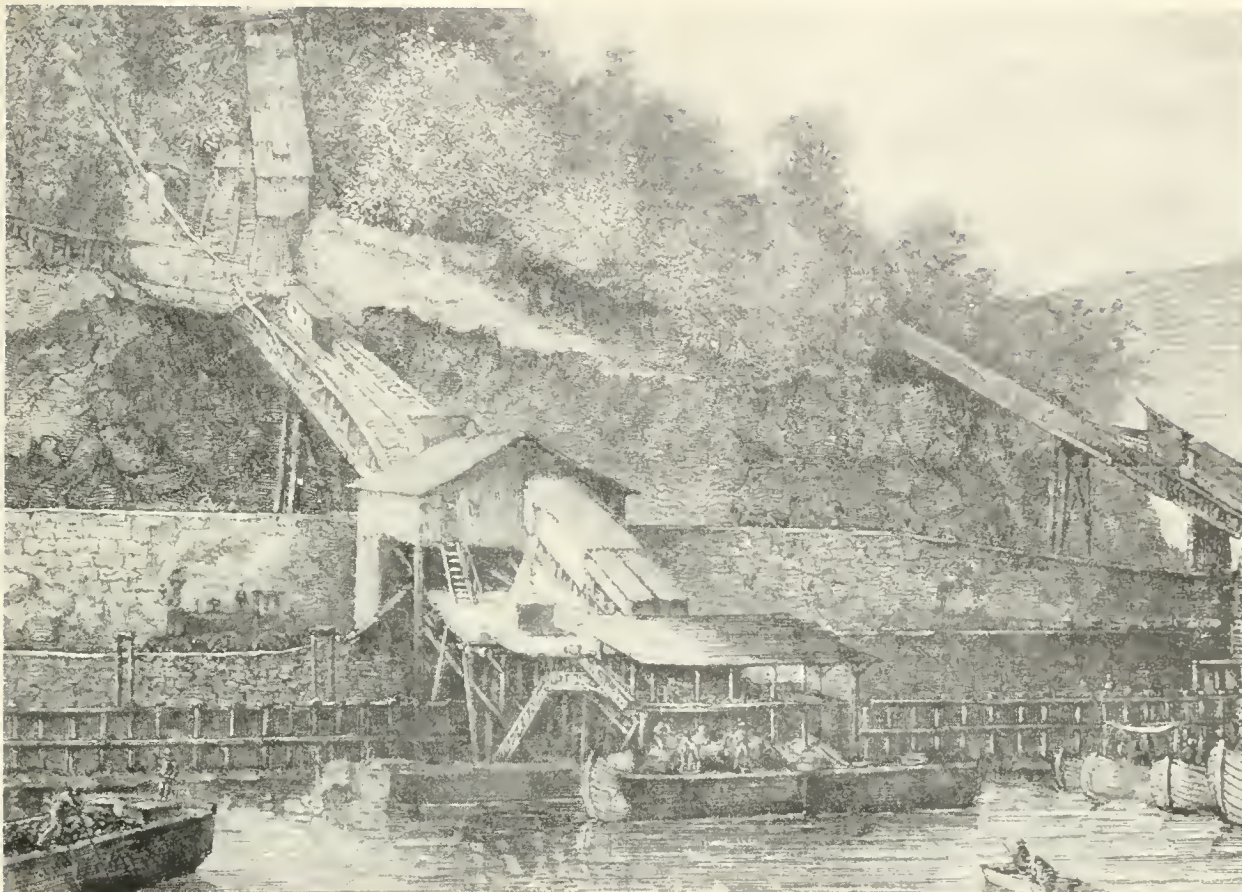


Figure 14.—LOADING BOATS on the Lehigh Canal; from an old woodcut. (L.C.N.C.)

<i>Great Mine</i>	<i>Room Run</i>
21 Mule wagons	21 Coal wagons
44 Dirt wagons	13 Dirt wagons
308 Coal wagons	
9 Miscellaneous wagons	

An unusual method of railroad operation required the listing of mule wagons in the inventory. The railroad was a gravity road and the loaded coal wagons plus mule wagons (each holding four mules) rode down the track (fig. 13). After being unloaded, the empty coal wagons were returned by mule power to the summit mines along with the empty mule wagons. The speed of the loaded wagons down the track was between 5 and 7 miles per hour.⁵⁹

The coal wagons were square boxes widened at the

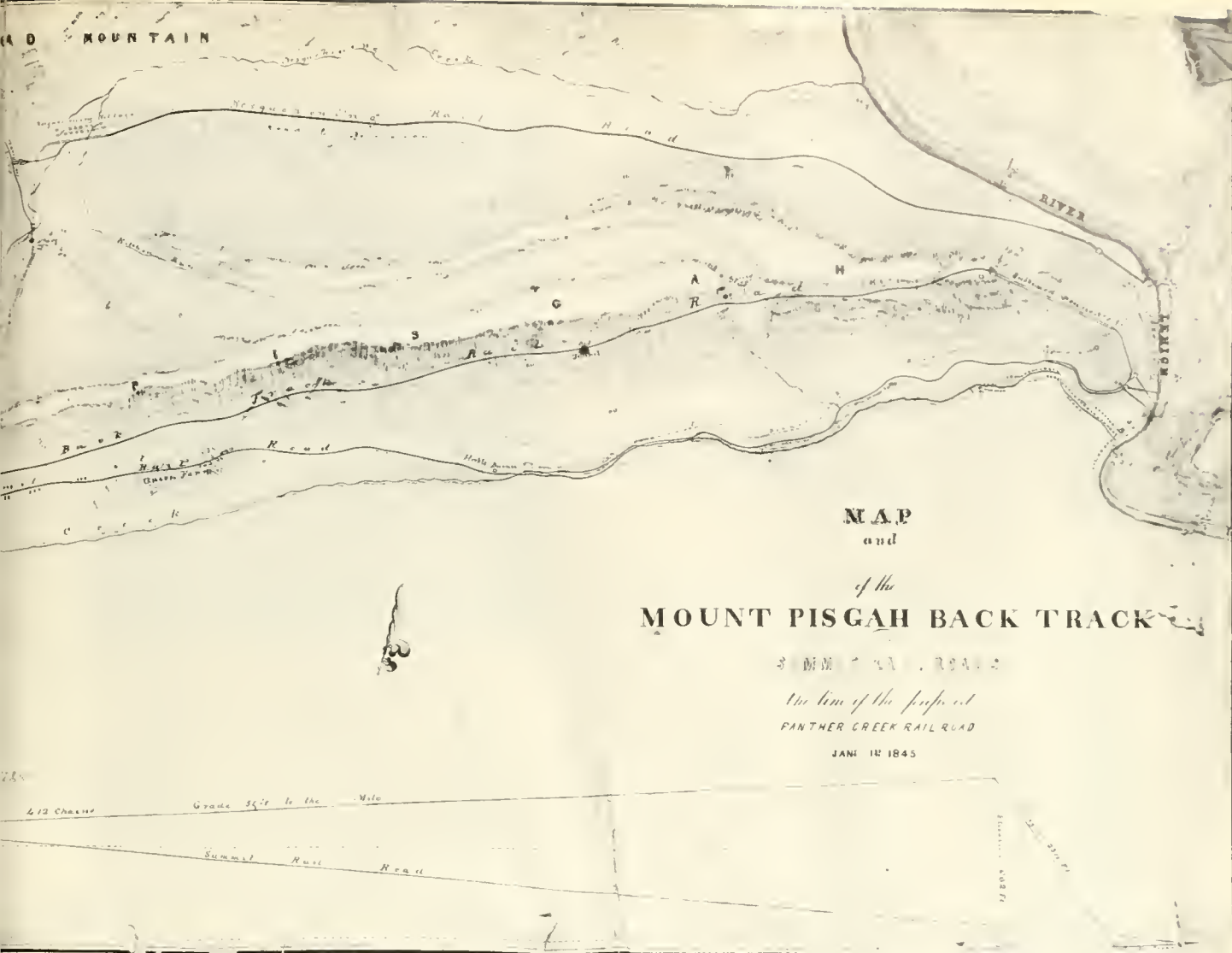
top and mounted on cast iron wheels of 18 to 24 inches in diameter. The axle holding the wheels turned as the wheels turned. The wheels were constructed with a 4-inch flange and an inner lip to keep them positioned on the rails.

A lever was fixed to each wagon near the left front wheel and extended above the side of the wagon. By pulling this lever back, every wheel was clasped by two semicircular pieces of wood. The friction thus applied retarded or instantly stopped the wagon. In a trainload of wagons, these levers were tied together with a rope so that the trip operator could control the speed of the entire load. Average trainloads consisted of 14 wagons, each with a capacity of one and a half tons of coal.⁶⁰

The problem of getting coal from wagon to ark was

⁵⁹ L.C.N.C., *Annual Report for 1828* (Philadelphia: S. W. Conrad, 1829), p. 7.

⁶⁰ *Hazard's Register of Pennsylvania* (vol. 2, no. 31, August 2, 1838).



iron bands were installed on the other two inclined planes. Maintenance costs were reduced and replacements were seldom required.⁶²

In 1839, the company leased the entire Room Run operations for a 3-year period. The contractors were to mine 30,000 tons of coal the first year and thereafter to increase their output by 5,000 tons per year. The company received a royalty payment for each ton of coal mined. Similar leasing arrangements were planned for the old mine property at Summit Hill whenever a second or return track could be built between the mines and the loading chute at Mauch Chunk.⁶³

A separate return track was eventually constructed during 1844 and opened for use with the 1845 season.⁶⁴ The empty coal wagons from the loading chutes at Mauch Chunk were returned to the mines via this new road, thereby increasing the capacity of the original road by eliminating the delay caused by waiting for the loaded train to pass at turnouts. At about the same time, stationary engines were installed at the inclined planes leading into the mines, replacing animal power and thereby increasing the road's haulage capabilities. A plan of the facilities, as they existed at the beginning of the 1845 season is shown in figure 15.

⁶² L.C.N.C., *Annual Report for 1838* (Philadelphia: James Kay, 1839), p. 31.

⁶³ *Ibid.*, p. 20.

⁶⁴ L.C.N.C., *Annual Report for 1845* (Philadelphia: James Kay, 1846), p. 6.

Incorporation of Additional Companies

The Lehigh Coal and Navigation Company conducted the first successful mining operations in the Lehigh region, and during the first 25 years (1820-45) was joined by 17 other corporations (Table 1). The companies, chartered by the Legislature of Pennsylvania, were granted similar privileges, powers, and limitations, but none received the unlimited concessions granted previously to the Lehigh Coal and Navigation Company.

These charters contained authorization to acquire coal lands (maximum 2,000 acres) and to construct a railroad, if needed, to connect their operations with existing transportation facilities.

TABLE 1.—Companies incorporated utilizing the facilities of the Lehigh Navigation¹

Company	Date Incorporated	Capitalization
Lehigh Coal and Navigation.	February 13, 1822. ²	\$6,000,000
Beaver Meadows.....	April 7, 1830.....	800,000
Little Schuylkill and Susquehanna.	March 31, 1831.....	2,000,000
Hazleton Coal.....	March 18, 1836.....	250,000
Summit Coal.....	March 18, 1836.....	250,000
Laurel Hill Coal.....	June 16, 1836.....	250,000
Buck Mountain Coal.....	June 16, 1836.....	250,000
Northampton and Luzerne Coal.	June 16, 1836.....	250,000
Mountain Coal.....	February 28, 1837.....	250,000
Stafford Coal.....	March 3, 1838.....	350,000
Sugar Loaf Coal.....	April 16, 1838.....	250,000
Tammanend Coal.....	April 16, 1838.....	250,000
Wyoming Coal.....	April 16, 1838.....	300,000
Hanover Coal.....	February 6, 1839.....	250,000
Potosi Coal.....	June 24, 1839.....	250,000
Middle Field Coal.....	May 29, 1840.....	250,000
Diamond Coal.....	March 19, 1841.....	250,000
Black Creek Coal.....	April 3, 1841.....	200,000
Total.....		\$12,650,000

¹ Pennsylvania Legislative Acts.

² Unincorporated from 1818 to this date.

COAL MINES TO LET.

The Summit Coal Company have completed their Rail Road, erected screens, and opened mines, ready for working to the extent of Fifty Thousand tons of coal per annum. Capable of being wrought by uncovering, entirely above water level which they are prepared to lease on advantageous conditions for a term of years.—These mines are in the immediate vicinity of the Beaver meadow works, and the transportation is continuously descending to the Lehigh River. The mining operations can be carried on with great economy, owing to the favorable position of the Veins.

Proposals may be left at the office no 57 South 3d street Philadelphia directed to

J. L. Fenimore.

Secretary of the Board of Directors.
Philadelphia, Dec. 16, 1841.

Figure 16.—SUMMIT COAL COMPANY December 20, 1841, request for bids. (*Mauch Chunk Courier.*)

The Beaver Meadows Company was chartered in 1830, and one year later the Little Schuylkill and Susquehanna Company received its charter. After a lapse of 5 years, the Hazleton Coal Company and the Summit Coal Company were chartered at the same time in 1836. The remaining companies were chartered between this date and April 1841. All of these companies utilized the navigation facilities of the Lehigh River in transporting their products to market.

