STEWARTSTOWN RAILROAD BRIDGE
Spanning Valley Road
Stewartstown Vicinity
York County
Pennsylvania

HAER No. PA-205

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record
National Park Service
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HISTORIC AMERICAN ENGINEERING RECORD

STEWARTSTOWN RAILROAD BRIDGE

HAER No. PA-205

Location:	Stewartstown Railroad spanning Valley Road. One mile west of Stewartstown, York County, Pennsylvania. UTM: 18/362110/4401630 Quad: Stewartstown, Pennsylvania
Date of Construction:	1870. Moved and reassembled at present site in 1885.
Designer:	Jacob Hays Linville
Fabricator:	Keystone Bridge Company Pittsburgh, Pennsylvania.
Present Owner:	Stewartstown Railroad Company P.O. Box 155 Stewartstown, PA 17363
Present Use:	Short line railroad. Passengers and freight.
Significance:	This span is one of the earliest bridges in the United States constructed almost entirely of wrought iron that still exists. It also features J.H. Linville's patented octagonal column.
Historian:	Robert W. Hadlow, August 1991

The Stewartstown Railroad Bridge spans Valley Road, near Stewartstown, York County, Pennsylvania. It is a composite cast- and wrought-iron Pratt-truss structure. The bridge is one of the oldest all-metal bridges in the United States and is one of the earliest to be composed almost entirely of wrought iron. The Keystone Bridge Company of Pittsburgh, Pennsylvania fabricated the structure in 1870 as a railroad crossing over Jones Falls, in Baltimore, on the Northern Central line. It was moved to its present location about 1885. In the 1920s, Stewartstown greatly modified the structure. It made the truss panels redundant by replacing the bridge with a steel deck-girder span. The patented Keystone Bridge Company octagonal wrought-iron columns and other truss components have remained on the site since they became nonfunctional nearly seventy years ago.

Northern Central and Pennsylvania Railroads

In the 1820s, the Baltimore and Ohio Railway Company, more commonly called the "B & O," began construction of what was to be the nation's first large railroad system. It maintained a close relationship with the city of Baltimore, and received millions of dollars to construct its repair and maintenance shops there. Likewise, the city developed a similar relationship with the Baltimore and Susquehanna (B & S) line soon after its charter by the Maryland legislature in 1828. This line completed a route to York, Pennsylvania, ten years later. By 1854, the B & S had become part of the newly-formed Northern Central Railroad (NCRR), a consolidation that included the York & Maryland, the York & Cumberland, and the Susquehanna lines. Establishing car shops and an engine house in Baltimore, by 1858 the B & S' combined trackage ran from Baltimore through Harrisburg to Sunbury, Pennsylvania.[1]

The NCRR soon fell into financial distress and the B & O acquired a majority of its stock. By 1861, however, the larger line placed its holdings of the NCRR on the market. The Pennsylvania Railroad (PRR), a northern rival to the B & O, saw this as an opportunity for gaining control of roads to the south, with a goal of a route to Washington, D.C. It immediately purchased a controlling interest in the Northern Central. Unlike its rival, the B & O, the PRR still had no direct route to the nation's capital. The PRR envisioned an independent route to Washington as the only alternative and formed the Baltimore and Potomac line for that purpose.[2]

The PRR operated its Baltimore office from the Northern Central's yards there, and began a phase of intensive development. By the early 1870s it had double-tracked the line along the entire

Northern Central right of way; was boring a tunnel under Baltimore for the B & P line to Washington; and had reconfigured its yard and station to function as a "Union Station" for all the roads it controlled. This facility lay near Jones Falls, an unpredictable flood-prone stream that flowed through Baltimore to the city's inner harbor.

The Keystone Bridge Company of Pittsburgh fabricated many iron bridges for the Pennsylvania and the Northern Central during the late 1860s and early 1870s. One of these was a double-track, two-span structure across Jones Falls near Baltimore's North Avenue, carrying NCRR's trackage to the mouth of the new B & P tunnel on its Washington route.

