

CAMBRIA IRON COMPANY
(Cambria Steel Company)
(Midvale Steel and Ordnance Company)
(Bethlehem Steel Corporation)
East side of Conemaugh River
Johnstown
Cambria County
Pennsylvania

HAER No. PA-109

HAER
PA
11-JOTO,
135-

PHOTOGRAPHS

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Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

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Location: East side of Conemaugh River, .5 miles North of its confluence with the Stonycreek River, Johnstown, Cambria County, Pennsylvania
Quad: Johnstown
UTM: 17 E.676380 N.4466610

Date of Construction: 1852 and after

Fabricator: unknown

Present Owner: Bethlehem Steel Corporation

Present Use: Referred to as the Lower Works, the Cambria Ironworks was recently closed by Bethlehem Steel and is currently for sale.

Significance: The Cambria Ironworks is a part of a National Historic Landmark district recognized for its association with such renowned figures as John Fritz, Captain Bill Jones, Daniel J. Morrell, and William Kelly. It was one of the nation's leading producers of iron and steel rail through the nineteenth century; John Fritz refined his innovative three-high rolling mill at Cambria's rail mill. The works was also the site of William Kelly's unsuccessful attempts to develop a pneumatic convertor for making steel from pig iron. A number of bitter strikes, most notably in 1873, 1919, and 1937, are associated with the works.

Historian: Gray Fitzsimons, 1989.

Project Information:

The results of the study of Cambria County were published in 1990: Fitzsimons, Gray, editor, Blair County and Cambria County, Pennsylvania: An Inventory of Historic Engineering and Industrial Sites (Washington, D.C.: America's Industrial Heritage Project (AIHP) and HABS/HAER, National Park Service). The contents of the publication were transmitted to the Library of Congress as individual reports. Research notes, field photos and copies of historic photos collected during the project were transmitted to the AIHP Collection, Special Collections, Stapleton Library, Indiana University of Pennsylvania, Indiana, PA 15705.

HISTORY

The subject of a recently published National Park Service study,¹ the Cambria Iron Company's Johnstown works began as a financially strapped enterprise in the 1850s, but emerged as one of the nation's premier rail mills in the 1860s and 1870s. The company rose from obscurity to a major producer of iron and steel rail as a result of three major factors: its ability to attract several of the best technical minds in the nation's iron business (chief among these men were the Fritz brothers, John and George, "Captain" William R. Jones, Daniel Jones, Samuel Lapsley, Alexander Holley, and Robert Hunt); Company president Daniel J. Morrell's shrewdness in helping establish the Pneumatic Steel Association, a patent-pooling arrangement for the production of Bessemer steel that allowed a small group of companies, including the Cambria Iron Company, to dominate the nation's steel rail market; and the strongly paternalistic Cambria Iron Company's domination of Johnstown, ensuring a favorable political and business climate, as well as rigid control over its workforce.

Although a number of histories have been written concerning Cambria Iron and these issues--including an outstanding study of the company's nineteenth-century workers²-- more work is needed in several areas, particularly in the realm of patent pooling and

¹Sharon A. Brown, Historic Resource Study: Cambria Iron Company (Denver, CO: Denver Service Center, National Park Service, 1989).

²John William Bennett, "Iron Workers in Woods Run and Johnstown: The Union Era, 1865-1895," (Ph.D. diss., University of Pittsburgh, 1977).

steel rail production.³ However, it is not the intent of this short essay and accompanying historic structures' inventory to explore these issues. Instead, its focus is the physical remains of Cambria Iron's buildings and steel making equipment, that is, it traces what the company built at its iron works and when these building activities occurred.

The roots of Johnstown's iron industry may be traced to the early 1840s when merchant-turned-ironmaster George Shyrock King erected Cambria Furnace on Laurel Run, about three-quarters of a mile east of the Pennsylvania Canal. The Conemaugh Valley in the Johnstown area contained vast timberlands and rich deposits of limestone, coal, and iron ore, all of which were exploited for use in the region's burgeoning pig iron industry. By 1845 King and the prominent Pittsburgh iron merchant Dr. Peter Shoenberger, as well as several other partners, established George S. King and Company. Schoenberger had extensive holdings in the Upper Juniata iron region as well as interest in the Juniata Rolling Mill No. 2 in Pittsburgh. (Dr. Peter Shoenberger, a well-known ironmaster throughout Pennsylvania, was the son of George Shoenberger, who established the family in the iron business in Huntingdon County in the early 1800s. About 1824 Dr. Shoenberger opened the Juniata Iron Works in Pittsburgh, which included a large rolling mill.)⁴ From the 1840s through the early 1850s King and his partners produced pig iron using charcoal and coke. Much of the pig iron produced in the area was probably shipped to Pittsburgh for processing in the city's numerous forges, rolling mills, and nail mills.