Coal production during this period was limited to eight active operations. One company, the Laurel Hill, conducted operations for about one year and then consolidated with the Hazleton Coal Company. Another company, the Sugar Loaf Coal Company, produced anthracite for 6 years (1839-44) and then also combined with the Hazleton Coal Company. Development work on the properties of the remaining companies continued, but little, if any, shipments of coal from these mines entered the market prior to January 1845. Anthracite shipments on the navigation between 1820 and 1845 are given in Table 2.

THE BEAVER MEADOWS RAILROAD AND COAL COMPANY, incorporated on April 7, 1830, was authorized to hold coal lands in Northampton County⁶⁵ and to construct a single- or double-track railroad from their

⁶⁵ Carbon County was taken from Northampton County land in 1843.

TABLE 2.—*Anthracite shipped from Lehigh region by source, via navigation, from 1820 to 1845, in short tons*¹

Year	Lehigh Company	Beaver Meadows	Hazleton	Sugar Loaf	Buck Mountain	Others	Total
1820	365						365
1821	1,073						1,073
1822	2,240						2,240
1823	5,823						5,823
1824	9,541						9,541
1825	28,393						28,393
1826	31,280						31,280
1827	32,074						32,074
1828	33,150						33,150
1829	25,110						25,110
1830	41,750						41,750
1831	² 42,743						42,743
1832	75,937						75,937
1833	122,938						122,938
1834	106,518						106,518
1835	131,250						131,250
1836	146,738						146,738
1837	192,595	31,500					224,095
1838	153,547	44,442	14,221			³ 2,001	214,211
1839	140,760	38,595	33,826	7,510		³ 1,159	221,850
1840	102,264	43,707	50,366	28,958	54	⁴ 236	225,585
1841	78,164	26,232	21,263	17,170	—	209	143,038
1842	163,762	45,423	31,082	31,934	—	352	272,553
1843	138,826	54,729	44,579	26,814	2,844	34	267,826
1844	219,245	70,379	70,760	2,866	13,844	—	377,094
1845	257,740	77,161	70,659	⁵ —	23,858	74	429,492
Totals	2,283,826	432,168	336,756	115,252	40,600	4,065	3,212,667

¹ L.C.N.C., *Annual Reports* for the years 1820–45.

² Room Run production beginning in 1831.

³ Laurel Hill production combined with Hazleton Coal Company in 1840.

⁴ Tammanend production of 27 tons included.

⁵ Sugar Loaf production combined with Hazleton Coal Company in 1845.

mines to any convenient point on the Lehigh River at any location above Mauch Chunk. Supplemental legislation authorized the continuance of the railroad down the Lehigh valley or to any other convenient point. Mining operations were begun in 1831.

The first shipment of coal from this property was made during 1837, and the quantity of coal moved during that year amounted to 31,500 tons.⁶⁶

Coal was loaded into railroad cars with a capacity

⁶⁶ L.C.N.C., *Annual Report for 1837* (Philadelphia: James Kay, 1838), p. 6.

of two and one-half tons and hauled in trains of 20 cars by locomotive to the loading docks on the navigation. Four locomotives were in use on the road by the end of the navigational season in 1837.⁶⁷

The first locomotive on the railroad was built by the firm of Garrett and Eastwick of Philadelphia and was named the "Samuel D. Ingham" after the president of the company.⁶⁸ The locomotives were of the wood-

⁶⁷ *Ibid.*, p. 19.

⁶⁸ M. S. HENRY, *History of the Lehigh Valley* (Boston: Bixler and Corwin, 1860), p. 400.

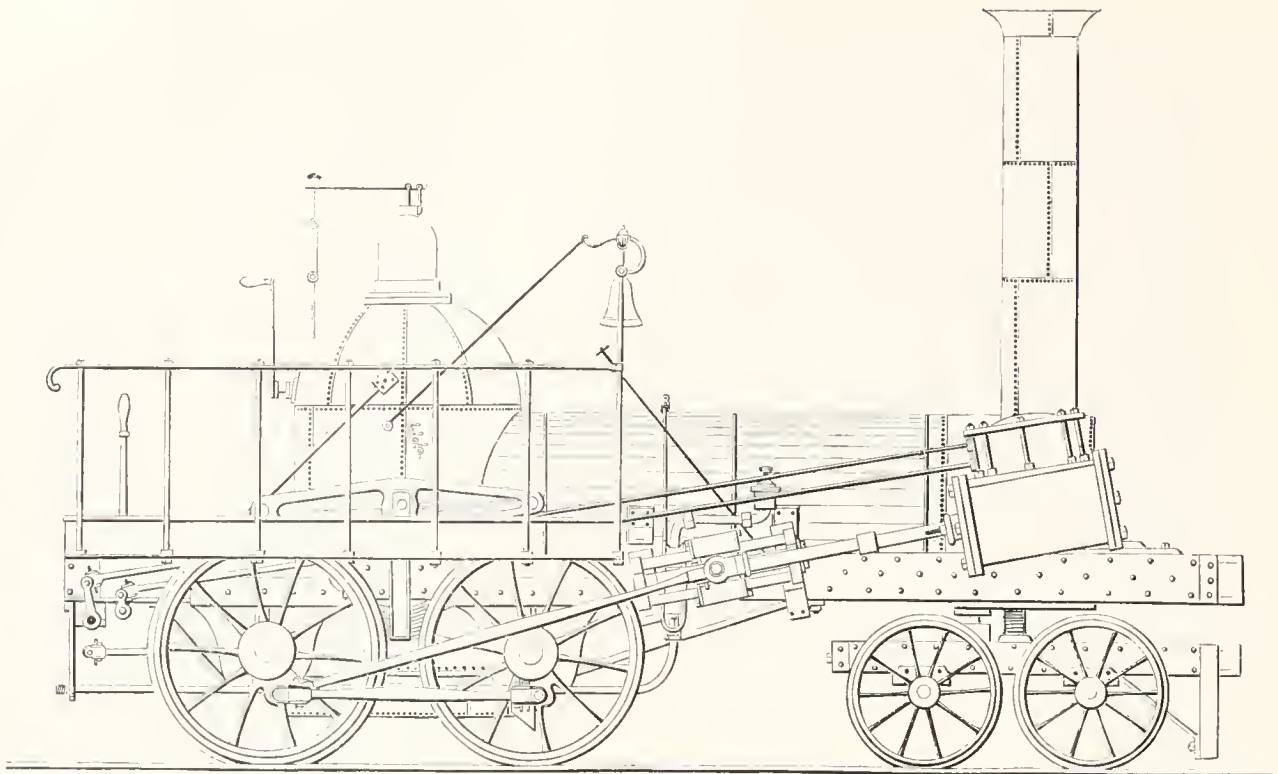


Figure 17.—1837 “HERCULES,” Garrett & Eastwick’s first 8-wheel locomotive. The “Hercules” quickly replaced the “Samuel D. Ingham,” also built by Garrett & Eastwick. (Joseph Harrison, Jr., *The Locomotive Engine*, 1872, p. 49.)

burning type, but after experimentation and redesign were burning anthracite exclusively (except for the first-built fire).

The railroad extended from the company’s mines to Parryville, 6 miles below Mauch Chunk, for a total distance of 20 miles. The completed road differed from the original layout due to opposition by the Lehigh Coal and Navigation Company to the exact location of the road and apparent infringements of the Lehigh Company’s prior concessions.⁶⁹

By June 1839, the Beaver Meadows had five locomotives in use and was shipping 38,595 tons of anthracite to the Lehigh Navigation. During 1840, the company leased the mining operations to Vancleve and Company. The transportation of the coal was accomplished by using the cars and locomotives owned by the Beaver Meadows and under contract to the same company.⁷⁰

⁶⁹ *Pennsylvania Legislative Acts, 1837–38* (Harrisburg: T. Fenn, 1838), p. 393.

⁷⁰ BEAVER MEADOWS RAILROAD AND COAL COMPANY, *Annual Report for 1842* (Philadelphia: Elliott’s Printing Office, 1843), p. 7.

The Beaver Meadows Railroad was subject to disruptions in traffic due to the flooding of the Quakake Creek and Lehigh River. After the flood of 1841, the company was forced to abandon the tracks extending from Mauch Chunk to Parryville. To replace this section, a new loading facility was built in East Mauch Chunk for loading the boats for the downriver trip.

THE HAZLETON COAL COMPANY, incorporated on March 18, 1836, was authorized to hold coal lands within Sugar Loaf Township in Luzerne County and Lausanne Township in Northampton County.⁷¹

Another section of the act authorized the construction of a railroad, consisting of one or two tracks, from any point on their lands to an intersection with the Beaver Meadows Railroad.

The company started mining operations on their property and the construction of the railroad during 1836. The first shipment of coal over the completed road was made on May 14, 1837. Shipments to the

⁷¹ Lausanne Township became part of Carbon County in 1843.

Proposals for Mining Coal.

THE "Beaver Meadow Railroad and Coal Company" will receive proposals for Mining and delivering from 30,000 to 60,000 tons of their Coal, free from Slate and other impurities, into their Cars at the Mines, during the coming boating Season—and also for transporting the same to their landing at Parryville. The Company to furnish the Cars and motive engines and engineers. The contractors to keep the Cars and engines in good running repair, supply fuel, oil, &c. &c. &c.

Sealed proposals will be received for either the old or new mines or both. They must be sent to their Office in Philadelphia by the 25th of March, instant.

Persons desirous to Contract will receive further information at the Company's office Beaver Meadow or at Philadelphia.

Philadelphia March 9th, 1840.

Figure 18.—BEAVER MEADOW RAILROAD AND COAL COMPANY March 14, 1840, request for bids. Vaneleve and Company were the successful bidders. (*Mauch Chunk Courier*.)

navigation during the first year of operation were 14,221 tons.⁷²

The railroad, 10 miles in length, extended from their mines at Hazleton to an intersection with the Beaver Meadows Railroad at Weatherly. The coal then moved over the Beaver Meadows Railroad for 5 miles to Penn Haven, located 8 miles above Mauch Chunk. At Penn Haven, the coal was loaded into boats for movement down the Lehigh River.

Anthracite was the fuel for the steam locomotives used on the road. Two locomotives were in operation during the first year and additional locomotives were planned to be purchased in the future as the demand for coal increased.

In 1840, Ario Pardee, Robert Miner, and William Hunt, formed a company and contracted with the Hazleton Coal Company for the purposes of mining coal, transporting the coal to Penn Haven, and loading the boats at the river docks.⁷³ This contract was in force for several seasons and, in 1842, was extended to include the marketing of a portion of the annual tonnage. The Hazleton Coal Company retained part of the tonnage which they marketed, but paid Pardee and Company a fee for this privilege. Pardee and Company

⁷² L.C.N.C., *Annual Report for 1837* (Philadelphia: James Kay, 1838), p. 11.

⁷³ H. C. BRADSBY, *History of Luzerne County* (Chicago: S. B. Nelson and Company, 1893), p. 291.

Buck Mountain Coal Co.

PROPOSALS

WILL be received at the office of the Buck Mountain Coal Company in Philadelphia, for the mining and delivering of coal in boats, at their landing at Lockport on the Lehigh, until the 15th day of August next. Their mines will be put in working order by the operation of syphons—the vein to be worked is about ten feet thick, free from slates and the dip about one foot in five. The distance by their rail road to the canal is about four miles. The mine must be worked in twenty feet breast, leaving pillars of the same size.

The company are making arrangements, which, after this year, will enable them to mine coal to the extent of from thirty to fifty thousand tons per annum, and it will therefore be an object to any one fully competent to make application, with satisfactory references.

Such as may wish to contract, will no doubt examine the mines previously. Address
SAM'L L. SHOBER,
President of the Buck Mountain Coal Company, Philad'a.
July 1, 1840.

Figure 19.—BUCK MOUNTAIN COAL COMPANY July 11, 1840, request for bids. (*Mauch Chunk Courier*.)

negotiated a new contract in 1844 in which a royalty was paid to the Hazleton Coal Company for each ton of coal mined and marketed.

The BUCK MOUNTAIN COAL COMPANY, incorporated on June 16, 1836, was authorized to acquire coal lands in Sugar Loaf and Hanover Townships in Luzerne County. The company was also subjected to the same powers, restrictions, and immunities that were granted previously to the Hazleton Coal Company including the construction of a railroad, if market conditions justified such a means of transportation. Supplemental legislation permitted the company to hold coal lands in Northampton County.⁷⁴

Construction of the railroad started in 1839, and was completed in 1840 (figure 19). The railroad was 4 miles in length and extended from their mines at Spring Mountain to the company's coal breaker at Rockport, 15 miles above Mauch Chunk. During 1840,

⁷⁴ *Pennsylvania Legislative Acts, 1838-39* (Harrisburg: Packer, Barrett and Parke, 1839), pp. 145-146. These lands became a part of Carbon County in 1843.

the company mined and sent to the navigation 54 tons.⁷⁵ The flood on the Lehigh River during the winter of 1841 delayed further coal shipments for 2 years.

The LAUREL HILL COAL COMPANY, incorporated on June 16, 1836, was authorized to hold coal lands in Sugar Loaf Township in Luzerne County and in Lausanne Township in Northampton County. Their mining operations were located adjacent to the Hazleton Coal Company property.