Keystone constructed a "half-through" two-span bridge for the Northern Central at North Avenue in Baltimore. Each span measured 107'-6", wide enough for two sets of track. The spans were arranged in tandem, one ahead of the other, to take the Northern Central across Jones Falls to the eastern entrance of the B & P's tunnel. It is believed that the Keystone Bridge Company erected these spans in 1870.[3]

As its presence grew in Baltimore, the PRR again expanded its facilities in the city. By 1885, it had reconfigured its yard and began replacing many of the spans it had erected there in the past decade, including the twin iron Keystone bridges over Jones Falls, at the mouth of the B & P's tunnel, on the Northern Central's line. The Pennsylvania commonly reused its surplus bridges on short feeder lines that it either owned or controlled, such as the Stewartstown Railroad Company.

Stewartstown Railroad Company

A group of local citizens chartered the Stewartstown Railroad Company in 1884 to connect their town and its agricultural base with the Northern Central Railroad's Harrisburg-to-Baltimore route at nearby New Freedom. Its 7.4-mile length posed many obstacles, including steep grades and sharp curves, and took nearly a year to complete. Many bridges were used on the route, including one of the two 15-year-old spans that once crossed Jones Falls at North Avenue, in Baltimore.

The Stewartstown line erected the iron bridge about one mile west of its Stewartstown station. It spanned both a local lane, Valley Road, and Ebaugh's Creek. In order to accommodate a single-track right-of-way and cross the lane and creek on an angle (askew), the PRR greatly modified the Keystone span, cutting and shortening its deck beams and offsetting the trusses by two-and-one-half panels' length.[4]

By 1885, passengers and agricultural products traveled on the Stewartstown line that connected points north and south at New Freedom. In the early years, six trains daily ran the route. By 1906, the New Park & Fawn Grove line connected with the Stewartstown's eastern terminus, adding nine miles of track to the eastern end of the older line. The Stewartstown Railroad finally took over this route in 1923 and operated it for the next twelve years.[5]

The years of the Great Depression took their toll on the Stewartstown Railroad Company, with revenues dropping sharply. The end of the steam locomotive era marked the introduction of a gasoline powered combination car that provided both passenger and express service.

In 1972, Hurricane Agnes temporarily halted the Stewartstown Railroad's service. Destroying a section of the old Northern Central line between Harrisburg and Baltimore, the hurricane severed the Stewartstown Railroad's links with the rest of the country, forcing it to close.[6]

Not until the mid 1980s did the line from York to New Freedom reopen, and only then did the Stewartstown Railroad renew operations. It now carries both excursion passengers and occasional freight and connects at York with Conrail and the Maryland & Pennsylvania Railroad. In the interim, trackage south to Baltimore was removed.[7]

Project Information

This recording project is part of the Historic American Engineering Record (HAER), National Park Service. It is a long-range program to document historically significant engineering and industrial works in the United States.

The Cast- and Wrought-Iron Bridges Recording Project was co-sponsored in 1991 by the Historic American Engineering Record and the West Virginia University Institute for the History of Technology and Industrial Archaeology. Fieldwork, measured drawings, historical reports, and photographs were prepared under the general direction of Dr. Robert J. Kapsch, Chief, HABS/HAER; Eric N. DeLony, Chief and Principal Architect, HAER; Emory L. Kemp, Director, Institute for the History of Technology and Industrial Archaeology; and Dean Herrin, HAER Staff Historian.

The Recording Team consisted of Christine Ussler (Architecture Faculty, Lehigh University), Architect and Field Supervisor; Christine Theodoropoulos, P.E. (Architecture Faculty, California

State Polytechnic University, Pomona); Wayne Chang (University of Notre Dame), Monika Korsos (Technical University of Budapest, Hungary, US/ICOMOS), Architectural Technicians; Robert W. Hadlow (Washington State University), William Chamberlin, P.E., Historians; and Joseph E. B. Elliott (Muhlenberg College), Photographer.