³The standard economic history of the nation's early steel industry remains Peter Temin's Iron and Steel in Nineteenth Century America: An Economic Inquiry (Cambridge, MA: The MIT Press, 1964). Other notable works concerning Cambria Iron and the development of cheap steel include Philip W. Bishop, The Beginnings of Cheap Steel: United States National Museum Bulletin 218 (Washington, D.C.: Smithsonian Institution, 1959), Jeanne McHugh, Alexander Holley and the Makers of Steel (Baltimore, MD: The Johns Hopkins University Press, 1980), and Donald Sayenga, "Canals, Convertors, and Cheap Steel," Canal History and Technology Proceedings, VIII (Easton, PA: The Center for Canal History and Technology, March 18, 1989).

⁴See James M. Swank, Introduction to a History of Iron making and Coal Mining in Pennsylvania (Philadelphia: James M. Swank, 1878), 39-40; and J. P. Lesley, The Iron Manufacturers Guide to the Furnaces, Forges and Rolling Mills of the United States (New York: John Wiley, 1859), 250-51.

Compared with Pittsburgh in 1850, Johnstown was a primitive village with a population numbering around 2,000. The city was laid out along river bottom land at the junction of Stony Creek and Little Conemaugh rivers, and was surrounded by steep hills. As one traveler described it, Johnstown, although "pleasantly situated . . . is without the least interior attraction . . . [its] buildings are small and without ornament."⁵ The city's major thoroughfare was the Pennsylvania Canal that joined the Allegheny Portage Railroad at Woodvale, crossed the Little Conemaugh River, extended northwest of Johnstown along the base of Prospect Hill, and followed the east side of the Conemaugh River through the Conemaugh Gap. The canal served the impressive stone-constructed Johnstown Steam Hot Blast Coke Furnace located across from the confluence of the Stony Creek and Little Conemaugh rivers, as well as Johnstown's two small foundries that each employed about nine men.⁶

Johnstown's relatively small-scale iron industry was rapidly transformed in the decade following 1852, with the completion of the Pennsylvania Railroad through the Alleghenies, linking Philadelphia with Pittsburgh via Johnstown, and the formation of the Cambria Iron Works. Seeking to manufacture iron rail at a new works in Johnstown, George King convinced a reluctant Dr. Shoenberger to become a partner in this enterprise. Using their land holdings in Cambria County as security, the two men sought financial backing to construct new furnaces and a rolling mill. After an unsuccessful attempt at interesting Boston financiers in this venture, King went to New York where he convinced banker Simeon Draper to provide the necessary capital. With great haste, King travelled to the state capitol at Harrisburg where he purportedly woke the governor late at night for his signature on the charter creating the Cambria Iron Company, capitalized at one million dollars.⁷

In the spring of 1853 construction commenced on four coke-fired blast furnaces near Hinckston Run, north of the city's downtown.

⁵Eli Bowen, The Pictorial Sketch-Book of Pennsylvania (Philadelphia: Willis P. Hazard, 1852) 157.

⁶J. P. Lesley, 92; Dennis P. Kelly, "The Contrasting Structure of Johnstown, Pennsylvania, and Binghamton, New York: 1850-1880," Ph.D. dissertation, University of Pittsburgh, 1977, 30-32.

⁷Richard A. Burkert, "Iron and Steelmaking in the Conemaugh Valley," in Johnstown: The Story of a Unique Valley, 2nd edition, (Johnstown, PA: Johnstown Flood Museum, 1984), 263-64.

Work was also begun on the large cruciform-shaped rolling mill, located just south of the furnaces at the foot of Prospect Hill. In December of 1853 company engineer S. A. Cox reported that the brick works completed on site the previous summer were in full operation and making all of the brick for Cambria Iron's buildings. Cox noted that several buildings were recently finished including a foundry, a machine shop, a pattern shop, and a blacksmith's shop. Pig iron production at the four existing King and Shoenberger charcoal blast-furnaces amounted to nearly 120 tons per week, and, as the engineer observed, the four new coke-fired furnaces were likely to be completed within the next several months. In addition, Cox announced, "the rolling mill will be making iron by the last of January or the first of February."⁸