The company was also authorized to construct a railroad consisting of one or two tracks. The railroad could extend from any location on their lands to any convenient connection with the proposed railroad to be constructed by the Hazleton Coal Company.

A later amendment authorized the construction of the railroad from their lands to a connection with either the Hazleton Railroad or the Lehigh River and granted them the same powers and immunities given previously to the Beaver Meadows Company.⁷⁶

Laurel Hill Coal Company disposed of their real estate holdings near Hazleton to the Hazleton Coal Company during 1839, and discontinued their mining operations.

The SUGAR LOAF COAL COMPANY was incorporated on April 16, 1838. The act was submitted to the Governor on April 2, 1838, but he failed to sign the measure within the 10-day limit, and it automatically became law under the Commonwealth's constitution. The company was permitted to hold, either by lease or by purchase, coal lands in Sugar Loaf Township in Luzerne County.

In addition to the mining privilege, the company was authorized to construct a railroad. This railroad could consist of one or two tracks, and extend from any point on their lands for a connection with the Hazleton Company's railroad, or any other railroad required to transport their products to market.

A single-track railroad, 2 miles in length, was constructed during 1839. Two locomotives were in use on the railroad during 1839 and transported 7,510 tons to the navigation.⁷⁷ Mining operations were conducted

between 1839 and 1844, after which time their properties were consolidated with the Hazleton Coal Company.

The TAMMANEND MINING COMPANY, incorporated on April 16, 1838, was authorized to hold coal lands in Union and Rush townships in Schuylkill County.

The construction of a railroad was authorized, extending from any point on their lands and intersecting at such places that were deemed convenient, with the Lehigh Branch of the Little Schuylkill and Susquehanna Railroad.

The Little Schuylkill and Susquehanna Railroad was authorized on March 26, 1838, to construct the Lehigh branch. This branch connected with the company's main line at Linder's Gap and extended for 12 miles to an intersection with the Beaver Meadows Railroad near the mouth of Black Creek. Construction began during 1838, and the road was opened for traffic in 1840. One locomotive hauled 27 tons of coal from the Tammanend mines to the Lehigh Navigation in 1840.⁷⁸

Delaware Division of the Pennsylvania Canal

As the quantity of anthracite mined and transported from the Lehigh region was dependent upon a connection with the Delaware Division of the Pennsylvania Canal at Easton, Pa., a summary of the construction efforts on this canal is included here.

The original purpose of this State-owned canal was to supplement the improvements already underway on the Lehigh River. The Lehigh Company applied to the 1824 legislature for permission to undertake the improvement of the Delaware River, but their proposal was rejected.⁷⁹ As mentioned previously, the canal commissioners in 1827 limited the size of this canal, but in their report for 1830 showed a complete reversal in their attitude by stating, "the Delaware Division may be fairly considered to be an extension of the Lehigh Coal and Navigation Company Canal."⁸⁰

Coal was to be the main commodity handled and the main source of income was to be from tolls. The

⁷⁵ L.C.N.C., *Annual Report for 1840* (Philadelphia: W. S. Young, 1841), p. 6.

⁷⁶ *Pennsylvania Legislative Acts, 1837-38* (Harrisburg: T. Fenn, 1838), pp. 151-152.

⁷⁷ L.C.N.C., *Annual Report for 1839* (Philadelphia: W. S. Young, 1840), p. 6.

⁷⁸ L.C.N.C., *Annual Report for 1840* (Philadelphia: W. S. Young, 1841), p. 6.

⁷⁹ RICHARDSON, *op. cit.*, p. 81.

⁸⁰ PENNSYLVANIA CANAL COMMISSIONERS, *Annual Report to the Senate of Pennsylvania* (December 23, 1830; Harrisburg: H. Welsh, 1831), p. 35.

canal was also to develop the trade upstate from the city of Philadelphia and this would, in effect, help industrialize the entire northeastern section of the State.

Construction of the canal was begun in October 1827, starting at Bristol and working northward. The Bristol to Philadelphia section was deemed less important and its construction was deferred until last. Water was admitted into the canal in 1830, but its insufficiency left some sections unnavigable. The poor construction in many of the first-built sections and the porous character of the earth through which part of the canal was constructed aggravated this condition.⁸¹

From the very beginning of the State's construction program, the management of the canal was hampered by both interstate and sectional disputes. The canal size, including the entire system of locks and control of water level, was inadequate. This size limitation prevented the canal from becoming an effective outlet for trade moving from the Lehigh region. The original plan to supply the canal with water from the Lehigh River likewise proved to be unworkable. Negotiations with the State of New Jersey to provide an adequate water supply for the canal failed to materialize, mainly because Pennsylvania was jealous of New Jersey's threat of receiving benefits from such agreements. (A compromise with New Jersey was made in 1846, and the construction of an outlet lock was authorized at Well's Falls.⁸²)

Two years later, October 1832, the canal was navigable after being thoroughly repaired by using better construction materials and by sealing the bottom with hydraulic lime.⁸³ The waterway was built 25 feet wide at the top and the size of the locks was limited to 11 by 90 feet. Total cost exceeded \$1.2 million as against the original estimate of about \$.7 million.⁸⁴ The commissioners realized their mistake in limiting the size of the canal and, by continuous reconstruction efforts, raised the tonnage capabilities of boats moving on the Delaware Canal to 60 tons by 1841.⁸⁵

Two problems faced the canal's operation and were constantly mentioned in the annual canal commissioners' report starting in 1833.⁸⁶ In the dry season it was almost impossible to maintain the water level at 5 feet and the canal was subject to damage by freshets. In the report of 1835, the commissioners stated that dredging had started at the lower end of the canal and would proceed in a northward direction.⁸⁷ No constructive improvement program was initiated until 1852, when the Pennsylvania Legislature authorized the start of improvements to make the locks equal in size to those on the Lehigh.⁸⁸

From the statistics reported by the canal commissioners, the chief source of income for the canal was from coal movements. By the year 1837, after 6 years of operation, the earning capacity of the canal had grown sufficiently to pay the interest on the cost of construction. The coal rate had risen to nearly 6 mills per ton per mile and income remained steady.⁸⁹

Besides the coal traffic, general trade shipments on the canal during 1834 showed that, upward from Bristol, the major items were wheat, fish, butter, cheese, tobacco, and leather. From Easton southward went flour, rye, corn, butter, and cheese.⁹⁰

From the commissioners' report of 1845, it is noted that the character of the general trade had changed and that agricultural and dairy products decreased in importance. Up from Bristol, we find the following: glassware, bacon, chinaware, hides, and coffee. Southward from Easton came the following items: iron ore, lumber, lime, and whiskey. The State had expended over \$1.7 million on the canal's development up to 1845.⁹¹

Capital Requirements

Significant financial aid for the business ventures undertaken in the Lehigh region was required to construct both mining and transportation facilities. Most of the capital was expended in providing carriers because the locations of the mines were remote from the markets. Costs of the transportation facilities constructed during the period 1820 to 1845, are listed in Table 3.

⁸¹ *Ibid.*, December 6, 1832, p. 18.

⁸² *Pennsylvania Legislative Acts*, 1846 (Harrisburg: J. M. C. Lesure, 1846), p. 409.

⁸³ Josiah White had used this same material in the construction of the Lehigh Navigation.

⁸⁴ PENNSYLVANIA CANAL COMMISSIONERS, *op. cit.*, December 9, 1836, p. 16.

⁸⁵ *Ibid.*, January 15, 1841, p. 8.

⁸⁶ *Ibid.*, December 2, 1833, p. 12.

⁸⁷ *Ibid.*, December 3, 1835, p. 16.

⁸⁸ *Ibid.*, November 30, 1852, p. 11.

⁸⁹ *Ibid.*, December 27, 1838, p. 12.

⁹⁰ *Ibid.*, December 2, 1834, p. 21.

⁹¹ *Ibid.*, November 30, 1845, p.

TABLE 3.—Construction costs for railroad and navigation companies in the Lehigh region, 1820–41 ¹

Year opened	Company	Miles	Cost
Railroad			
1827	Lehigh (Mauch Chunk).	² 9.0	³ \$48,226
1833	Lehigh (Room Run).	5.0	123,000
1837	Beaver Meadows.	20.6	365,000
1838	Hazleton ⁴	10.0	120,000
	Sugar Loaf ⁴	2.0	20,000
	Laurel Hill ⁵	0.2	1,000
1839	Summit Hill.....	2.0	20,000
1840	Buck Mountain....	4.0	40,000
	Lehigh and Susquehanna.	20.0	1,326,700
	Tammanend.....	2.0	20,000
1841	Little Schuylkill and Susquehanna.	12.0	500,000
Total.....		86.8	\$2,593,426
Canal			
1820	Lehigh.....	85.0	\$4,455,000
1832	Delaware Division.	60.0	1,736,000
Total.....		145.0	\$6,191,000
Grand Total.....		231.8	\$8,784,426

¹ Company annual reports.

² Wagon road 1820–27.

³ Includes \$9,500 for loading chute.

⁴ The Hazleton and Sugar Loaf companies consolidated their operations in 1844.

⁵ Operations ceased in 1839.

The largest expenditure for carriers was made in the development of navigational facilities using the Delaware and Lehigh Rivers. The development of a navigational facility using the Delaware River was vital to the Lehigh Coal and Navigation Company's movement

of coal from Easton. Total expenditures for the improvement of these two waterways with a combined length of 145 miles amounted to \$6.2 million: the Lehigh Navigation, 85 miles, cost \$4.5 million; and the Delaware Division of the Pennsylvania Canal, 60 miles, cost \$1.7 million.

The organizational structure and operational management of these two navigational facilities varied widely. The Lehigh Coal and Navigation Company was incorporated by the Commonwealth of Pennsylvania and was managed by a board of directors elected annually by the stockholders. The Delaware Division of the Pennsylvania Canal was a State owned and financed facility and was controlled by the canal commissioners, who were appointed by the Governor. Many of the early difficulties in improving the navigation route from Stoddartsville to Bristol can be attributed to the differences in the composition of these two organizations.

Approximately 87 miles of railroads were constructed for use in conjunction with the Lehigh Navigation at a cost of approximately \$2.6 million. The Lehigh Coal and Navigation Company spent the largest amount, \$1.33 million, on the construction of the Lehigh and Susquehanna Railroad. This line connected the mining operations of the northern anthracite field at Wilkes-Barre with the Lehigh Navigation at White Haven. The high cost of this road was caused by the extreme terrain conditions found between these regions.

The costs of other railroads constructed during this period ranged between \$1,000 and \$20,000 per mile, and were dependent on the type of terrain traversed and the permanency required for the road. The usual cost estimate per mile for construction of a railroad in this region was \$10,000. Capital was difficult to raise for the construction of railroads because of the unproven capabilities of this method of transportation. Public opinion in the Commonwealth during the early years of this period favored the construction of navigational facilities.

The true value of an acre of coal land in the Lehigh region during the early days of the industry was difficult to determine. Values that were commonly used in the anthracite regions ranged from a low of \$20 an acre to a high of \$400 an acre.⁹² Using an average value of \$200 an acre, and with a total coal-bearing

⁹² *Packer Report*, op. cit., p. 31.

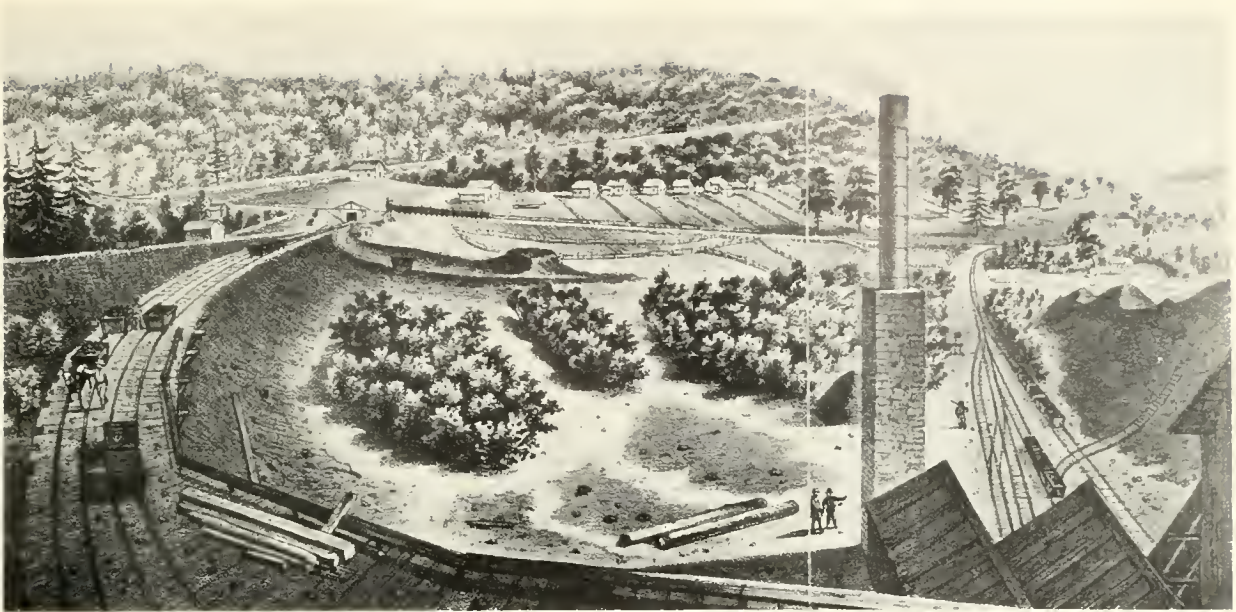


Figure 20.—“SWITCH-BACK RAIL-ROAD” at Mauch Chunk, ca. 1850. Currier lithograph. (M. S. Henry, *History of the Lehigh Valley*, 1860.)

area of 42,000 acres, the value of coal lands under control of the incorporated companies was estimated at \$8.4 million. If 25 percent of the acreage of land authorized under the charter provisions of the various companies was purchased, the investment required was \$2.1 million. In most cases, the newly chartered companies would have been unable to purchase their entire authorization of land at this average price, construct the transportation and mining facilities required, and still be within the capital limitations under their respective charters. These limitations placed many acres of coal lands under leasing arrangements rather than outright purchases.

