

WILLIAMS ROAD BRIDGE  
Pennsylvania Historic Bridges Recording Project III  
Spanning Sugar Creek Middle Branch  
Plum Township  
Venango County  
Pennsylvania

HAER No. PA-626

PHOTOGRAPHS

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
U.S. Department of the Interior  
1849 C St. NW  
Washington, DC 20240

ADDENDUM TO:  
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Spanning Sugar Creek Middle Branch  
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ADDENDUM TO:  
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Chapmanville vicinity  
Venango County  
Pennsylvania

HAER PA-626  
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

FIELD RECORDS

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HISTORIC AMERICAN ENGINEERING RECORD

ADDENDUM TO  
WILLIAMS ROAD BRIDGE

HAER No. PA-626

LOCATION: Spanning Sugar Creek Middle Branch at Williams Road (Township Road 627), Plum Township, Chapmanville vicinity, Venango County, Pennsylvania

UTM: 17.594991.4602792, Dempseytown, Pennsylvania Quad

STRUCTURAL TYPE: Pratt through truss

DATE OF CONSTRUCTION: 1911-12

MANUFACTURER: Phoenix Bridge Company, Phoenixville, Pennsylvania

BUILDER: Abutments: James F. Smith and William R. Flickner  
Superstructure: Emery C. Read and Clyde M. Read

OWNER: Venango County, Pennsylvania

USE: Vehicular bridge

SIGNIFICANCE: Williams Road Bridge is a unique vernacular example of a late-nineteenth century pin-connected Pratt through truss adapted for re-use as a county bridge in the late twentieth century. It is of engineering interest for its rare patented Phoenix columns, manufactured by the Phoenix Bridge Company of Phoenixville, Pennsylvania.

HISTORIAN: Researched and written by Lola Bennett, April-May 2006

PROJECT INFORMATION: The Pennsylvania Historic Bridge Recording Project III is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by Heritage Documentation Programs, a division of the National Park Service, U.S. Department of the Interior. The Pennsylvania Department of Transportation (PennDOT) and the Pennsylvania Historical and Museum Commission funded the project.

## Chronology

- 1762 Pennsylvania legislature authorizes county governments to build and maintain bridges
- 1800 Venango County created; Plum Township organized
- 1816 John G. Bradley settles in Venango County near present-day Bradleypoint
- 1840 America's first all-iron bridge built on Erie Canal at Frankfurt, New York
- 1844 Pratt truss patented
- 1855 Phoenix Iron Company incorporated
- 1859 America's first commercial oil well dug at Titusville, Pennsylvania
- 1862 Samuel Reeves patents the Phoenix column
- 1868 Kellogg, Clarke & Company contract to build bridges with Phoenix Iron Company
- 1876 Bradley brothers strike oil in Plum Township
- 1879 Pennsylvania legislature authorizes counties to assist townships in building bridges without future liability for maintenance or repair
- 1884 French Creek Bridge built at Franklin, Pennsylvania  
Phoenix Bridge Company becomes a wholly-owned subsidiary of Phoenix Iron Company
- 1889 Plum Township builds Valley School
- 1892 Williams Road laid out as a county road
- 1909 Venango County abandons Lower Bridge over French Creek in Franklin Borough
- 1911 Parts of Lower Bridge salvaged for use in building Williams Road Bridge
- 1912 Williams Road Bridge erected
- 2002 Pennsylvania Historic Bridges Recording Project III

## Description

Williams Road Bridge is a single-span Pratt through truss bridge on mortared ashlar abutments.<sup>1</sup> The bridge is 72' long, 15' high and 20' wide, with a clear span of 70' and a roadway width of 15'. The deck is approximately 8' above water level. The 7-panel iron superstructure is composed of parts of a two-span Pratt through truss bridge erected in 1884 over French Creek in Franklin, Pennsylvania.

The upper chords are riveted, built-up members composed of back-to-back channels with a plate on top and lacing underneath. The lower chords are 1/2"x3" eye bars. The eye bars are paired in panels 1, 2, 6 and 7, but increase to three in the center panels, where maximum bending moments occur. The upper and lower chords are connected by Phoenix columns, made of four rolled, wrought-iron segments riveted through their flanges to form hollow, circular posts. The columns increase in size from 6" diameter at the center of the span to 8-1/2" diameter at the ends of the span, where maximum shear occurs. Each segment of each column bears the raised stamp: *Patent June 17, 1867 Phoenix Iron Co, Philadelphia*. Diagonal braces angling up toward the ends of the bridge within each panel are paired, loop-ended square bars, which vary in dimension from 1-3/4" in the end panels to 1-1/4" in the center panel. The braces in panels 1, 2, 6 and 7 have turnbuckles. The members are pinned at each panel point and a simple sleeve with pin plates substituted for Phoenix Company's patented cast iron joint blocks.

The deck is composed of 1-1/2"x3" timber decking laid on edge on nine lines of 5"x8" longitudinal steel stringers on 4"x11" transverse steel I-section floor beams. The floor beams hang below the lower chord with U-shaped, 1" square rods with threaded ends. The hangers loop over the pin at each panel point and are secured under the floor beams with a plate and nuts.