This optimistic pronouncement, however, was soon followed by the collapse of financial backing for the enterprise and its New York investors sold the Cambria Iron Company to Matthew Newkirk of Philadelphia. Work was halted on the rolling mill in early 1854 and for several months it remained only partially built. In the meantime, the original partners withdrew from the company; Shoenberger in Pittsburgh retained his interests in a number of other iron-mining and manufacturing properties, whereas George S. King moved to Lewistown, Illinois, where he founded several banks.⁹

With King's retirement from Cambria Iron the new company president, Matthew Newkirk, persuaded a young John Fritz to leave his newly established machine shop in Norristown, Pennsylvania, and assume the superintendency of the troubled iron works. Fritz arrived in June 1854 whereupon he supervised the completion of the cruciform-shaped rolling mill. On July 27, 1854, the mill finally produced its first iron rails.

As John Fritz observed in a paper presented at the annual meeting of the American Institute of Mining Engineers, the quality of the first rails produced at Cambria was far from satisfactory. All involved in the effort were disheartened at the appearance of the rails whose "flanges looked like saw-teeth, and the head was

⁸S. A. Cox, "Engineer's Report," in Cambria Iron Company of Johnstown, Pennsylvania, December 1853 (New York: George F. Nesbitt and Co., 1853), 1-2.

⁹Richard A. Burkert, 264-65.

rough and full of holes."¹⁰ Hoping to improve the rails, Fritz, along with the skilled puddlers, heaters, and rollers, continually experimented with various iron ores, as well as the rolling process. As they soon discovered, however, the engine and flywheel driving the roll train was inadequate to attain the speed required to roll the quality rails. Much to the frustration of John Fritz, the company's continuing financial difficulties delayed for several months the purchase and installation of a new power system for the mill.¹¹

The enterprise continued to flounder until May 1855, when the iron works was again reorganized, this time by Wood, Morrell & Company of Philadelphia. The company appointed Daniel J. Morrell, a highly successful merchant with no experience in the iron industry, as general manager of Cambria Iron. However, this change in organization did not immediately rescue the troubled iron works. The existing two-high rolling mill, in use for less than one year, was still unable to produce inexpensive high-quality rail.

John Fritz believed that only a drastic overhaul of the entire rolling mill would improve Cambria's rail production. As superintendent of the works, Fritz recommended a newer, more powerful steam engine and, most importantly, a three-high rolling mill, of his design, in place of the existing two-high mill. However, his ambitious plan encountered stiff resistance from the company's stockholders, on the one hand, and the skilled iron workers, on the other. From the stockholders' standpoint a great deal of capital already had been expended in the completion of the existing two-high mill, the industry's standard rolling mill.¹² At the same time, the iron workers were greatly

¹⁰John Fritz, "Early Days of the Iron Manufacture," Transactions of the American Institute of Mining Engineers, v. 24, (New York: American Institute of Mining Engineers, 1895), 601.

¹¹John Fritz, 601-02.

¹²The first successful three-high mill in the United States was employed in 1853 by Charles Hewitt at the Trenton Iron Works in Trenton, New Jersey. Hewitt rolled iron rail and beams with this three-high non-reversing mill containing vertical rolls. See Allan Nevins, Abram S. Hewitt, with some account of Peter Cooper (New York: Harper & Brothers, 1935), 114-15; and Fritz, 602. Though it is narrowly focused on John Fritz and does not examine the important British contributions to the development of the three-high mill, see Elting E. Morison, From Know-how to

concerned that the Fritz-proposed three-high mill would reduce the number of skilled heaters and rollers required to operate the two-high mill and, additionally, would result in a grueling increase in the speed of production.¹³

Eventually, with the support of Cambria Iron's vice president E. Y. Townsend, John Fritz received additional capital to construct his three-high mill. The two-high mill was shut down on July 3, 1857, and work commenced on the Fritz-designed three-high mill. In addition, Fritz rearranged the rail department, raising the floor by two feet and installing a new, more powerful steam engine. John and George Fritz, Alexander Hamilton, the mill superintendent, and the head of the rail department, Thomas Lapsley, oversaw the work which was completed on the 29th of July. The successful rolling of the mill's first iron rails was soon overshadowed when, just two days after the three-high mill was placed in operation, a fire destroyed the mill building.¹⁴

Despite this setback, John Fritz managed to repair the three-high mill and its engine, and was able to produce rail in a temporary frame building less than one month after the fire. In January 1858, Cambria Iron completed construction of a large brick and iron-frame mill building, which housed the puddling furnaces, rail mill, and engine. Cruciform in plan, this building dominated the iron works and was among the largest rail mills in the nation.