No fixed amount of capital was needed for the day-to-day operations of the individual mining properties, but it was necessary for the company to have some working capital to pay for the essential services that were incurred in the period between the mining of the coal and the receipt of monies from the sale of their product. Daily mining costs were low initially because of coal's close proximity to the surface, but as mining depths increased the amount of capital required to perform these operations also increased.

Development costs, including capital needed for day-to-day operations, was estimated to be 10 percent of the authorized capital or approximately \$1.25 million. Several companies were authorized to increase

their capitalization by subsequent acts of legislature, while others were required to consummate business loans or consolidate their operations with others to keep their mining operations in an active status.

The total of these three major investments—land, mining operations, and transportation facilities—amounted to almost \$10.5 million. This total investment is considered a conservative estimate since incomplete details of commercial loans negotiated by some companies precluded their inclusion in the determination of this estimate. By adding the cost of the Delaware Division of the Pennsylvania Canal, as it properly should be, the total investment costs were increased to \$12.2 million. These millions of dollars of investments during the first 25 years of mining operations can truly be considered an outstanding accomplishment by the State's business community for the future economic development of the anthracite industry in the Lehigh region.

Summary

The quantity of anthracite transported on the Lehigh Navigation during the period 1820 to 1845, was slightly more than 3.2 million tons. The Lehigh Coal and Navigation Company exercised exclusive control on the movement of coal produced in this region, as



Figure 21.—WATERCOLOR OF MAUCH CHUNK, ca. 1845, by an unknown artist. (L.C.N.C.)

they provided the only carrier between Stoddartsville and Easton.

The Lehigh Coal and Navigation Company began regular shipments of anthracite from the region in 1820, after some navigational improvements were made on the Lehigh River. Seventeen years later, in 1837, the Beaver Meadows Railroad and Coal Company became the next anthracite producer in the region. By January 1845, 18 companies with a total capitalization of \$12.65 million were formed and chartered to conduct mining operations.

Eight of these companies chartered during this period (including the two that ceased operations) were actively engaged in the mining and transportation of anthracite to market and had invested approximately \$10.5 million. The remaining 10 companies were developing their properties, but made no shipments of coal to market prior to January 1845.

The first steam locomotives in the Lehigh region appeared during 1836 on the railroad operations of the Beaver Meadows Railroad and Coal Company. The success of these locomotive experiments were imme-

diately recognized by the operators. As market requirements increased, so did the use of locomotives. Coal movements were more easily facilitated by using steam power and the navigation company was soon challenged to provide more efficient transportation facilities.

To Contractors.

PROPOSALS will be received at the office of E. The Lehigh Coal & Navigation Company either in Mauch Chunk or Philadelphia until the 7th of next month, for mining and delivering into boats from the summit hill mines 200,000 Tons of Coal, during next season. The Company propose to divide the mines into two or more parts, and to be worked by as many companies of contractors. Specifications & mode of working the mines can be seen and blank proposals had at either of the above offices. For further information apply to the superintendent or mine agent at Mauch Chunk.

E. A. DOUGLAS,
Mauch Chunk, } Supt. & Eng.
Nov. 19th. 1844. } 30d

Figure 22.—LEHIGH COAL AND NAVIGATION COMPANY November 21, 1844, request for bids from subsidiary companies. (*Mauch Chunk Courier*.)

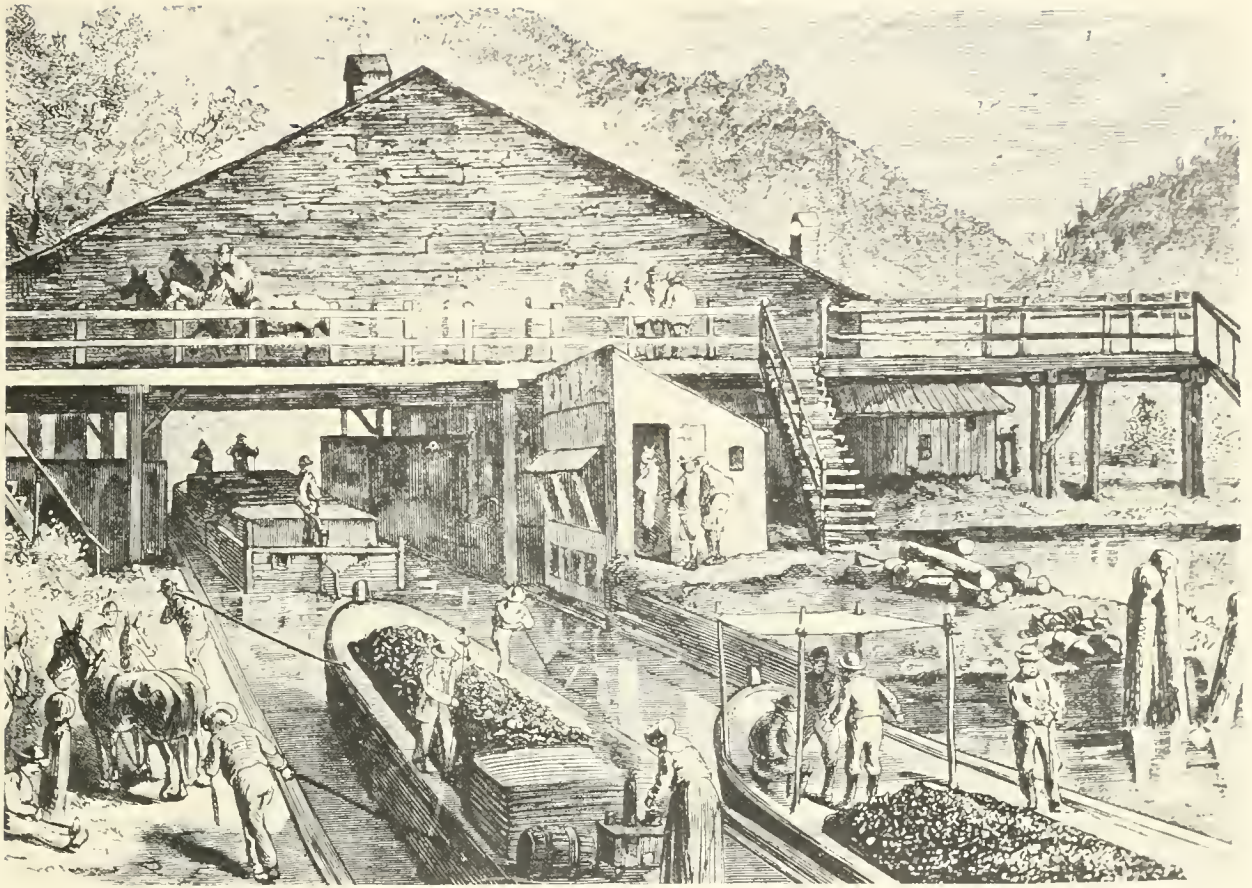


Figure 23.—WEIGHING THE CANALBOATS in the weigh lock on the Lehigh Canal. (L.C.N.C.)

From 1820, anthracite shipments from this region generally showed an annual increase with an exceptionally large increase for 1825, 1832, and 1833. The increase was the result of greater use of anthracite in the home by the introduction of grates and furnaces designed to burn anthracite and the completion of the Delaware Division of the Pennsylvania Canal which permitted the use of permanent shipping facilities.

Up to the fall of 1831, a surplus of coal occasionally occurred at the close of each shipping season, but after that time and until the late 1830's the demand usually exceeded the supply.

Factors which caused fluctuations in annual production were: (1) the inability of the producer to anticipate supply and demand requirements; (2) consumer reluctance to accept anthracite as a reliable source of heat and energy; (3) occasional flooding of the Lehigh River; (4) operational difficulties between the administrative procedures of the two navigational facilities;

and (5) general business conditions.

The companies incorporated in this region received similar powers, privileges, and immunities, and were authorized to engage in mining and railroad operations. None, however, was granted the "unlimited powers" which had previously been given to the Lehigh Coal and Navigation Company. The Pennsylvania Legislature was criticized many times for granting such unlimited concessions. Adequate justification is found, however, in the primitive conditions of the State and the basic need for the development of such works.

With the introduction of Schuylkill anthracite to the market, two types of anthracite became available to consumers. These types were identified by the color of the ash, as being either white or red ash coals. The Lehigh region was a white-ash producer, while the Schuylkill region (which produced both types) was, in these early years of the industry, considered a red-ash producer.

TABLE 4.—*Number of boat trips and tonnage of anthracite transported on the Lehigh and Schuylkill Canals, 1820-45*¹

Year	Lehigh Canal		Schuylkill Canal	
	Number of Boat Trips	Tonnage	Number of Boat Trips	Tonnage
1820	² 15	365	—	—
1821	² 43	1, 073	—	—
1822	² 90	2, 240	—	—
1823	² 233	5, 823	—	—
1824	² 382	9, 541	—	—
1825	329	28, 393	260	5, 306
1826	546	31, 280	650	16, 767
1827	584	32, 074	1, 183	31, 360
1828	605	33, 150	1, 751	47, 284
1829	494	25, 110	2, 909	79, 973
1830	852	41, 750	2, 978	89, 984
1831	931	42, 743	2, 338	81, 854
1832	1, 916	75, 937	5, 961	209, 271
1833	2, 774	122, 928	6, 054	252, 971
1834	2, 331	106, 518	5, 167	226, 692
1835	3, 735	131, 250	7, 109	339, 508
1836	3, 465	146, 738	9, 139	432, 045
1837	5, 316	224, 095	9, 535	523, 152
1838	5, 127	214, 211	7, 891	433, 875
1839	5, 238	221, 850	8, 174	442, 608
1840	5, 371	225, 585	8, 223	452, 291
1841	2, 804	143, 038	14, 111	584, 692
1842	5, 450	272, 553	9, 276	491, 602
1843	5, 240	267, 826	8, 138	447, 058
1844	7, 098	377, 094	6, 408	398, 887
1845	8, 104	429, 492	4, 974	263, 587

¹ Company annual reports, the *Pottsville Miner's Journal*, and the *Mauch Chunk Courier*.

² Calculated 25-ton boats.

The delay in the completion of improvements on the Delaware Division and the inefficient utilization of the navigation by the use of temporary boats prevented expansion of mining activities in the Lehigh region. This condition for many years prevented the opening of additional properties in the coal areas bordering the Lehigh River.

Organizations and individuals desirous of engaging

in anthracite mining ventures turned their efforts to the Schuylkill region. With the Schuylkill region receiving more attention, its production moved ahead at a rapid pace and greatly overshadowed the activities in the Lehigh region. The tabulation in Table 4 shows the growth in production and in the number of boat trips on the Schuylkill and Lehigh Navigation for the period 1820 to 1845.

The active companies in the Lehigh region soon discovered that to conduct operations in all phases of the industry was not in their best interests for continued growth. Leasing arrangements were negotiated for the individual services—mining, transportation, and marketing. This procedure proved to be practicable and eventually contracts were negotiated (to individuals and organizations) whereby a royalty was received for the privilege of managing the mining and shipping operations.

The companies attempted to retain ownership of their equipment and properties, but consolidations and mergers of companies occurred in several instances to achieve more efficient mining operations. The leasing procedures separated corporate activities from mining operations and resulted in more efficient utilization of the industry's facilities.

The markets for anthracite were expanding quite rapidly during the early 1840s and did not present a major problem for the industry. The promotional efforts of The Lehigh Coal and Navigation Company were aided by the introduction of improved grate and stove design for burning anthracite, the use of anthracite as a fuel in blast-furnace operations and the use of anthracite for heating public buildings. The demand for Lehigh coal continued to grow as the various utilization means proved efficient.

The development of the Lehigh region during the first 25 years required an investment of approximately \$12.2 million. The amount of capital obtained during the early years represented an outstanding accomplishment by the promoters of the industry. Credit should be given them for their strong convictions as to the future economic value of this natural resource.

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Appendixes

I

CHAPTER CII.

AN ACT

To improve the navigation of the river Lehigh.

Persons authorised to improve the Lehigh.

Power to enter thereon, &c.

and to use timber, rocks, &c.

and make dams, locks, &c, of a certain description.

Proviso.