APPENDIX 1. Jacob Hays Linville[8]

Jacob Hays Linville was born in Pequea, Pennsylvania on 23 September 1825 to Arthur Linville and Elizabeth Haines. The son of a farmer and tanner, he attended local public schools in Pequea, Dr. Duffield's Academy at Belleview, and graduated Union College in 1848. He read Law at the offices of William Meredith, in Philadelphia, but soon ended these studies to become a "top assistant" in the U.S. Army Corps of Engineers under William Hassell Wilson. He helped survey the route for the Lancaster, Lebanon & Pine Grove Railroad, and later assisted surveyance and construction of the Philadelphia, Media & West Chester Railroad. In 1857, under Wilson, he became assistant resident engineer on the Harrisburg to Altoona section of the Pennsylvania Railroad.

Linville later became an employee of the PRR as Engineer of Bridges and Buildings, specializing in the design and construction of wrought-iron bridges. He created the first span to included upset, head-link tension members, over the Schuylkill at Arsenal, in Philadelphia. An advocate of testing iron bridge members for tensile strength, he worked with William Sellers & Company of Philadelphia to build some of the first machines for this purpose. As chief engineer for the Pennsylvania Steel Company in the early 1860s, he designed shops for Sellers and other firms.

By 1865, he had become president and chief engineer of the Keystone Bridge Company of Pittsburgh, a business begun by Andrew Carnegie to market bridges and building trusses using rolled iron beams and bars made at Carnegie's Union Iron Mills. During his tenure at Keystone, Linville built many bridges for the PRR, including an iron span over the Monongahela at Pittsburgh and the first long-span truss (320') over the Ohio River at Steubenville. He designed superstructures for the Baltimore & Ohio at Bellarie, over the Ohio; for the Cincinnati & Newport at Cincinnati, also over the Ohio; for the Illinois Central at Dubuque, Iowa, over the Mississippi, and for the Hannibal & St. Joseph at Kansas City, Missouri, over the Missouri.

Linville resigned from the Pennsylvania Railroad and from the Keystone Bridge Company in the late 1870s and moved to Philadelphia, where he designed railroad bridges. He became a member of the ASCE in 1875, and died on 4 August 1906.

APPENDIX 2. Keystone Bridge Company

Andrew Carnegie organized the Keystone Bridge Company of Pittsburgh, Pennsylvania in 1865, with officers including Jacob H. Linville, President; J. L. Piper, General Manager; and Thomas M. Carnegie, Treasurer. Capitalized at $300,000, Keystone absorbed the firm of Piper and Shiffler started by Carnegie and Linville in 1862. Carnegie considered the Keystone his pet company and linked all others he created directly to it.[9] Carnegie's nearby mill, Carnegie, Kloman & Company, supplied Keystone with rolled iron components from its Union Iron Mills. Iron came from mines Carnegie leased and was smelted at his "Lucy Furnace." He oversaw, at every step of the process, the transformation of iron ore into bridges. This arrangement exemplified the vertical integration for which Carnegie became famous.

Jacob H. Linville was president and chief engineer of the Keystone Iron Company from its inception. He and the firm have been credited with producing some of the earliest long-span iron bridges in the United States. Supplying tubular steel components for construction of Captain James Buchanan Eads' three-span arch bridge across the Mississippi at St. Louis, in the early 1870s, was one of the company's greatest achievements. As a principal stockbroker and seller of bonds to finance the project, Carnegie earned a large profit on this venture.[10]

The Keystone Bridge Company perfected a type of iron bridge that avoided the design errors of predecessors in the field. According to the firm's 1874 Album, "It too often happens that parts [of bridges] resisting tensile stresses are not combined in such a manner as to render the entire sectional area efficient in sustaining loads." Its scientific testing of bridge components for moduli of elasticity, insuring that the parts would function as intended yet not be out of proportion to the jobs for which they were designed, was unprecedented in the industry. The Keystone Bridge Company approached the business of bridge building as a science rather than a craft.[11]

Under Linville's direction, the company patented the hollow wrought-iron column section used in all of its truss spans. Riveting together rolled iron pieces to form octagonal compression members, this technique intentionally left spaces between the vertical sections to expose the inside surfaces of the columns. The company believed this would help prevent the usual build-up of moisture and debris commonly found in cast tubular members that often deteriorated the metal. The openness of Keystone's patented columns also meant that maintenance crews could easily and thoroughly inspect the members for deterioration

and could also paint the inside surfaces to check oxidation. Keystone's goal was to create long life spans for its "modern" bridges.[12]