By the end of 1858, Cambria Iron's rail mill was vying with several other mills, all located in the northeast, as the nation's largest iron rail producer.¹⁵ Although much of Cambria's rail mill was destroyed in a second fire in 1872, another cruciform-shaped brick building was constructed in its place. (Today, sections of the mill survive which date from the

Nowhere: The Development of Technology in America (New York: Basic Books, Inc., 1974), 81-86.

¹³Fritz, 602-03.

¹⁴Fritz, 602-03.

¹⁵The other large rail mills include the Bay State Rolling Mill in Massachusetts, the Rensselaer mill in Troy, New York, the Phoenixville Iron Company's mill in Phoenixville, Pennsylvania, the Trenton Iron Company's mill in Trenton, New Jersey, the Lackawanna Iron Company's mill in Scranton, Pennsylvania, and the Montour Iron Company's mill in Danville, Pennsylvania. See J. P. Lesley, 219-262.

1860s and 1870s.) Construction of the third rail mill was carried out immediately for the Cambria Iron Company was undergoing considerable expansion in the early 1870s. A Bessemer steel plant, designed by Alexander Holley and completed in 1871, marked the establishment of Cambria as a fully integrated steel mill. By the mid-1870s, just prior to the completion of Andrew Carnegie's Edgar Thomson Works in Braddock, outside of Pittsburgh, the Cambria Iron Company led the nation in iron and rail production.¹⁶

During the 1860s and 1870s the Cambria Iron Company added a number of buildings to its Johnstown works. The largest of these structures, other than the rail mill, was the Bessemer Building, a tall brick structure with iron trusses supporting a clipped-gable roof. The Bessemer Building stood until the late 1950s when it was demolished prior to the construction of the 11" Mill. However, the most architecturally distinguished of Cambria Iron's nineteenth-century structures, the octagonally shaped brick blacksmith shop, was erected about 1864. It housed steam hammers used for forging tools and metal products used within the iron works. Large arched windows on all eight sides of the building permitted a great deal of natural light into the shop's interior. Containing a number of smoke-emitting forges, the building was vented with a central cupola that extended through the roof. During its peak in the late nineteenth and early twentieth centuries, the blacksmith shop employed as many as forty men in a single shift.

In 1865 Cambria Iron erected a new foundry adjacent to the blacksmith shop. The ornamented brick building featured a large cupola extending above the wide mansard roof. About 1870 the company constructed a pattern shop next to the foundry. The shop provided wood patterns for castings in the foundry and was also constructed with brick and a mansard roof. This collection of 1860s and 1870s mill architecture survives today, and along with the nearby rail mill and Rolling Mill Office (1874), are physical reminders of the Cambria Iron Company's Johnstown works during its peak years of operation.

Despite the addition of an open hearth steel-making facility in the 1880s, the Cambria Iron Company's Lower Works was dropping in stature compared to a number of other mills in the Pittsburgh district. Although it was located on the Main Line of the Pennsylvania Railroad, it was relatively isolated from major East

¹⁶James M. Swank, Introduction to a History of Ironmaking and Coal Mining in Pennsylvania (Philadelphia: James M. Swank, 1878), p. 91.

Coast and Midwestern markets. The growing importance of the Great Lakes iron ores in the 1880s resulted in the construction of several new steel mills in Pittsburgh, Cleveland, and Chicago. Cambria Iron owned ore mines in Michigan and, in the 1890s, considered relocating to the Great Lakes region. However, with the reorganization of the company in 1898, the newly formed Cambria Steel Company decided to expand its Johnstown operations. The Lower Works, having suffered little damage in the disastrous flood of 1889, continued producing steel rail and structural steel shapes. But its importance, even in Johnstown, diminished greatly when Cambria Steel elected to build a new modern mill in Franklin Borough, north of Johnstown, complete with blast furnaces, open hearths, and a steel railroad car department.¹⁷

In addition to the Franklin Works, Cambria Steel began to rebuild the nearby Gautier Works which had been completely destroyed in the 1889 flood. Gradually reconstructed in the late 1890s through 1911, Cambria Steel built the Gautier Works to produce steel for agricultural needs including wire fencing and plows. The company also built a new rod and wire mill along the Conemaugh River in Morrellville. Part of the Lower Works was becoming increasingly used for maintenance shops for the Johnstown plants. Most notable of the maintenance facilities was the modern machine shop, constructed in 1906. This tall brick building contained three stories which flanked a large central shop floor. It was to be the last major building constructed at the Lower Works by the Cambria Steel Company.