2d proviso.

Remedy of persons injured by dams or swelling the water.

SECT. 1. *BE it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met, and it is hereby enacted by the authority of the same,* That it shall and may be lawful to and for Josiah White, George F. A. Hauto and Erskine Hazard, of the county of Philadelphia, their heirs and assigns, or in case any or either of them should die, for the survivor or survivors, his or their heirs and assigns, their surveyors, engineers, superintendents, artists and workmen, to enter upon the said river Lehigh, to open, enlarge or deepen the same in any part or place thereof, between the Great Falls and the mouth of the said river Lehigh, in the manner which shall appear to them most convenient for opening, enlarging, changing, making anew or improving the channel; and also to cut, break, remove and take away all trees, rocks, stones, earth, gravel, sand or other material, or any impediments whatsoever within the said river: and to use all such timber, rocks, stones, gravel earth or other material in the construction of their necessary works, and to form, make, erect, set up any dams, locks or any other device whatsoever, which they shall think most fit and convenient to make a good navigation downward at least once in every three days, except during winter, with a channel not less than twenty feet wide and eighteen inches deep, for arks and rafts, and of sufficient depth of water to float down boats of the burthen of one hundred barrels, or ten tons; *Provided,* That during the said three days there shall be no interruption to the said navigation for or by reason of any neglect or default of the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns: *Provided also,* That no toll shall be demanded for any boat, vessel or craft in going up said river, unless the same is converted into a complete slack water navigation, as provided by this act.

SECT. 2. *And be it further enacted by the authority aforesaid,* That if any person or persons shall be injured by means of any dam or dams being erected, or the land of any person inundated by swelling the water by means of any dam or dams, or any mill or other water works injured by swelling the water into the tail-race of any mill or other water works

which may have been erected in said river; and if the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, cannot agree with the owner or owners thereof on the compensation to be paid for such injury, the same proceedings shall be had as is provided in the third section of this act, the persons valuing the damages, being first sworn or affirmed, or the jury as the case may be, shall take into consideration the advantages which may be derived by such owner or owners by the navigation aforesaid.

SECT. 3. *And be it further enacted by the authority aforesaid,* That the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall have authority and power by themselves or their superintendents, engineers, artists and workmen, to enter in and upon and occupy for the purpose, all land which shall be necessary and suitable for erecting of a lock, sluice, canal, tow-path or other device, doing as little damage as possible, and there to dig, construct, make and erect such lock, sluice, canal, tow-path or other device, satisfying the owner or owners thereof; but if the parties cannot agree upon the compensation to be made to such owner or owners, it shall and may be lawful for the parties to appoint six suitable and judicious persons, who shall be under oath or affirmation, and who shall reside within the proper county where the land lies; or if they cannot agree on such persons, then either of the parties may apply to the court of common pleas of the proper county where the land lies, and said court shall award a *venire* directed to the sheriff, to summon a jury of disinterested men, in order to ascertain and report to said court what damages, if any, have been sustained by the owner or owners of said ground, by reason of such lock, canal, sluice, tow-path or other device passing through his, her or their land, which reports being confirmed by the court, judgment shall be entered and execution may issue, in case of non-payment, for the sum awarded, with reasonable cost to be assessed by the court. And it shall be the duty of the jury or the six appraisers as the case may be, in valuing any land, to take into consideration the advantage derived to the owner or owners of the premises from the said navigation; *Provided,* That either party may appeal to the court, within thirty days after such report may have been filed in the prothonotary's office of the proper county, in the same manner as appeals allowed in other cases: *And provided also,* That if any person owning land or any other property which shall be affected by this act, be femme coverte, under age, non compos mentis, or out of the state, then and in either of those cases the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall within one year thereafter, represent the same to a neighboring justice of the peace, or to the court of common pleas of the county as the case may be, who shall proceed thereon in the same manner and to the same effect as is directed by this act in similar cases.

SECT. 4. *And be it further enacted by the authority aforesaid,* That the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, by and with their superintendents, engineers, artists, workmen and laborers, with their tools, instruments, carts, waggons and other carriages and beasts of draft and burthen, may enter upon lands

Power to enter on land and dig, &c.

Remedy for damage done thereby.

Proviso.

2d proviso.

Power to enter on lands contiguous, & take stone, timber, &c.

Conditions thereof.

Remedy for damages.

contiguous and near to the said river, giving notice to the owners or occupiers thereof, and from thence take and carry away any stone, timber, gravel, sand, earth or other material, doing as little damage thereto as possible, and repairing any breaches they make in the enclosures thereof, and making amends for any damages that may be done thereon, and paying for the materials to be taken away, the amount whereof, if the parties do not agree, shall be assessed and valued by any three disinterested freeholders residing in the neighborhood, under oath or affirmation, to be appointed by consent of the parties, or if they cannot agree, by any disinterested justice of the peace of the proper county, allowing an appeal to the court of common pleas as in the third section of this act.

To erect fords or bridges when directed by a jury.

Proviso.

SECT. 5. *And be it further enacted by the authority aforesaid,* That whenever any sluice or canal shall cross any public or private laid out road or highway, or shall divide the grounds of any person or persons into two parts, so as to require a ford or bridge to cross the same, the jury who shall enquire of the damages to be sustained, in manner directed by the third section of this act, shall find and ascertain whether a passage across the same shall be admitted or maintained by a ford or bridge to cross the same, and on such finding, the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall cause a ford to be rendered practicable, or a bridge fit for the passage of carts and waggons to be built, and forever thereafter maintained and kept in repair, at all and every places so ascertained by the said jury, at the costs and charges of the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, but nothing herein contained shall prevent any person from erecting and keeping in repair any foot or other bridge across any sluice or canal at his own expense, when the same shall pass through his ground: *Provided,* That such foot or other bridges so to be erected by the owners of such land, shall not interfere with any sluice or lock or other works of said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs or assigns.

Commissioners to be appointed by the Governor to examine the improvements when completed, and report the same.

Report to be laid before the Legislature.

Privilege thereupon granted.

SECT. 6. *And be it further enacted by the authority aforesaid,* That as soon as the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall have completed the improvements in the navigation of either of the grand sections hereinafter mentioned, in the manner prescribed in the first section of this act, they shall give notice thereof to the Governor, who shall, as soon as conveniently may be, appoint five persons of skill and practical knowledge of river navigation, three of whom shall not reside in the neighbourhood of said river; and the said commissioners shall proceed to examine the said improvements, and make a detailed and specific report thereof to the Governor, accompanied with such observations as may serve to explain the same; and the said report shall be laid before the next succeeding legislature, and if the legislature shall approve of the said improvements in the navigation, then and in that case the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall have the privilege and be entitled to use all the water from the said river, sluices, canals or other devices, to propel such machinery as they may

think proper, to erect on the land which they may previously have purchased from the owner or owners, or to sell in fee simple, lease or rent for one or more years, the said water to any person or persons, to be used in such manner and on such terms as they may think proper: *Provided*, It be so done that it shall not at any time impede or interrupt the navigation.

Proviso.

How the size of rafts or arks and tonnage of boats shall be ascertained.

SECT. 7. *And be it further enacted by the authority aforesaid*, That in order to ascertain the size of arks and rafts, and the tonnage of boats using and passing the said navigation, and to prevent disputes between the supercargoes and collectors of tolls concerning the same, upon the request of the owner, skipper or supercargo of such boat, raft or ark, or of the collector of said tolls, it shall and may be lawful for each of them to choose one skilful person to measure and ascertain the size of said raft or ark, and the tonnage the said boat is capable of carrying, and to mark the said tonnage so ascertained in figures upon the head and stern of said boat, in colours mixed with oil or other durable matter, and that the said boat or vessel so measured and marked, shall be permitted to pass on the said navigation for the price to which the number of tons so marked on her shall amount, agreeably to the rates per ton hereinafter established. And if the owner, skipper or supercargo of any raft, ark or boat, shall decline choosing a person resident within two miles of the place where the said toll is payable, to ascertain the tonnage thereof, then the amount of such tonnage shall be fixed and ascertained by the person appointed for that purpose by the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, or chosen by the said collector of tolls, and the tolls shall be paid according to such measurement, before any such boat, raft or ark shall be permitted to pass the place where such toll is made payable.

Proceeding in case the owner, &c. declines choosing a person.

SECT. 8. *And be it further enacted by the authority aforesaid*, That if any person or persons shall wilfully and knowingly do any act or thing whereby the navigation shall be impeded, or any dam, lock, gate, canal, engine, machine, property or device whatsoever thereunto belonging, shall be injured or damaged, he, she or they so offending shall forfeit and pay to the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, four times the amount of the damages by them sustained, together with costs, to be recovered by action of debt before a justice of the peace, or in any court of competent jurisdiction.

Penalty for impeding the navigation or injuring the dams, locks, &c.

SECT. 9. *And be it further enacted by the authority aforesaid*, That if the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall neglect or refuse to keep in good order or repair, any dam, lock or sluice of their own construction, or shall neglect to remove any obstacle which may occur, so that boats, arks, rafts or other vessels may safely navigate the said river at the times and in the manner fixed in the first section of this act, on the complaint of any person or persons to the judges of the court of common pleas in the county where such default occurs, it shall and may be lawful for the said judges (due notice thereof in writing being previously given by

Proceeding in case of not keeping the locks, &c, in repair, or not removing obstructions, &c.

Commissioners to be appointed to view and report.	<p>such complainant to the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, or to any or either of them), to appoint three commissioners to view the said breach or obstacle and report to them at their next sessions the state thereof, and whether it is conformable to the provisions of this act; which report on oath or affirmation, if it contain an offence against this act, shall be sufficient ground for the court to direct a bill of indictment to be sent to the grand jury against the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns: and upon conviction for every such offence they shall be liable to pay all damages resulting therefrom, to be recovered before a court of competent jurisdiction, and a fine not exceeding two hundred dollars at the discretion of the court, for the use of the poor of the said county or township: and the service of any civil process upon the toll gathered in the proper county, and next to the place where the offence shall have been committed, shall be held as good and available in law as if served on the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns.</p>
Effect thereof.	
Penalty on conviction.	
Service of process when good.	
River divided into two grand sections.	<p>SECT. 10. <i>And be it further enacted by the authority aforesaid,</i> That the river Lehigh for the purpose of said improvements shall be divided into two grand sections, the first grand section to begin at the mouth of said river and to end at the mouth of Nescohoning creek, the second grand section to begin at the said Nescohoning creek and to end at the foot of the great falls; the second grand section to be subdivided into sections of ten miles each.</p>
Proceeding on completion of the first grand section.	<p>SECT. 11. <i>And be it further enacted by the authority aforesaid,</i> That as soon as the said Josiah White, George F. A. Hauto and Erskine Hazard, and their heirs and assigns, shall have improved the said first grand section of said river ending at said Nescohoning creek, they shall give notice thereof to the Governor of the commonwealth, who shall thereupon forthwith appoint three skilful, judicious and disinterested persons to view and examine the said grand section, and report to him in writing whether that part of the navigation is completed in the manner aforementioned according to the true intent and meaning of this act; and if the report of them or a majority of them shall be in the affirmative, then the Governor shall by license under his hand and the lesser seal of the commonwealth, permit and suffer the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, to fix upon and appoint so many places at or between the places before mentioned as will be necessary and sufficient to collect the tolls and duties hereinafter granted to the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns; and the same process shall be had upon the completion of each succeeding ten miles in the second grand section.</p>
Governor to appoint three viewers.	
Report to be made to the governor.	
License to fix places to collect tolls.	
Collectors of tolls to be appointed.	<p>SECT. 12. <i>And be it further enacted by the authority aforesaid,</i> That it shall and may be lawful for the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, as soon as they have obtained the Governor's permission as aforesaid for fixing upon and appointing proper places for collecting tolls and duties as aforesaid, to appoint so many collectors of tolls as they shall think proper, and that</p>

Rates of tolls.

Proviso.

2d proviso.

3d proviso.

Penalty for attempting to defraud out of toll.

How recovered.

Tenancy of the property.

it may and shall be lawful for such toll collectors and their deputies to demand and receive of and from the persons having the charge of all boats, vessels, crafts and rafts passing down the said river such tolls and rates for every ton weight of the ascertained burthen of the said boat or craft, and for every one thousand feet board measure of boards, timber, planks or scantling, and for every ton weight of shingles or other material in rafts as the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall think proper at any place for receiving of toll as ascertained: *Provided*, That the amount of the said toll shall not in the whole exceed the rate of three cents per mile for every ton of the ascertained burthen of such boat, vessel or craft; and for every one thousand feet board measure of boards, timber, planks or scantling, and for every ton weight of shingles or other material in rafts from the great falls to the mouth of Nescohonong creek, and from thence to the mouth of the said river Lehigh, one cent per mile for every ton of the ascertained burthen of such boat, vessel or craft, and for every one thousand feet board measure of boards, timber, plank or scantling, and every ton weight of shingles or other materials in rafts: *Provided also*, That the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall be obliged to commence the improvement of the aforesaid first grand section ending at the mouth of the said Nescohonong creek within the period of two years from the passage of this act, and finish the same in six years: *And provided also*, That the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall commence the said second grand section ending at the great falls within the period of seven years from the passage of this act, and finish the same within twenty years; in failure whereof the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall forfeit all the rights, liberties and franchises hereby granted to the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns.