Keystone also made utility and safety "ruling considerations" in railway bridge design, placing trackage upon the upper chords of its bridges. Over-grade or through-truss spans, it argued, were more difficult to brace against wind pressure, although it employed through trusses where greater clearance was needed during floods. For short spans, such as the Stewartstown Railroad Bridge, Keystone used "low trusses," with upper chords being "well stayed, laterally, by stay braces footing into independent girders."[13]

The Keystone Bridge Company classified the spans it offered into divisions: solid girder spans of rolled beams; plate girder iron spans up to 60'; single intersection truss deck bridges; and through or over grade, single intersection truss spans. In addition, it custom made draw bridges, suspension bridges, and long-span trusses of 500' and upward. It also produced wrought-iron turntables for railroads. By 1874, the company had produced seventy-five plate girder spans and 274 truss spans.[14]

In 1900, the Keystone Bridge Company became the nucleus around which Carnegie formed the new American Bridge Company, a consolidation of over twenty-five independent firms that became one of the largest in the country.[15]

APPENDIX 3.

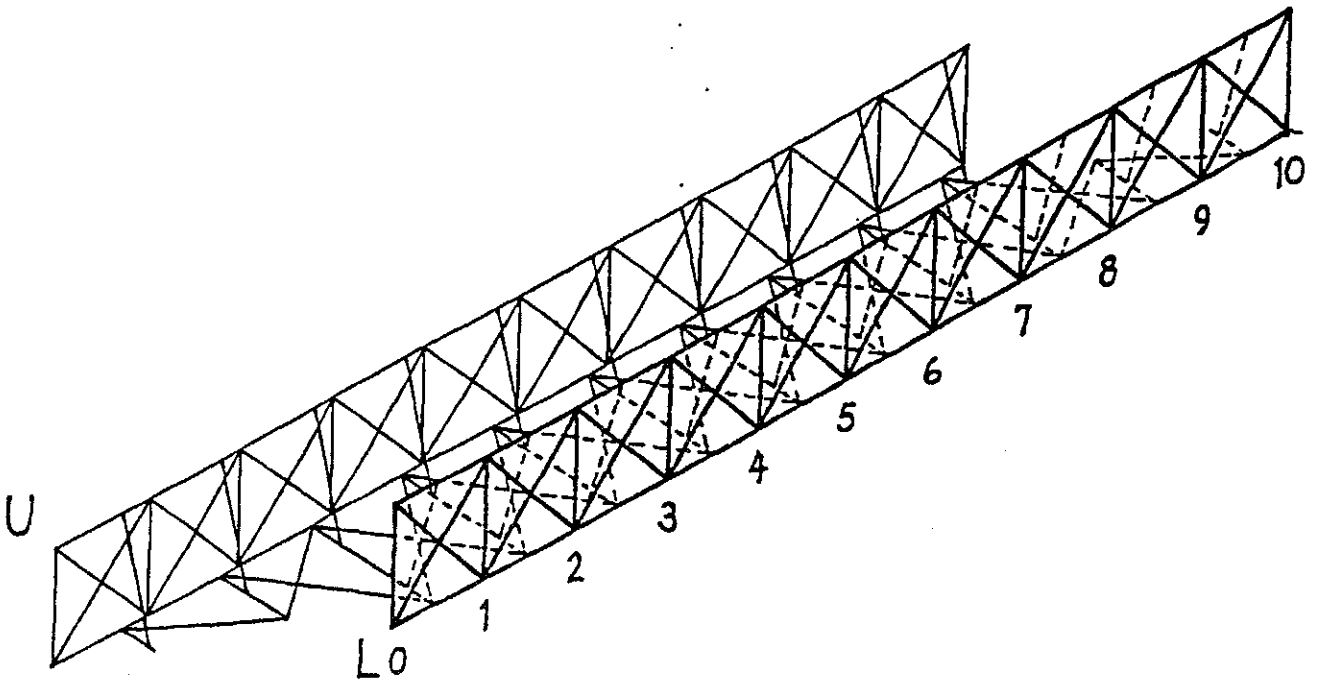

Table A: Bridge Dimensions

Truss type	Pratt pony truss
Number of spans	1
Number of panels	10
Panel width, center to center of web posts	10'- 9 1/4"
Bridge length, L_0 to L_{11}	107'- 7 1/2"
Maximum truss span at present location	106'- 5 1/2"
Distance between centers of upper and lower pins	11'- 9"
Truss spacing, from center to center	15'- 6"
Shift between trusses	23'- 2 1/2"

