PINE CREEK BRIDGE
Pennsylvania Historic Bridges Recording Project III
River Road spanning Pine Creek
Jersey Shore vicinity
Lycoming County
Pennsylvania

HAER No. PA-614

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

HISTORIC AMERICAN ENGINEERING RECORD

PINE CREEK BRIDGE

HAER No. PA-614

LOCATION:	River Road spanning Pine Creek, Jersey Shore vicinity, Lycoming County, Pennsylvania, connecting Porter Township, Lycoming County and Pine Creek Township, Clinton County, PA. Bin # 41 3003 0010 0000
DATE OF CONSTRUCTION:	1889
DESIGNERS:	William O. Douglas and Charles M. Jarvis
BUILDER:	Berlin Iron Bridge Company (East Berlin, CT)
PRESENT OWNER:	Pennsylvania Department of Transportation
PRESENT USE:	Vehicular Bridge
SIGNIFICANCE:	The Pine Creek Bridge is an outstanding example of a lenticular through truss. The lenticular, or parabolic, truss is a type developed during the mid-nineteenth century in Europe, but it enjoyed its greatest popularity in forms derived from designs by William O. Douglas and Charles Jarvis, engineers associated with the Berlin Iron Bridge Company. This company was the main producer of this unusual truss form, which was erected in many rural and urban settings throughout the United States between 1878 and 1900. The Pine Creek Bridge is one of the longest single span bridges (288') remaining in a group of about fifty surviving lenticulars. Its Warren pattern web bracing was typical for such long lenticulars as were the highly decorated portals for such through truss bridges. The Pine Creek Bridge was placed on the National Register of Historic Places on June 22, 1988.
HISTORIAN:	Dr. Linda S. Phipps, summer 2002
PROJECT INFORMATION:	The Pennsylvania Historic Bridges Recording Project III is part of the Historic American Engineering Record (HAER),

a long-range program documenting historically significant engineering, industrial, and maritime sites in the United States. The National Park Service, U.S. Department of the Interior, administers the HAER program. The Pennsylvania Historic Bridges Project III was co-sponsored during the summer of 2002 by HAER under the general direction of E. Blaine Cliver, Chief; and the Pennsylvania Department of Transportation (PENNDOT), Bureau of Design, Dean A. Schreiber, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer. Ms. Kara Russell of the Bureau of Design's Environmental Quality Assurance Division served as principal liaison.

The fieldwork, measured drawings, historical reports and photographs for the Pennsylvania Historic Bridges Recording Project III were prepared under the direction of Eric DeLony, Chief of HAER. The team consisted of: Architects—Todd A. Croteau, Project Leader (HAER Architect); Roland S. Flores, Field Supervisor (HAER Architect); Marcy Ann Giannunzio (University of Michigan, Ann Arbor); Katherine Marie Kozarek (University of California, Berkeley); Sara Kryda (Illinois Institute of Technology); Jenna Michelle Murphy (University of Detroit—Mercy); Sandra Christine Pires (ICOMOS—Portugal); Dr. Linda S. Phipps and Dr. Richard Vidutis served as project historians under the supervision of Dr. Richard O'Connor (HAER Senior Historian). Professor Thomas E. Boothby, PhD, PE, RA (Pennsylvania State University, State College) was the Consulting Engineer; Jose C. Colon (Pennsylvania State University, State College), was the Project Engineer. Jet Lowe (HAER Photographer) took all large format photography. Justine Christianson (HAER Historian) prepared the documentation for transmittal to the Library of Congress.

Description

The Pine Creek Bridge carries River Road over Pine Creek at the boundary between Clinton and Lycoming Counties, Pennsylvania. It is a seven-panel through lenticular truss with the Warren pattern typical of such longer spans. On the top chord, the panels measure 41' between joints, while on the bottom chord between joints the panels measure 20 1/2'.[1] The bridge is of wrought and cast iron with steel members and decking added in later renovations. The bridge spans 287'-8" between end posts, with 21' high endposts measured from their bases to their upper pin connections.[2] The maximum distance between the upper and lower chords is 39'-8" near the center of the span. The endposts are roughly square in section and consist of three flat plates riveted to four angles. Their inner edges are open and secured by latticed straps. At the portals, the end posts are joined by a pair of riveted angles that are further strengthened by latticed arches joining the posts near the top.

As is consistent with lenticular trusses by the Berlin Iron Bridge Company, the top chords of the bridge are curved, thus approximating true parabolas.[3] Their composition mirrors that of the end posts, with riveted angles connecting three flat plates with the sides secured by riveted straps. Splices in the top chord occur between the panel points. The lower chord, or cable, consists of paired flat eyebars that are pin connected at the panel points. Their curves oppose those of the upper chord.