SECT. 13. *And be it further enacted by the authority aforesaid*, That if any owner, skipper or supercargo of any boat, ark, craft or raft shall pass by any place appointed for receiving tolls without making payment thereof, with intent to defraud the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, out of such toll, he, she or they shall forfeit and pay for every time they shall so pass by each appointed place to the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, the sum of twenty dollars to be sued for and recovered before any justice of the peace, in like manner and subject to the same rules and regulations as debts under one hundred dollars may be sued for and recovered, together with reasonable costs of prosecution.

SECT. 14. *And be it futher enacted by the authority aforesaid*, That the said navigation with the rights and privileges appertaining thereto, shall be held by the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, as tenants in common and not as joint tenants, and in case of the decease of either or all of them before the same shall be completed, it shall and may be lawful for the survivor

Survivors may complete the work.

or survivors or the heirs or assigns of either or all of them to complete the same, and to exercise all the rights and privileges hereby granted for the use and benefit of the survivor or survivors and the heirs of the deceased, in the same proportion as if all had lived till the work had been completed.

Duty in case the legislature deem the navigation insufficient.

SECT. 15. *And be it further enacted by the authority aforesaid,* That at any time after the expiration of the periods herein fixed for the completion of each grand section in the manner aforesaid, should the legislature deem the navigation contemplated by the preceding sections of this act insufficient, the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, due notice in writing being given them thereof, shall convert the said navigation into a complete slack water navigation, and shall erect and complete at least one lock or other device overcoming at least six feet falls in each and every year, in such part of said respective grand sections as they may think proper, and so on until the whole shall be completed; and in such case after each and every such lock or other device has been inspected, and the Governor's license for each of them has been obtained in the manner prescribed herein, it shall be lawful for the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, to charge and receive for the passage up and down through each and every such lock or other device, as soon as it shall have been completed and the license for it obtained as aforesaid, for their own proper use and benefit, a toll not exceeding eight cents per ton per lock or other device of six feet fall or lift, and so in proportion for any greater or less fall or lift, and the same for every thousand feet board measure of boards, timber, plank or scantling in rafts: *Provided,* That the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall not receive for the distance thus made slack water, the toll granted them by the eleventh section of this act.

Tolls in case of a complete slack water navigation.

Proviso.

SECT. 16. *And be it further enacted by the authority aforesaid,* That if the legislature after due notice given as aforesaid shall direct the said navigation to be converted into a slack water navigation, the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall proceed to carry on the same under all the provisions, immunities, privileges, restrictions, penalties, rules and regulations contained in the first, second, third, fourth, seventh, eighth, ninth, eleventh, twelfth and fourteenth sections of this act.

Duty in case of the legislature directing a slack water navigation.

Privileges allowed in such case of using the water to propel machinery.

SECT. 17. *And be it further enacted by the authority aforesaid,* That as soon as the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall have completed the said slack water navigation in either or both of the grand sections aforesaid, and the same shall have been approved by commissioners appointed as hereinbefore directed, the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall for such grand section or sections so finished as aforesaid, have the privileges and be entitled to use all the water from the said river, sluices, canals or other devices to propel such machinery as they may think proper to erect on the land which they may previously have purchased from the owner or owners,

or sell in fee simple, lease or rent for one or more years the said water to any person or persons to be used in such manner and on such terms as they may think proper: *Provided*, It be so done that it shall not at any time impede or interrupt the navigation.

SECT. 18. *And be it further enacted by the authority aforesaid*, That the locks shall be in the clear at least eighteen feet wide and eighty feet long, and it shall be the duty of the master or commander of any boat, ark or other vessel navigating the said river when they shall arrive within one-fourth of a mile from any lock so erected, upon the penalty of two dollars, to blow a trumpet or horn whereupon the keeper of such lock shall attend for the purpose of opening the gate or sluice to let the said boat, ark or other vessel pass without unnecessary delay and in safety; and if any boat, ark or other vessel shall be prevented from passing up or down any of said locks or sluices by reason of the lock not being raised for more than thirty minutes, the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall on conviction thereof before any justice of the peace of the proper county, forfeit and pay to the person so hindered the sum of one dollar for every thirty minutes beyond the said time that he shall be so prevented, and in the same proportion for any longer or shorter time: and the service of any civil process upon the toll gatherer in the proper county and next to the place where the offence shall have been committed, shall be held as good and available in law as if served upon the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns.

SECT. 19. *And be it further enacted by the authority aforesaid*, That at any time after the expiration of thirty-six years from the date of this act, the legislature shall have the privilege of purchasing every right and title to the navigation; and the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, shall after the expiration of thirty years keep a regular account of all monies received by them for toll, and shall annually before the first day of January, under oath or affirmation make report thereof to the legislature, in failure whereof it shall be lawful for the legislature to resume the privileges hereby granted: and in such case in order to ascertain the purchase money, the one sixth of the nett amount of toll received in the six years next preceding such purchase shall be considered as equal to the interest of said purchase money at six per cent. per annum: and in case of such purchase or resumption by reason of forfeiture, the legislature shall be bound to fulfil all and every obligation enjoined by this act on the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns.

SECT. 20. *And be it further enacted by the authority aforesaid*, That if the slack water navigation aforesaid shall not be begun by the said Josiah White, George F. A. Hauto and Erskine Hazard, their heirs and assigns, within one year after notice given as aforesaid, and shall not within twenty years thereafter be completed, or if they shall at any time hereafter misuse or abuse any of the privileges granted by this act, then or in either of these cases the legislature may resume all and

Size of the locks.

Duty of master, &c, of a boat on arriving.

Duty of Keeper.

Penalty.

Service of process.

When the legislature may purchase the navigation.

When accounts shall be kept & laid before the legislature.

Duty of legislature.

Right of resumption by the legislature on failure in certain cases.

Repeal.

singular the rights, liberties and privileges hereby granted.

SECT. 21. *And be it further enacted by the authority aforesaid, That the twenty-eighth section of the act, entitled "An act making appropriations for certain internal improvements," passed the twenty-fourth day of March one thousand eight hundred and seventeen, be and the same is hereby repealed.*

WILLIAM DAVIDSON, *Speaker
of the House of Representatives.*

ISAAC WEAVER,
Speaker of the Senate.

APPROVED—the twentieth day of March, one thousand eight hundred and eighteen.

WILLIAM FINDLAY.

II

TERMS OF SUBSCRIPTION

TO THE

Lehigh Navigation and Coal Mine Company.

The Capital Stock of the Company shall consist of Two Hundred Thousand Dollars, divided into Two Hundred Shares.

Josiah White, George F. A. Hauto, and Erskine Hazard, each reserve fifty shares, for which they assign to the Company, all their interest in the law granted them at the last Session of the Legislature, for improving the navigation of the river Lehigh, and the lease for twenty years, which they hold on the "Lehigh Coal Mine Company's" lands.

The amount of the remaining fifty shares shall be invested in the said navigation, in working the coal mines, and in business connected therewith exclusively. J. White, G. F. A. Hauto, and E. Hazard, will specifically pledge their shares to the subscribers, as security that the whole nett profits of the Company, shall be exclusively appropriated to them until they receive an interest of eighteen per cent. per annum, on the amount of their subscriptions.

When the nett profits exceed nine thousand dollars

per annum, the surplus shall be divided equally on the shares retained by J. White, G. F. A. Hauto, and E. Hazard, until they receive eighteen per cent. interest per annum.

When the profits amount to, or exceed, thirty-six thousand dollars, they shall be divided equally among all the shares.

J. White, G. F. A. Hauto, and E. Hazard, shall manage and personally superintend the business until the navigation be completed, and the coal business reduced to system; for which service they shall each be entitled to receive One Thousand Dollars annually. The subscribers shall be entitled, if they deem it necessary, at any time to appoint a person to be associated with J. White, G. F. A. Hauto, and E. Hazard, or the survivors, or survivor, of them, in the management, which person shall have the same authority, devote the same personal attention, and receive the same compensation as each of the other managers. A majority of the managers shall govern the affairs of the Company.

Fifteen per cent. of the amount subscribed, shall be paid within ten days after the whole fifty shares shall have been subscribed. The remainder to be called for in instalments, as required by the work, of which twenty days notice shall be given.

Any subscriber neglecting or refusing to pay the instalments, within ten days after the time appointed for their payment, shall forfeit what he has already paid, for the benefit of the Company, and shall cease to be a stockholder.

The stock shall be transferable upon giving notice to the managers for the time being, who are authorized to give certificates as evidence of stock.

Should fifty thousand dollars be found an insufficient capital for all the purposes of the Company, additional shares shall be created, which shall be subject to the same regulations as the fifty shares now

subscribed for, which new shares shall be added to the original two hundred, and the dividends shall be made on the whole number of shares.

J. White, G. F. A. Hauto, E. Hazard, and the subscribers, shall all be at liberty to subscribe to the additional stock, in the proportion of the original shares they may hold.

If any, or all the subscribers, decline advancing their proportion to the new stock, J. White, G. F. A. Hauto, and E. Hazard, engage to make up the deficiency.

It shall be the duty of the managers for the time being, to keep a fair book of account, of all expenditures made by them in the prosecution of the business intended, and of all monies received by them, or their agents, on the Company's account, so as to exhibit a clear, correct, and just state of the concern, which book shall be open to the inspection of the stockholders, or any of them who shall choose to examine the same.

Meetings of the stockholders shall take place on the first Monday in January in each year, at which by-laws for the regulation of the Company shall be made, and each share shall be entitled to one vote.

Dividends of the nett profits, reserving a contingent fund to meet the exigencies of the Company, shall be made semi-annually.

We, the subscribers, promise to pay to Josiah White, George F. A. Hauto, and Erskine Hazard, or to the order of any two of them, One Thousand Dollars for each share of stock set opposite to our respective names, in the manner, and subject to the terms above written, provided that they shall have first executed and recorded a mortgage to us of the whole of their shares, as security for the performance of their part of the above terms; which mortgage shall cease to be binding as soon as the nett profits of the Company shall amount to eighteen per cent., or the amount of our subscriptions shall have been received by us in dividends.

FACTS
ILLUSTRATIVE OF THE CHARACTER
OF
THE ANTHRACITE,
OR
LEHIGH COAL,
FOUND IN THE
GREAT MINES AT MAUCH CHUNK,
IN POSSESSION OF THE
LEHIGH COAL AND NAVIGATION COMPANY,
WITH CERTIFICATES
FROM VARIOUS MANUFACTURERS,
PROVING ITS DECIDED SUPERIORITY
OVER
EVERY OTHER KIND OF FUEL.



BOSTON :

Printed by T. R. Marvin, Congress-street

1825.

III LEHIGH COAL.

The importance and value of this coal in various manufactures, as well as for domestic use, are now beginning to be more generally known. Its use is in consequence rapidly extending, it having been found, for most of the purposes to which it has been applied, greatly superior to all other descriptions of fuel.

For melting metals, for nailing, for rolling and slitting of iron, for malting, distilling, burning lime, baking and evaporating salts, it is entitled to a decided preference; and for various other uses in the arts it is confidently believed that, on trial, its advantages will be found to be equally great. Of all known species of fuel, it makes the most durable fire, creating an intense but regular and steady heat, without smoke or unpleasant smell, and producing no soot. The pipe or *chimney* therefore can never *take fire*, neither will the misery of a *smokey chimney* ever be felt where this coal is used.

For blacksmiths it is superior to the bituminous coals for all general purposes. But some alteration is necessary in the tue-iron. The gudgeons of the bellows ought to be placed 4 or 5 inches above the level of the nose of the pipe. The back of the fire place should be brought up slanting backwards, so that part of the fire may rest on it. The hearth should be filled up nearly level with the bottom of the tue-iron, which should be 1½ to 1¼ inches diameter, and a little art, which is soon acquired, is necessary to keep the fire open.

Furnaces for burning this coal should be so constructed as to *free themselves from ashes*. For this purpose the bars of the grate should be made smaller at the bottom than at the top where the coal rests, and should be placed not less than seven eighths of an inch apart, giving the grate or stove a *strong draught of air*.

The following certificates, selected from a great number which might be given, will confirm the statement above made of the great value of this fuel.

The following certificate was given to the *then* pro-

prietors of the great Lehigh Coal mine, by Messrs. White and Hazard, when owners of an extensive wire factory, and rolling and slitting mill, at the falls of Schuylkill, five miles above Philadelphia—

“We have used the Lehigh coal, and in the heating of bar iron for rolling, we find it to contrast with Virginia as follows:—

With Lehigh coal, three men will roll *ten cwt. of iron* for wire, and burn *five bushels* of coal per day of 12 hours.

The wages are	4 00
Five bushels of coal at 90 cents is . . .	4 50
	\$8 50

With Virginia coal it takes *ten bushels* to heat *five cwt.* of bars, which is all the three men can do with this coal in one day.

The wages as above is four dollars per day, but rolling but *five cwt.* a day, it will take *two days* to roll *ten cwt.* making the wages for that quantity . . . 8 00

Suppose the coal to cost only 2½ cts. per bushel, 20 bushels would be	0 50
	\$8 50

It follows that to us Lehigh coal at *ninety cents* is equally cheap as Virginia coal at *two and a half cents* per bushel.”