The trusses are connected overhead with a built-up strut fastened to brackets attached to the upper chord at each panel. The portal struts are composed of back-to-back channels connected by a series of slender metal spokes. The bridge is laterally braced in the planes of the upper and lower chords with a pair of 1"-diameter, loop-ended rods crossing between the panel points.

A pair of 1'x3'x78' steel girders has been added at deck level to keep the bridge in service. The girders sit just inside the trusses and extend past the truss seats approximately 3'. At each panel point, a rod-and-plate assembly secured below the floor beams transfers live loads from the deck to the girders. Modern galvanized steel guardrails are attached to the inner faces of the girders. The bridge is posted for a 3-ton weight limit.

## History

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<sup>1</sup> The bridge is also known as Shorts Bridge after Frank Shorts, owner of the property adjacent to the bridge. Williams Road was named for Samuel Williams, owner of the largest parcel of land on the road.

In 1876, seventeen years after Col. Edwin Drake drilled the world's first commercial oil well at Titusville, Pennsylvania, John and Jacob Bradley struck oil 13 miles away in Plum Township. Speculators rushed in, and within three years, eight oil wells were in operation at the crossroads of Bradleytown. In the decades that followed, additional infrastructure and municipal services were required throughout the township to support its growing population.

In 1888, the Plum Township school board voted to build a new schoolhouse, known as Valley School, one mile north of Bradleytown to accommodate the children in that area.<sup>2</sup> Two years later, residents of Plum Township petitioned the county to lay out an east-west county road between two existing north-south county roads, to allow easier access to the new schoolhouse. On October 19, 1892, Venango County road viewers William K. Gilliland, J.H. Alcorn and J.L. Peebles reported to the court that they had laid out a road to the Valley Schoolhouse in Plum Township through land belonging to Thomas McClelland, Thomas Shay, Peter Bower, Samuel Williams, R. Stratton, William Lesh and Frank Shorts.<sup>3</sup>

Although no documentation has been found concerning the first bridge at this location, county records concerning the present bridge indicate that there was an existing township bridge at this site by January 1909, when local citizens petitioned the Venango County Court for "a bridge over the middle branch of Sugar Creek on the highway leading by the Valley School House, in the said Township of Plum."<sup>4</sup> The County Court appointed viewers to examine the site and make recommendations. Accordingly, the viewers presented their report on April 26, 1909. On November 16, 1909, the Grand Jury approved construction of a bridge at this location, with the proviso that the Township maintain it.<sup>5</sup>

Meanwhile, the Venango County Commissioners were preoccupied with the replacement of an old metal truss bridge in Franklin Borough. "Lower Bridge," a two-span metal Pratt through truss bridge carrying South Park Street over French Creek, was built in 1884 by Samuel P. White of Beaver Falls, Pennsylvania.<sup>6</sup> By the early 1900s, Lower Bridge had suffered some structural damage and was repeatedly closed to traffic. In 1907, Col. S.C. Lewis, President of the Atlantic Refining Company on the east side of French Creek, began lobbying for construction of a new bridge. With Colonel Lewis' assistance, the county obtained the necessary rights of way, and in 1909, the McClintic-Marshall Construction Company of Pittsburgh erected a new plate girder bridge downstream of the old crossing.

The Venango County Commissioners decided to make use of the abandoned South Park Street Bridge by salvaging sound truss members for building a smaller bridge at a suitable location in

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<sup>2</sup> *History and Biographies of Plum Township, Venango County, Pennsylvania* (n.p., 1976), 18.

<sup>3</sup> *Venango County Road Dockets*, Book 4, 349-50.

<sup>4</sup> *Venango County Court of Quarter Sessions, Petition Dockets*, Book 6, 359.

<sup>5</sup> In 1879, the Pennsylvania Legislature authorized counties to assist townships in building bridges without future liability for maintenance or repair.

<sup>6</sup> At the age of 14, Samuel P. White (b. 1847) began working with his father, Timothy B. White, a bridge builder and contractor. In 1868, T.B. White & Sons formed the Penn Bridge Company at New Brighton, Pennsylvania. The company later moved to Beaver Falls under the management of Samuel White and his brothers. [Joseph H. Bausman, *History of Beaver County, Pennsylvania* (New York: Knickerbocker Press, 1904), 234-35.]

the county. On August 1, 1911, the county commissioners recommended that Venango County assist Plum Township in building a bridge over Sugar Creek near the Valley School House and immediately advertise "for the erection and construction of two stone abutments for said bridge and that, upon the completion of said two abutments."<sup>7</sup> On September 8, 1911, the commissioners awarded the abutment contract to James F. Smith and W.R. Flickner for \$700.<sup>8</sup>