Because this is a Warren pattern lenticular, laced angle web posts run in a v-pattern between the pin connections of the upper and lower chords and are oriented transversely to the span. Latticed sway bracing of a construction similar to the web posts is symmetrically distributed across the truss, connecting every other pair of web posts at their midpoints. There are also latticed sway braces connecting the top chord at each panel point. Diagonal tie bars with adjustable turnbuckles connect the upper chord and also run beneath the decking at the panel points. A thin rod runs longitudinally through the center of these bars to reinforce their repeating x-pattern. A parallel reinforcement runs through the center of each web in the form of slender paired rods.

At various times, renovations have resulted in slight alterations to the bridge. At some point, the timber decking of the original bridge was replaced with welded steel I-beams and a steel grid road surface. Steel guardrails and intermediate supports have also been welded to these surfaces. The original coursed masonry of the abutments and wing walls has been encased in scored reinforced concrete revetments, in an effort to create the effect of rustication. One result has been that, in adding this material, the distance between the abutments and the bridge seats have been reduced. In the most problematic of such improvements, during the late 1960s, the end connections were encased in reinforced concrete. This essentially prevented the bridge from expanding and

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[1] E-mail communication between Justine Christianson, HAER Historian, with Matt Hamel, Regional Architectural Historian, PENNDOT Districts 2-0, 3-0, 4-0, August 29, 2003.

[2] The author is indebted to Jose Colon for these measurements.

[3] See Robins Fleming, "Early Parabolic Truss Bridges Gradually Disappearing," Engineering News-Record, 100, no. 19 (May 10, 1928): pp. 748-749 for a discussion of the early forms of such bridges under Chief Engineer William O. Douglas and the shift toward forms approximating true parabolas beginning in 1886, under Charles M. Jarvis, President of the Berlin Iron Bridge Company from 1886 until 1900.

contracting, causing multiple deflections in the deck beams. At points near the west side of the bridge, the outermost beams ripple like ribbons. The end panel diagonals were also encased at that time, thus stripping them of their ability to steady the bridge against shear forces. The bridge now bears a 9-ton weight limit and is presently being studied with the intention of fully rehabilitating the structure in harmony with its original design.

The Pine Creek Bridge retains a good deal of its original ornamentation. Each end post terminates in a decorative urn-like finial, resembling an oversized newel post, and flanking a stamped metal crest railing or balustrade. The composition recalls ornamentation found in architecture and interiors during the 1870s in work by architects such as Frank Furness. Sometimes referred to as the Eastlake style, there is a Gothic revival cast to the vegetal patterning of the balustrade that is echoed in the decorative cutouts of the finials. Photographs of contemporaneous bridges in the county depict small stamped eagles at the tops of these finials. At the apex, a decorative cartouche with pilasters and an arch bears the names of the respective county commissioners responsible for the erection of the bridge and credits the Berlin Iron Bridge Company for the design. The names of the commissioners vary, as the bridge spans two separate counties. On the southern shore (in Clinton County), the plaque reads from the top down: "1889, Built By The Berlin Iron Bridge Co. East Berlin Conn. Douglas & Jarvis Pat. Ap'l 16, 1878, Ap'l 7, 1885, John Grugan, J.D. Engles, H.B. Klockner, Commissioners." On the north shore, the plaque is identical except that the commissioners for Lycoming County are named: A.P. Forestman, Wm. S. Storr, T.J. Strebeich. The ornamentation is better preserved on the south portal, as the north portal is missing sections of the balustrade. The north finials are missing on both portals.

Significance

Pine Creek is the largest tributary of the West Branch of the Susquehanna. Known by Native Americans as "Tiadaghton," the area was once covered in pine forests, hence its name. The vicinity is rich in archaeological sites and includes the remains of Native American burial grounds and early settlements. River Road runs west from the Borough of Jersey Shore through Porter Township, crossing the creek at a point near where the Pine Creek Presbyterian Church once stood, about 65' from the former bridge. A few steps away, the Tiadaghton Elm, one of the oldest and largest trees in the area once stood. On July 4, 1776, under this tree, local patriots signed a declaration of independence from British rule.[4] In fact, there was a bridge at this site early in the nineteenth century. Its presence is documented before 1839, when Clinton County was created. A Bridge Book in the Clinton County Courthouse cites a number of repairs and replacements for this wooden bridge in 1853, 1865, and 1870. After the formation of

[4] For more specific information on the Pine Creek vicinity, see Helen H. Russell, The Tiadaghton Tale: A History of the Area and Its People (Williamsport, PA: Scaife's Valley Press, 1975), pp. 99-131; "Borough of Jersey Shore," and "Porter Township," in John Franklin Meginness, History of Lycoming County, PA (Chicago: 1892), pp. 485-498, 664-668. For Pine Creek Township, Clinton County, see "Pine Creek Township," and "Flood of 1889," in J. Furey Milton, Historical and Biographical work, or Past and Present of Clinton County (Williamsport, PA: 1892), pp. 85-88, 392-399.