Data Limitations

The Stewartstown Railroad's archives relating to the Keystone Bridge Company span included the Interstate Commerce Commission Report of 1916. Other general historical information on the line is found only in standard published sources on the Pennsylvania Railroad.

Authorities on the Northern Central are Herb Harwood, of Baltimore, and Frank A. Wrabel, of Timonium, Maryland. Standard nineteenth century histories of York County shed little information on the Stewartstown Railroad.

The best source available on the activities of the Keystone Bridge Company is its 1874 "Album" that provided itemized lists of all the spans it constructed. The company also described its rationale for the type of construction it promoted.

ENDNOTES

1. Sherry H. Olson, Baltimore: The Building of an American City (Baltimore: Johns Hopkins University Press, 1980), 105; Edwin P. Alexander, The Pennsylvania Railroad: A Pictorial History (New York: Bonanza Books, xxxx), 19.

2. Olson, 145; Alexander, 19-20.

3. The Keystone Bridge Company's Illustrated Album, Embracing Iron Bridges, Roofs, Columns, Chord Links, and Shapes, with Description of Long-Span Bridges, Quality of Materials, and Principles of Construction (Pittsburgh, 1874), 35.

4. Robert W. Hadlow to Frank Wrabel, Timonium, MD, July 1991, telephone conversations with Wrabel who is an authority on railroad history of Baltimore.

5. Charles W. Boas and Eric J. Bickleman, Stewartstown Railroad Guidebook (Stewartstown, PA: Friends of the Stewartstown Railroad, 1990), 1.

6. Ibid., 2

7. Ibid.

8. The following information is taken from the American Society of Civil Engineers' Biographical Dictionary of American Civil Engineers (1972).

9. Andrew Carnegie, Autobiography of Andrew Carnegie (Cambridge: Houghton Mifflin Company, The Riverside Press, 1920) 16, et passim.

10. See Quinta Scott and Howard S. Miller, The Eads Bridge (Chicago: University of Missouri Press, 1979) 109.

11. See The Keystone Bridge Company's Illustrated Album, 17-20.

12. Ibid., 16-18.

13. Ibid., 27.

14. See Ibid., 34-38, on bridges of multiple spans, each span was counted, not the structure as a single unit.

15. David Plowden, Bridges: The Spans of North America New York: W. W. Norton & Company, 1974), 66-67.

SELECTED BIBLIOGRAPHY

Unpublished

Telephone interviews with Frank Wrabel, Timonium, MD, July 1991. Wrabel is an authority on the railroad history of Baltimore, Maryland.

U.S. Interstate Commerce Commission. Division of Valuation. [Bridge of Stewartstown Railroad at Ziegler, Pennsylvania], by A. E. Hess. 1916. Original held by National Archives, Washington, DC.

Published

Alexander, Edwin P. The Pennsylvania Railroad: A Pictorial History. New York: Bonanza Books, 1967.

Boas, Charles and Eric J. Bickleman. Stewartstown railroad Guidebook. Stewartstown, PA: Friends of the Stewartstown Railroad, 1990.

Carnegie, Andrew. Autobiography of Andrew Carnegie. Cambridge: Houghton Mifflin Co., The Riverside Press, 1920.

Olson, Sherry H. Baltimore: the Building of an American City. Baltimore: The Johns Hopkins University Press, 1980.

Plowden, David. Bridges: The Spans of North America. New York: W. W. Norton & Company, 1974.

Scott, Quinta and Howard S. Miller. The Eads Bridge. Chicago: University of Missouri Press, 1979.

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