WHITE & HAZARD.

Whitestown, November, 1814.

“We the undersigned do certify that we are now using the stone coal for heating hoops for cut nails, and find it to exceed any other coal or wood fire for this purpose.

Our practice is, in the morning when we leave the shop for breakfast, to throw a quantity of coal on the

fires which will be fit for working on our return, and will last until we leave it at 9 in the evening, when we again put on a quantity which lasts until the next morning at breakfast time. We find a very great advantage in thus having the fire ready to work at an early hour in the morning.

Such a fire requires about half a bushel of coal in twelve hours. We find also that the hoops beat in half the time that they do with any other fire.

Upon the whole we think that the Lehigh coal is much the best for nailing and not attended with one fourth the trouble of any other fire, and that the nails are, in our opinion, superior to others on account of the quickness of the heat, which does not cause the iron to scale so much.

We also can cut one fourth more nails with this fire, than a wood fire.”

GEORGE SMITH.
JOHN MORGAN.
DANIEL CLOCKGLASER.

December 12th, 1814.

“I have used in my business for years past, occasionally, charcoal, sometimes Virginia coal, and at others Lehigh, and from use and careful examination of their relative value, I am perfectly satisfied that one bushel of Lehigh coal is equal in durability and value to nearly three of Virginia, and from ten to twelve of Charcoal; and further I find it is the only coal I can depend on for welding of gun barrels, as with it I am always sure of a true and uniform result. I have now used them twenty years, and would not be willing to be without it even if it costs me two dollars per bushel.

I own three tilt hammers, and have worked for the United States and the state of Pennsylvania for the last eight years.

It requires about a peck of the Lehigh coal per day, with a small proportion of Charcoal, for one fire; with this I manufacture 8 gun barrels, or 20 pistol barrels, or 1 quart of coal to a musket barrel.”

DAVID HESS.

Smith and gun barrel maker, Northampton, Pa.

Dec. 3d, 1814.

“I have used this kind of coal (the Lehigh) for the last two years, both for the malt kiln, as well as under the brewing copper, and also for distilling, for which purpose I find it to be superior to wood, cheaper, safer, and attended with much less labour.

In distilling, with 30 bushels of this coal and half a cord of wood, (to raise occasionally the heat) I distil 100 bushels of grain in a still, containing 125 gallons, upon the common old construction, in ten days—when I formerly used 5 cords of wood for the same quantity, taking longer time and requiring much more labour.

In order to dampen the fire whilst occasionally washing or drawing off the still, I have only to throw on some of the *finest* of the coal, and when again I want to raise the heat, I put on a stick or two of wood. The length of the bars of my grate is 22 inches, of inch square iron; they are set in loose, the ends widened, so that the bars may be about seven eighths* of an inch apart, and placed thus side by side, they make a grate of 15 inches wide. The stills are set bare to the fire, about 16 inches above the grate, with single flues passing round each still, with doors to the furnace.

For malting, the advantages are, that producing no smoke and containing no sulphur, there is no danger of its smoking or otherwise injuring the malt, whilst the *regularity of the heat* is such, that the fires require little or no attention at night, and there is also no danger, with common attention, of burning the malt.

For brewing, or under the boiler, I prefer it for the reasons which induce me to use it in distilling.”

WILLIAM BOWN,
Brewer and Distiller.

December 20th, 1814.

Extract from a memorandum furnished by Mr. Joseph Smith of Bucks county, Plough manufacturer.

“From the whole of my observations, (and I have been particularly attentive to the subject for a month past) I am fixed in the opinion that *one bushel* of the Lehigh coal is worth *two* of the Richmond, and ten or twelve of the best charcoal; and it is found to work *steel better* than any other kind of coal; not burning either that or iron as other coal does.

One of my journeymen, who was the most averse, is now using the Lehigh coal at Boyertown, Berks county, at \$75 per hundred bushels, in a neighbourhood where charcoal can be purchased for one tenth of the sum.”

JOSEPH SMITH.

Tinicum, Bucks county, Pa.

4th Mo. 2d, 1814.

*TRIANGULAR bars with a flat side uppermost, placed HALF AN INCH apart, have been found to answer better.

"We the subscribers, residents of the county of Bucks, do certify, that on the recommendation of Joseph Smith, we were induced to make trial of the Lehigh coal in our smith-shops. We have used it about four months; and believe, at the price we gave, (\$24 per ton) they are the most economical coals we could use. We find that the weight on the fire, the only objection to them, is more than compensated by the intensity of heat and freedom from that corrosive quality and cinder, to which all other kinds of coal are subject."

Given under our hands, February 24th, 1815.

JACOB B. SMITH, of New Hope.
EDMUND KINSEY, of Milton.

"I have for two months past made use of Lehigh coal in my distillery, and am much pleased with it. I have ascertained that three bushels of coal (with a little dry wood to kindle) is sufficient to run my singling still six times, my doubling still once, and boil all the water for mashing, &c. I find in using this coal a great saving of labour, and the copper is not so liable to be injured as by wood, because there is not so much danger of burning the still, or running foul at the worm.

My mode of setting stills for this kind of coal is as follows: I draw a circle sufficiently large to give room for a circular flue round the body of the still, of about four inches, leaving an opening of twelve inches wide and two feet deep for an ash hole; I then raise the ash hole twelve inches high and put on my grate, which is made of inch square bars, placed about three quarters* of an inch apart, and a sufficient number to cover the ash hole. I prefer to have the square bars rivetted (instead of putting them in loose as some do) into a cross bar at each end, to keep the bars stationary. I have put up a cast iron door frame in front, of 15 inches wide and 12 high, with a cast iron door to it; then raise the side wall and back of the furnace, a little flaring, to the height of the cast iron door frame, levelling the top; then put down four bricks for bearers, on which I set my still, then drawing a flue of about four inches round the sides of the still, inclose it at the top rise of the breast.

This mode I find to answer a very good purpose for stone coal. It is not necessary to have a slider or damper in the chimney, because by closing the front of the ash hole and opening the door of the furnace, it will suf-

ficiently check the operation of the fire when required."

GEORGE HAINES.

March 10th, 1815.

"We have used the Lehigh coal in our cupola, and after an experience of two years, we find that by using one bushel of Lehigh coal to five bushels of charcoal, we can melt double the quantity of iron in the same time—for instance, where we formerly melted twenty-five hundred of iron in our cupola, starting at 10 o'clock, A. M. and ending at 6, P. M. we, by using Lehigh coal mixed with charcoal as aforesaid, now melt fifty hundred weight. By using charcoal exclusively we formerly considered castings over ten hundred precarious to run by cupola, we now by using Lehigh coal can run castings over twenty hundred without danger. We discover Lehigh coal does not harden the iron, but it comes out grey."

CAD. & O. EVANS.

City Foundry, Philadelphia, May 26th, 1824.

"I have used Lehigh coal for melting copper and brass, for the last two years, and give it the preference to any other fuel.

I consider common pine coal a nuisance in a brass founder's shop for melting metal."

CHARLES GREEN,

Brass Founder, No. 54, New street.

Philada. May 14th, 1824.

"We, James and Joseph Whitaker, proprietors of the Delaware rolling mills, have used Lehigh coal for rolling our iron for nearly three years, and find it so much superior to all other species of fuel which we have ever used, that we would, now that our workmen are accustomed to and prefer it, rather pay 30 cents per bushel for it, than get Richmond or Liverpool coal for nothing."

J. & J. WHITAKER.

Philada. May 24th, 1824.

"I have used Lehigh coal in a rolling and slitting mill for the last three years and consider it superior to any other fuel that I have employed. In 1812, I gave \$14 per ton for it, or 50 cents per bushel, and even at that price considered that I saved, and preferred it to any other coal that I could get. At present the Lehigh and Virginia cost me the same price per bushel de-

*See note to W. Bown's certificate respecting the bars.

livered at my mill. But with from 7 1-2 to 8 bushels of Lehigh coal I roll as much iron as would require 13 bushels of Virginia, and the work is done in from two to three hours less time; so that my profit by using the Lehigh is 4 dollars 55 cents per ton, or 1 dollar 75 cents per day. This however is not all the advantage—my foreman will work with Lehigh coal for lower wages than with Virginia, the trouble is so much less; for instance on Monday morning the fire is made with a little wood or half a bushel or more of Virginia coal to start it, and it can be got ready for a heat in about one and a half or two hours; when once in order you have nothing to do but add coal, heat after heat—no cinder or other trash to take out until the day's work is done—then rake up the fire by pushing to the back all the coal that remains in the oven, shut down the damper, and in the morning you have fine live coals, the quantity very little diminished during the night; from Monday to Monday, no wood or other fuel wanted, and your oven always warm in the morning. Any one acquainted with the business can compare this with the trouble of Virginia coal, and after all, you cannot make so regular a heat as with Lehigh, but are apt, without a great deal of care, to burn the iron in one place and not have it hot in another. My furnace was constructed to burn Virginia coal: I made no alteration in it, except taking some of the bars out of the grate, so as to make the spaces between the bars wider.

This statement, which may appear partial, is given only for information. I have no interest in the Lehigh company, other than that of getting a regular supply for my business of this excellent fuel."

AMOS A. JONES.

Verreville, May 15th, 1824.

"We have used the Lehigh coal several years past to heat bar iron for our rolling mill at Bridgetown, Cumberland county, New-Jersey; prior to the introduction of this, we used the Richmond coal for the same purpose, and from experience thus obtained, we are satisfied that for this purpose, one bushel of the former is worth at least two of the latter."

BENJAMIN & DAVID REEVES.

Philada. May 19th, 1824.

"The quantity of Lehigh coal in Philadelphia heretofore, not being equal to the demand, I have not been able to obtain sufficient for my use, and have burned it but seldom in the rolling mill. but constantly for several

years in the nail factory. I shall use it in preference to any other fuel when I can be supplied, being well convinced of its superiority. I have had heated, for rolling into hoops, 11 tons of bar iron, with 33 1-2 bushels of your coal, when it would require nearly double that quantity of Virginia coal, or about six bushels to the ton. In the nail factory we consume about one bushel and three pecks of Lehigh coal to heat a ton of nail plates. As it requires no charring, is very durable, and the heat intense, much time is saved in the use of it. A fire made in the morning lasts till noon, then replenished, endures the rest of the day."

HENRY MOORE.

Old Sable Works, May 19th, 1824.

"We are of opinion that Lehigh coal is much to be preferred to wood, as fuel for drying malt, being more economical, requiring less room for storage, and less attention whilst burning, from its steady heat and great durability. The danger of accidents from fire is so much diminished by the use of this coal, that it alone would be sufficient to give it a decided preference."

DAWSON & MORRISON.

"From considerable experience I have found the Anthracite from Lehigh much superior either to the Rhode-Island or Kilkenny, (Ireland)."

WILLIAM MORRISON.

Philada. 5th Mo. 8th, 1824.

"For melting brass the Lehigh coal is preferable to any other; for one ton of Lehigh will do as much work as 200 bushels of charcoal for melting, beside is not half the labour in attending the furnace; and likewise for soldering our work. One person can do more than double the work with the Lehigh than they could with charcoal on the forge, and I find a great advantage in using it at the rolling mill, for heating the oven in which we Neal the brass for rolling, for two fires will serve for the whole day.

I therefore think it is the cheapest by one half."

J. BARNHURST.

May 8th, 1824.

"Having a mill for rolling and slitting of iron, we have for many years been in the habit of using the Virginia coal for heating the iron, until about six months ago we were induced to try the Lehigh coal, and find it so much superior to any other, that we now use it exclusively, and we believe there is a saving in the ex-

pense of about fifty per cent in favour of the Lehigh at the present prices of each, as we can perform the same business with two tons of the latter that we could with 85 bushels of Virginia.

Our workmen also prefer the Lehigh as they have much less trouble in keeping their fire with it than any other that we have used."

JAMES & MAXWELL ROWLAND.

Philada. 5th Mo. 22d, 1824.

"This is to certify, that I have used at one of my blacksmith forges, for some time past, the Lehigh coal, and (about adopting it in all of them) find that one bushel of it will last longer than two of Virginia or Liverpool, it being much cleaner, and the smith likes it better, and can safely say that I have had the largest day's work done with that coal that I have had with any other for ten years."

JONAS GLEASON.

"N. B. I find you must alter your bellows tue-iron by making it about twice as large as is common, and begin your fire with a little charcoal or wood at the bottom, and not let any dead coal get to the tue-iron and you have no difficulty, and when you leave your fire, put in a small piece of wood or charcoal, to keep it while at dinner, &c.—A little instruction is necessary to a new beginner or he is apt to get too soon prejudiced." J. G.

Philada. May 7th, 1824.

"I Thomas Barnhurst, brass founder &c. of Philadelphia, certify, that I have been in the use of the Lehigh coal for several years, for brazing and melting brass and copper; and my experience authorises me to say, that in brazing or soldering, my hands can do in a given time with one half the expense, three times as much work as they can with any other kind of coal that I have ever used. And for melting any kind of metal, one fire will answer the place of eight fires of charcoal, at not greater expense than each fire of charcoal;—that taking into view the great saving of expense of fuel, and the very great additional quantity of work my hands can do with Lehigh coal more than any other kind, I think it invaluable either for melting or brazing."