Clinton County, commissioners of the two counties would have cooperatively funded such construction projects. An 1870 flood demolished an earlier bridge, which was replaced by a new wooden structure by George Stoner erected on masonry by Reed and Shaw. The combined cost of this bridge, $12,639.34, serves as a useful comparison for the cost of the 1889 metal structure.[5] Remains in the creek bed of an intermediate masonry pier midway across the stream indicate that this was a two span wooden bridge, most likely covered.[6]

When the Pine Creek Bridge was constructed, the area bustled with local industry. The lumber industry was a key source of income to the region and created special concerns on the rivers during floods. German immigrants to the region referred to the area along Pine Creek as the "Black Forest" because the plentiful thick forests cast very dark shadows. Pine Creek was a key venue for the transportation of logs. The bridge crossed the creek just downstream from an important sawmill, a lime quarry and kiln. The site lay midway between the Jersey Shore, Pine Creek, and Buffalo Railroad Line, and the West Branch of the Pennsylvania Canal, both key transportation lines for local products. Jersey Shore, less than two miles from the bridge, was an important stop for the canal and the railroad. Large storage yards lined the course of the canal that paralleled the Main Street of the town. Vestiges of the aqueduct that carried the canal across Pine Creek can still be seen in the creek bed downstream.[7]

From May 30 until June 1, 1889, unusually heavy rains served as the unhappy termination of a month that had already included eleven days of rain. The severe floods that resulted swept away even the largest bridges in the region. The same rains nearly destroyed the town of Johnstown to the southwest. The various bridges and aqueducts of the canal were decimated. The new Pine Creek Bridge was one of several constructed in 1889 and 1890 in order to replace bridges that had been severely damaged or destroyed by the inundations. A number of these new bridges were metal truss structures, with a substantial percentage furnished by the Berlin Iron Bridge Company.

The lenticular, or parabolic, truss is a type developed during the mid-nineteenth century in Europe, but it enjoyed its greatest popularity in the United States based on designs patented by William Douglas (1878, 1885) an engineer associated with the Berlin Iron Bridge Company, and its predecessor, the Corrugated Metal Company.[8] The company enjoyed considerable success from 1878 until its absorption by the American Bridge Company in 1900. Advertising the many advantages of its unique truss system, the company claimed to have combined the structural principles of arch and suspension bridges with an efficient deployment of material superior to more conventional truss

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[5] The author is indebted to Kathy Conrad of the Clinton County Commissioners' Office at the County Courthouse in Lock Haven, Pennsylvania for locating this information and the Commissioners' Bridge Book.

[6] The rectangular footprint of the former pier that supported the wooden superstructure mid-stream is clearly visible through the steel grid decking of the present structure.

[7] For a discussion of the canal and related transportation infrastructure, see Russell, The Tiadaghton Tale, pp. 99-131.

[8] See Victor Darnell's comprehensive study of the Berlin Iron Bridge Company and its products, "Lenticular Bridges from East Berlin, Connecticut," IA 5, no. 1 (1979): 19-32; for a discussion of Douglas' various patents and their historical context, see pp. 19, 24.

structures. These bridges were described as models of economy resulting from the most advanced structural research.

The lenticular truss of the new iron bridge over Pine Creek was not a novelty to the Lycoming County Commissioners or to the inhabitants of Williamsport, the county seat and the largest city in the region. Among the casualties of the 1889 flood was one of the Berlin Iron Bridge Company's proudest achievements, the multi-span lenticular truss bridge carrying Market Street into Williamsport, over the West Branch of the Susquehanna River. Engravings of this bridge graced the company's August 1886 catalogue.[9] Constructed in 1885, the bridge succumbed to raging waters after only four years of service. Fortunately for the company, the commissioners were not swayed by this misfortune. The catalogue encouraged potential clients to "Remember that a bridge once built by the Berlin Iron Bridge Company is built forever."[10] Although the commissioner's meeting minutes from these years have been lost, the Register of Orders Issued by Lycoming County Commissioners, 1884-1895, a ledger recording their expenditures during those years, suggests the extent of their commissions with the Berlin Iron Bridge Company. Although it is difficult to assemble a precise count since place names are idiomatic and often the same bridge will be referred to by more than one name, during the period covered by this register, the county appears to have commissioned at least six large metal bridges from the company. This excludes commissions by the City of Williamsport, such as the Market Street Bridge, and by townships or rail companies.[11] By the date of the flood, company sales had exceeded 600 bridges across twelve states from New England to Texas.