Eight weeks later, the commissioners advertised for bids for "the arranging, cutting and fitting up the necessary parts taken from the old South Park Street Bridge, and for the erection and construction of a span 72 feet 4 inches long, to be erected upon the necessary masonry abutments now ... being erected and built at the site of what is known as the Shorts Bridge."<sup>9</sup> On November 27, 1911, the commissioners awarded the contract for the bridge superstructure to the sole bidder, local civil engineer Emery C. Read and his son, Clyde M. Read, for the sum of \$356.00. Williams Road Bridge was completed in the summer of 1912 and accepted by the county commissioners on November 18, 1912.<sup>10</sup>

## **Design**

In 1844, Boston architect Caleb Pratt and his son, railroad engineer Thomas Pratt, received a patent for a wood and iron truss with vertical members in compression and diagonal members in tension that became the seminal truss type in American bridge building. Similar in appearance to the 1840 Howe truss, the Pratt truss reversed the functions of the web members to reduce the danger of buckling. Developed at a time when railroads were placing new demands on bridges and the structural action of trusses was just beginning to be understood, the Pratt truss was one of several truss types that heralded the transformation from empirical to scientific bridge design. While the type was not immediately popular for wood spans, the Pratt truss came to be favored for its straightforward design, strength and adaptability, and by 1870, in a simplified all-metal version, it had become the standard American truss for moderate road and railroad spans, and remained so well into the twentieth century.

## **Manufacturer**

In 1790, Benjamin Longstreth established the first nail factory in the United States on French Creek near Philadelphia. When bridge builder Lewis Wernwag became superintendent and general manager of the factory in 1813, he renamed it the Phoenix Iron Works. In 1827, a new group of investors, headed by David and Benjamin Reeves, came to Phoenixville and expanded operations with a rolling mill and a puddling furnace. In 1855, after the Reeves family gained control of the firm, they reorganized and incorporated as the Phoenix Iron Company.

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<sup>7</sup> *Venango County Court of Quarter Sessions, Petition Dockets*, Book 7, 135.

<sup>8</sup> *Venango County Court of Quarter Sessions, Petition Dockets*, Book 7, 195.

<sup>9</sup> *Venango County Court of Quarter Sessions, Petition Dockets*, Book 7, 136.

<sup>10</sup> *Venango County Court of Quarter Sessions, Petition Dockets*, Book 7, 195.



By the 1860s, David Reeves' son Samuel was determined to get the company involved in bridge building. In 1868, railroad engineer Thomas Curtis Clarke, along with Charles Kellogg and Adolphus Bonzano of the Detroit Bridge & Iron Works came to Phoenixville to establish a bridge manufacturing company. The Phoenix Bridge Company (known as Kellogg, Clarke & Company from 1868 to 1870 and Clarke, Reeves & Company from 1871-1884) was originally a sub-contractor, and later a wholly-owned subsidiary of Phoenix Iron Company. Company literature emphasized low prices and rapid delivery of standardized, prefabricated iron bridges that utilized patented components.<sup>11</sup> During its heyday, from 1870 until 1920, the company designed, manufactured and erected hundreds of railroad and highway bridges for clients in the United States, Canada, Mexico, China, Japan, India and Russia. Among the company's largest projects were the Girard Avenue Bridge at Philadelphia (1874), the Kinzua Viaduct (1882) and the Manhattan Bridge (1909). Although business declined after World War I, the company managed to survive until 1962. Phoenix Iron & Steel Company ceased operations in 1984.

One of the Phoenix Iron Company's trademarks was the Phoenix column, patented by Samuel Reeves in 1862. The Phoenix column is a hollow, circular column made of four, six or eight wrought-iron segments with their flanges riveted together. In contrast to cast-iron compression members, Phoenix columns were rigid, yet ductile, and not prone to buckling under heavy loads. They were used as compression members in buildings, bridges and elevated railways until being superseded by rolled steel columns in the 1890s. Williams Road Bridge is one of three surviving Pennsylvania bridges with Phoenix columns:

HAER PA-626	Williams Road Bridge	Shenango County	(1884)	72' Pratt through truss
	Swamp Creek Bridge	Montgomery County	1888	135' Pratt through truss
HAER PA-412	Walnut Street Bridge	Dauphin County	1890	2,850' Baltimore through truss

### Builder

Born in Clearfield, Pennsylvania, civil engineer Emery C. Read (1854-1937) moved to Venango County in 1892 while surveying for the Jamestown, Franklin & Clearfield Railroad. He was subsequently engaged in surveying projects throughout Venango County as well as supervising the construction of county bridges. The writer of Emery Read's 1937 obituary noted, "One can hardly motor for any distance in the county without passing over one or more structures whose

<sup>11</sup> Thomas R. Wimpenny, *Without Fitting, Filing or Chipping: An Illustrated History of the Phoenix Bridge Company* (Easton, Pennsylvania: Canal History and Technology Press, 1996), 18.

erection he supervised."<sup>12</sup> Emery Read drew plans for the abutments of Williams Road Bridge and was assisted by his eldest son, Clyde McClellan Read, in erecting the superstructure.

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<sup>12</sup> "Emery C. Read Dies; Noted As Surveyor and Civil Engineer," *Venango Citizen Press* (Franklin, Pennsylvania), 13 January 1937, 5.

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