The Midvale Steel & Ordnance Company, located in Nicetown, Pennsylvania, acquired Cambria Steel in 1916. With orders for steel pouring in as a result of the war in Europe, Midvale undertook a series of expansions at Franklin and constructed a wheel mill north of the Franklin Works. In addition to the wheel mill, Midvale quickly built new blast furnaces and a by-product coke plant at Franklin. The Lower Works and Gautier, however, saw little improvement to its facilities. Midvale continued to operate all six blast furnaces at the Lower Works, along with the Bessemer and open hearth plants, but, as Bethlehem discovered when it acquired Midvale's Johnstown plants in 1923, the physical condition had deteriorated substantially.

In the early 1920s Bethlehem Steel, headed by the dynamic Charles Schwab, aggressively expanded its holdings in the nation's steel industry, acquiring the Lackawanna Steel works in Buffalo, and the plants of the Midvale Steel & Ordnance Company in Pennsylvania. Bethlehem Steel reorganized the Johnstown plants,

¹⁷Brown, pp. 113, 120-3.

adding to the Gautier Works, electrifying a number of its steam-powered rolling mills, and modernizing blast furnaces at Franklin, as well as two blast furnaces in the Lower Works. At the same time Bethlehem Steel was improving the Johnstown plants, it closed some of the older sections. This included dismantling the four oldest blast furnaces in the Lower Works. The buildings supporting these blast furnaces, namely the blowing engine house and boiler houses, were reused as storage facilities. One other change at the Lower Works marked the end of an era in Johnstown's history: in the 1920s Bethlehem Steel ceased operating the rail mill and converted the building entirely to the production of railroad axles. In the 1950s Bethlehem Steel closed the old Bessemer plant and open hearth shop in the Lower Works, and, with the construction of the 11" Mill in 1961 all traces of these buildings vanished. Today, the steel-frame 11" Mill, measuring nearly 1,000 feet long, 120 feet wide, and 50 feet tall, dominates the Lower Works. Sadly, the once-important shop facilities have been largely retired by Bethlehem Steel. The huge machine shop has been abandoned for a smaller shop that stands above the works on Prospect Hill. The foundry also has been closed and only a few men work in the blacksmith shop and pattern shop.¹⁸

SOURCES

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¹⁸"History of the Evolution of the Johnstown Plant: Bethlehem Steel Company, 1852-1935, (revised to 1958)," unpublished manuscript in possession of Bethlehem Steel Corporation, General Office Building, Johnstown, PA.

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CHRONOLOGY

- 1852 – Cambria Iron Company founded on June 29 by George King and Peter Shoenberger
- 1853 – Company failed after partial completion of the works
- 1854 – David Reeves, Mathew Newkirk, George Trotter and others lease the plant, rolling mill completed; first iron rails rolled
- 1855 – Philadelphia company, Wood, Morrell & Company, lease the works to roll rail
- 1857 – First three-high rolling mill developed and put into use by John and George Fritz; rolling mill burned and rebuilt
- 1857-1862 – William Kelly experiments with converter
- 1862 – Wood, Morrell & Company lease expiration, company reorganized and named Cambria Iron Company
- 1867 – First commercially ordered Bessemer steel rails rolled at Cambria from ingots forged at the Pennsylvania Railroad's Pennsylvania Steel Works in Steelton, Pennsylvania
- 1869 – First Bessemer furnaces erected at Cambria, designed by George Fritz, Robert Hunt and Alexander Holley; sixth Bessemer plant in America
- 1871 – First blow with two six-ton converters, first steel rails rolled at Cambria
- 1873 – Cambria was the largest steelmaker in the country
- 1876 – Steel rail output at Cambria totals 10 percent of country's production
- 1878 – Two 10-ton open-hearth furnaces built
- 1889 – May 31 Johnstown Flood damaged Lower Works, destroyed Gautier Works, Mineral Point, Woodvale
- 1898 – Cambria Steel Company formed
- 1901 – Franklin Works started
- 1910-1911 – Rod and Wire Mill built
- 1916 – Midvale Steel and Ordnance Company bought Cambria Steel Company
- 1919 – Great Steel Strike
- 1923 – Bethlehem Steel Corporation acquired Cambria Steel Company
- 1937 – Little Steel Strike
- 1942 – USWA organized Johnstown Plant
- 1952 – Bessemer process discontinued and machinery demolished
- 1982 – Electric furnaces installed at Franklin

Reprinted from:

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