The Clinton County Bridge Book describes the Pine Creek Bridge (1889) as "…one span 287 ft long – roadway 18 ft – Height of truss 40 ft—14 panels—wooden joists 3 x 12 x 20 ft 6 in long…." The price of the inter-county bridge over Pine Creek was $14,480, with repairs and alterations to the existing abutments costing an additional $762.[12] Lycoming County paid for one half of this cost.[13] Thus, in 1889, the Berlin Iron Bridge Company built one of its new lenticular truss structures for a few thousand dollars more than the combined cost of the wood and masonry of the bridge that had been

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[9] See Berlin Iron Bridge Company, Iron Bridges (Catalogue) I, no. 2 (East Berlin, CT: August 1886).
[10] Berlin Iron Bridge Company, Iron Bridges.
[11] Commissioners of Lycoming County, PA, Register of Orders Issued by Lycoming County Commissioners, 1884-1895, in Archives, Lycoming County Historical Society Library and Museum, Williamsport, Pennsylvania. Among the bridges mentioned are the joint bridge over Pine Creek (described variously as the one at "Hugh Shaw's" and the one at "Wentz's," a saw mill located about 2 miles north of Jersey Shore), and others at Astonville, Waterville, Lairdsville, Slate Run (a lattice truss that still stands), and one at Pine Bottom Run. Another document, a Bridge Book that provided a complete list of bridges erected by the county, appears to have also been lost from the Lycoming County Courthouse. Historian Blythe Tanner referred to this document in another HAER report on the Berlin Iron Bridge Company lenticular bridge at Waterville, undertaken during the summer of 1997. See Blythe Tanner, "Waterville Bridge," HAER No. PA-462, Historic American Engineering Record, National Park Service, U.S. Department of the Interior, 1997, footnote 3, p. 3.
[12] Clinton County Commissioners' Bridge Book, entry for Pine Creek Bridge.
[13] The Register of Expenses of the Lycoming County Commissioners, 1884-1895 verifies that payments for the commissioners' share of the costs were made in two equal disbursements on Jan. 21 and April 2, 1890. It appears that the payments were made directly to the bridge company, instead of one county reimbursing the other.

erected two decades earlier. Allowing for inflation, this suggests that the company was successful because their bridges were priced competitively with more conventional structures.[14]

Many of these lenticular truss bridges were erected in Pennsylvania, with a significant number in the north central region.[15] Four of the surviving lenticular trusses in the state are by the Berlin Iron Bridge Company.[16] Three of these structures have already been recorded by earlier HAER projects. The remaining structure, a pony lenticular truss at Duncannon in Perry County, also erected as a result of the 1889 flood, is the subject of another report undertaken by HAER this summer (see HAER No. PA-612).

The lenticular truss has been the subject of considerable scholarly interest and its development has been well-documented elsewhere. In particular, earlier HAER reports have treated this unique truss type at length, but this summer, Professor Thomas Boothby and M.S. student Jose Colon, of the Engineering Department of Pennsylvania State University at State College have done a number of analytical studies to test the claims made by the company. They sought to determine whether these trusses are really structurally superior to more conventional Pratt or Warren trusses in their handling of stresses. Their analysis includes computer modeling of the extant structures in Pennsylvania and follows as an adjunct to this report.

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[14] Clinton County Commissioners' Bridge Book.

[15] Darnell, "Lenticular Bridges," notes that the 1889 catalogue recorded at least 664 spans in twelve states, p. 24. The Perry County Commissioners Meeting Minutes for the relevant years have been lost from the county courthouse in New Bloomfield, Pennsylvania. A Bridge Docket compiled in 1908 records no such bridges in the county's inventory at that time. Since the Duncannon lenticular was owned by the borough, it was not mentioned in the county docket.

[16] The three others are the Nicholson Township lenticular over the Tunkhannock Creek in Wyoming County (1881), the South High Street Bridge in Duncannon Borough, Perry County (1889), the Waterville Bridge, once over Little Pine Creek in Lycoming County (1890), but now spanning Swatura Creek as a pedestrian bridge in Swatura State Park, Lebanon County. Gustav Lindenthal designed a fifth multi-span structure named the Smithfield Bridge, which spans the Allegheny River at Pittsburgh. The engineer defines the relationship of his bridge to other developments of this type, both domestically and internationally, in "Letters to the Editor/Parabolic Truss Bridges—Some Early Facts," Engineering News-Record 100, no. 20 (May 17, 1928): p. 789.

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