THOS. BARNHURST.

Philada. May 10th, 1824.

"I Samuel Heston, of Bucks county, have followed

the business of a blacksmith for thirty years, and until the year 1819 was in the habit of using charcoal and Richmond coal. During the war I obtained a parcel of Lehigh coal for trial, but could do nothing with it and considered it a worthless article. In the year 1819, I made a visit to Mauch Chunk and there had an opportunity of seeing this coal properly used. I brought some of it back with me in my waggon, and have been in the use of it ever since, hauling it from Philadelphia a distance of 28 miles, rather than purchase charcoal in my neighbourhood. I can do more work with one bushel of the coal than any man can do with three bushels of Richmond coal or six bushels of charcoal. In short I consider the discovery of Lehigh coal one of the most important ever made in this country, and should hardly be tempted now to use any other if it were given to me for nothing. When I went up to Mauch Chunk for curiosity, I had sold out all my stock, intending to move to the state of Ohio, and nothing but the prospect of being able to carry on my business to great advantage by using this coal, induced me to alter my mind and remain. Fifty people in my neighbourhood know that I should have gone but for this accidental circumstance.

SAMUEL HESTON.

May 20th, 1824.

"I have found from experiment that 10 bushels Lehigh coal may be considered equal to 50 bushels charcoal, or to one cord of good hickory wood, when used for drying malt for brewer's consumption. The principal advantages the Lehigh coal possesses, compared with other fuel, consists in the steadiness, regularity and safety of the heat emitted, and the little attendance it requires, it also dries malt paler than other fuel.

ADAM SECKEL.

Philadelphia, June 4th, 1824.

Letter from William Young, Esq. proprietor of the Rockland Factories on the Brandywine, to one of the Managers.

"I have your letter of 9th instant requesting information respecting the manner of using the Lehigh coal, its cheapness, safety, and other advantages.

I will with pleasure note such circumstances as have been found to answer all these purposes at the warehouse, No. 10, South Third street, and at the Rockland cotton and woolen factories on Brandywine. The first

I had of the Lehigh coal was in 1798, when Mr. Charles Cist sent a basket of that coal, which was put into a carron coal grate, and the fire place inclosed to make the current pass through the fire; the heat produced was intense.

As soon as a supply could be had, it was introduced at the warehouse, and sent to the factories on Brandywine. The manner of using is simple, safe and efficacious. It has been used in furnaces (at the factories) built on the ground floor. These furnaces are made of fire brick enclosed in cylinders of sheet iron; around this, and leaving a space of about four inches for an air chamber, a circular brick wall is built, and the air chamber covered above the top of the furnace. The air from without the building is introduced as low under the air chamber and grate of the furnace as practicable, in order to give the greater pressure from the external column of air, to promote the combustion in the furnace, and to increase the current of warm air from the air chambers through the tubes to carry to the points required in the factory.

The conduits for the cold air are large, and also the smoke pipes and air tubes, from 7 to 14 inches diameter. The larger the conduits, and the colder the air introduced, the effects are so much the more immediate and satisfactory, and it is presumed, that in cases where the coal has not been so advantageously used, it has arisen from a want of attention to these very important circumstances. The smoke pipe, which is about 14 inches diameter, contains a tube of warm air of about 7 inches diameter; these are carried through each floor in copper reservoirs, filled with water, which while they remove all risk from fire, the evaporation produces a refreshing air in the factory. The woollen factory, a building of about 34 by 85 feet, four stories high, has been rendered comfortable with one furnace, except where a stove is required at the gig mill. The cotton factory, about 40 by 70 feet, three stories high, has never required more than the use of one furnace, to render it so warm as required in the coldest season. Thus in the one case, supposing the building 81 feet long, 31 feet wide and 35 feet high, all in the clear within the walls and floors gives 87.885 cubic feet of air, and the other building 67 feet long, 36 1-2 wide and 32 feet high, the stories being so much higher within the walls, gives 78.240 cubic feet of air rendered comfortable by one furnace and air tubes. The expenses I cannot exactly ascertain, because until 1822 we could not obtain a supply of your coal for both factories, and the smith shop. For the winter

season of 1822, 16 tons were used for the factories, and the smith shop, and the same quantity in 1823. The wood used for kindling, an occasional supply being taken from the other stores for weaving shop, dye house, &c. &c. cannot be ascertained, nor can we exactly state the expenses compared with other fuel, but our estimate has been, that 10 to 12 bushels of Lehigh coal, of 80lb. weight each, will yield the same quantity of caloric or heat as one cord of oak wood of 128 cubic feet; and one bushel of Lehigh coal will perform for us about the same service as one and a half bushels of such Liverpool as we have had.

It might also be stated that a neighbouring factory where they used oak wood, the building 4 stories high, and not much larger than these already mentioned, required about 200 dollars for wood for the season.

The circumstances already stated will show that the Lehigh coal used is by far the safest fuel. There is but one fire, and that shut up on the pavement floor; there are no sparks, and it is understood that the deposit in the pipes and chimnies are incombustible; this however may not be the case when the fires are kindled with wood, or where wood is used occasionally to continue the temperature till the time of shutting up in the evening; but in general three fires hold out to serve for each day.

The insurance offices have been so well satisfied about its additional safety, that the premiums are reduced where it has been in use in the manner stated, and which has been introduced from season to season into the most extensive factories near the Delaware, with some variation according to taste and circumstances. The convenience is also great; instead of carrying fuel into the different stories where dust, smoke, &c. are disagreeable and often injurious, the caloric is carried wherever required without risk, dust, smoke or labour. Coal has been used for six years at No. 10, S. Third street. The Rhode Island, which is more difficult to manage, was used until a supply of Lehigh could be obtained. The air is introduced from the outside of the room and as much below the grate as practicable, by which the combustion is carried powerfully on without any consumption of the warm air; and by means of the tubes the heated air is carried to any point required, within or without the warehouse, at a small expense, and without injury from smoke or dust: the temperature is regulated by valves or registers in the smoke pipes."

WILLIAM YOUNG.

Philada. May 19th, 1824.

"We the subscribers having made use of the Lehigh Coal in our parlours during the past season, are so well satisfied with it that we prefer it to any other fuel—being cheaper, safer, and more durable, after being once ignited, and therefore less troublesome to continue the fire than with wood or other Coal.

JOSEPH BALCH.
ISAAC WATERS.
C. BLANCHARD.
A. H. GIBBS.
I. P. DAVIS.

Boston, June 15, 1825."

NOTE.—It has been ascertained by calculation that by the substitution of Lehigh Coal for wood, the expenses of the Pennsylvania Hospital have been diminished about one thousand dollars per year, or say *one third*.—This is a well authenticated fact.

[From the New York Mercantile Advertiser.]

IMPORTANT TO AGRICULTURE,
COMMERCE, AND MANUFACTURES.

It appears from actual experiment made on the Coals dug out of the mines of our country, such as the Schuylkill, Lackawaxen and the Lehigh, being all of the same family, that they possess a degree of heat in the ratio of 5 bushels to 18 bushels of the Liverpool Coal after it had been cok'd: it is confidently believed these Coals are the pure carbon, and that there is no such Coal to be found in Europe, and from the experiment made by Messrs. Robert M'Queen & Co. in this city, we have reason to say that the grand desideratum so long sought after in the manufactures of Europe to acquire a degree of heat beyond that which the Coke Coal will produce, will be found in the Coal above mentioned.

Herewith subjoined is a certificate from the practical hands of Mr. Hood, the foreman of Messrs. R. M'Queen & Co. who carry on in this city one of the most extensive Iron Foundries in the United States. Here is no theory, it is the result of actual experiment passed through the ordeal of the large crucible technically called a Cupola from which there is no appeal.

The following certificate is from Mr. Hood, Foreman of Messrs. Robert M'Queen & Co.

"I do hereby declare that I have, in the Cupola Furnace of Robert M'Queen, Esq. made four different blasts with the Schuylkill Coal of Mr. Snowden, and find it fully to answer all our purposes. We used differ-

ent proportions of Coal and Iron on the different days to try the strength of the Coal, and the result is, that the Schuylkill Coal, *in its native state*, without any trouble or the expense of coking, and with a much *smaller* quantity of coal, makes *better iron* than any coke we ever used. It renders the metal *much softer* and fitter for our purpose than coke. I have no doubt that this coal, as soon as introduced here, will entirely do away the use of coke, and produce great saving in our works."

(Signed) WILLIAM HOOD.

William Hood acts in the capacity of foreman for us, and we believe what he has stated to be correct.

(Signed.) ROBERT M'QUEEN & Co.

LEHIGH COAL,

APPLIED TO ROLLING IRON.

The furnaces should be 12 or 15 inches longer than the bars intended to be heated, with a grating under the whole, and a flat roof about 12 or 13 inches above the grating, and the draft taken through 2 or 3 openings in the roof connected with the stack—each of the openings should be provided with a damper, to regulate the draft at pleasure. With such a furnace you need never wait for the coal to burn up, after making the first fire. At the same time that you put on the iron, throw a few lumps of coal at the back end of the furnace which will be ignited by the time the iron is rolled off, then stir up the fire so as to free it from ashes, bring forward the fresh coal, and immediately put on the change of iron and renew the coal at the back of the furnace. With two furnaces worked on this plan, the rollers may be kept constantly at work, as the iron will heat in one as fast as it can be rolled out of the other. This will be found to require water to be always running upon the rolls to keep them cool. Five bushels of coal will be sufficient for 1 1-2 tons of iron. Supposing the Lehigh and Liverpool coal to be at the same price, the use of the Lehigh will be found to save the whole cost of the coal and hands—as the same hands can do double the work, with half the coal, in the same time that they can with Liverpool or Virginia coal. Soap Stone, with the end of the grain next to the fire, is the best material for the furnace and will stand some years without repair.

TO BURN LIME.

The furnace, or kiln, may be constructed of almost any shape: that of an egg answers very well. The lower part is contracted to a square of 18 or 20 inches having the bottom on an inclined plane, so that the burned lime may be drawn out below with a shovel while the coal and stone are thrown in above. The stone should be broken moderately small and the coal made very fine. To commence operations, put a sufficient quantity of wood in the kiln to ignite the coal; then a stratum of coal; then fill up the kiln with alternate strata of stone and coal, in the proportion of six bushels of the stone, to one of coal, and set fire to it; as it settles, fill it up. After the wood and lower coal are burnt out, the lime will show itself at the bottom and may be drawn out as it cools. Thus by drawing out the lime and keeping the kiln filled with stone and coal, the operation may be continued at pleasure. In some kilns it is necessary to keep all the crevices on the top filled with fine coal, to prevent the stone from melting with the strong draft. The proportions of stone to coal will be found to vary from 5 to 8 for one—the quantity depending upon the quality of the stone and the size to which it is broken. If the coal be left too coarse, the mass will be melted by the intense heat. This will be found the most economical and pleasant way of burning lime—as the kiln is cool both at bottom and top, and requires no further attention than drawing out the lime morning and evening, and filling it up with stone and coal.

TO DISTILLING.

A furnace and grate is made under the stills, with a door to close up the front, that no air may get into the furnace but what passes through the grate and coal. A damper should likewise be put in the chimney, to regulate the draft. When the liquor is run off, and you wish to change the stills, throw some fresh coal on the fire and close the damper and ash hole, by which means the heat is almost instantly checked, and the still can then be run off and recharged by the time the fresh coal is ignited and furnishes the heat necessary to continue the process; so that no time is lost in making up the fire. One ton of coal has been found sufficient to run off 630 gallons of liquor from the low wines, besides heating all the water for mashing 210 bushels of grain, and washing the casks, &c.

TO BREWING AND MALTING.

In malting, the whole product of the combustion of the coal, passes through the malt, which partially bleaches it, and makes it much preferable to other malt for making pale ale. By making a uniform constant heat, the fire requires little or no alteration. The same fixtures and management are used with the brewing kettle as in distillery.

TO BURNING BRICK.

The bricks should be piled with spaces of about three quarters of an inch between them, and fine coal should be thrown loosely into those spaces. The lower part of the kiln must then be ignited with wood and the heat will gradually work through to the top, burning the bricks in its progress. The hardness of the bricks is regulated by quantity and fineness of coal.

TO MELTING IRON.

In a cupola furnace, one ton of coal will melt two tons of pig or scrap iron. The coal should be broken to about the size of eggs. It requires more blaze than charcoal.

TO BAKING.

The Lehigh coal is peculiarly adapted to perpetual ovens—as the heat may be kept regular for any length of time. The ovens are made of sheet iron, and built in brick or stone work, so that the heat may pass all around it. The grate should be placed about 20 inches below the oven, and have separate doors to the ash hole and furnace, that either, or both, may be opened to regulate the heat. One bushel of coal is sufficient for an oven capable of baking 100 lbs. of bread per hour for a day of 12 hours.

The subscribers, agents of the LEHIGH COAL COMPANY, are prepared to execute orders for Coal in any quantities, and will also give the necessary information for the construction of Grates and Stoves, to those disposed to make trial of it.

LYMAN & RALSTON,

71 *Broad Street*,
BOSTON.

