

HAER
IOWA
42-STERO.V,
1-

HAER No. IA-57

HARDIN CITY BRIDGE
Iowa Bridges Recording Project
Pedestrian area beside county road,
3 miles Northwest of Steamboat Rock
Steamboat Rock Vicinity
Hardin County
Iowa

BLACK & WHITE PHOTOGRAPHS
REDUCED COPIES OF MEASURED DRAWINGS
WRITTEN HISTORICAL & DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Department of the Interior
P.O. Box 37127
Washington, D.C. 20013-7127

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Location: Spanning a pedestrian path over slight depression; 3.0 miles northwest of Steamboat Rock; Hardin County, Iowa
UTM: 15.491140.4699400
USGS: Popejoy, Iowa quadrangle (7.5 minute series, 1979)

Date of Construction: 1879

Fabricator: Passaic Rolling Mills, Passaic, New Jersey

Designer/Contractor: Western Bridge Works, Fort Wayne, Indiana

Present Owner: Hardin County, Iowa

Present Use: Pedestrian bridge

Significance: Configured as a pin-connected Whipple (or double-intersection Pratt) through truss, the Hardin City Bridge is one of only eight such structures remaining in Iowa. It is the only bridge in Iowa by the short-lived Western Bridge Works, Fort Wayne, Indiana. With its Whipple web configuration, cast-iron hip blocks and bearing shoes, and rolled wrought-iron components, the Hardin City Bridge typifies wagon bridge construction of the late 1870s.

Historian: Leslie Pitner, August 1995

Project Information: This document was prepared as a part of the Iowa Historic Bridges Recording Project performed during the summer of 1995 by the Historic American Engineering Record (HAER). The project was sponsored by the Iowa Department of Transportation (IDOT). Preliminary research was performed by Clayton B. Fraser of Fraserdesign, Loveland, Colorado.

INTRODUCTION

In 1878, the Hardin County Board of Supervisors were faced with the need for a bridge across the Iowa River at Hardin City. In September of that year, the Hardin County Board of Supervisors appointed a committee to examine a proposed bridge site at Hardin City. In January 1879, the supervisors announced the request for bids for "an Iron Bridge across the Iowa River at Hardin City in this co [sic]. The bridge is to be 140 feet long, 16 feet wide, resting upon substantial piers."¹ In April 1879 the supervisors awarded the contract to Western Bridge Works of Fort Wayne, Indiana. Using cast-iron joint blocks and wrought-iron structural sections produced by the Passaic Rolling Mills of Paterson, New Jersey, and the Pottsville (Pennsylvania) Rolling Mills, Western Bridge completed its erection of the 140' pin-connected truss late that year at a cost of \$3145.38.² The Hardin City Bridge carried traffic until its replacement in 1982. In 1989, the truss was moved from its original location and re-erected beside a rural county road one mile from its original site, the location where it stands today.

BACKGROUND

Iowa is graced by dozens of rivers and streams. While these waterways supported its transformation from frontier to one of the world's foremost agricultural producers, they also created the need for thousands of bridges, both large and small. These rivers, creeks, and streams had to be spanned in the wake of Iowa's growth after receiving statehood in 1846. By the 1870s, when the Hardin City Bridge was built, Iowa was well into its early economic development. The population had tripled from 1850 to 1860, and continued to more than double in the next decade.³ With the influx of settlers from the eastern areas of the United States and from Europe, the amount of cultivated land grew to 36 million acres by 1880.⁴ As the railroads began to arrive in the 1860s and 70s, the infrastructure was set to move Iowa's abundant produce to outside markets. This growth also created the

¹Hardin County Board of Supervisors Minutes, 16 January 1879 (Book B, p. 23), held at Hardin County Courthouse, Eldora, Iowa.

²Supervisors' Minutes, April 11, 1879 (Book B, p. 52), April 6, 1880 (B, p. 115).

³Leland L. Sage, A History of Iowa, (Ames, Iowa: The Iowa State University Press, 1974), 92.

⁴Joseph Frazier Wall, Iowa: A Bicentennial History, (New York: W.W. Norton & Company, Inc., 1978), 127.

continual need for new and improved roadways to move crops and livestock to local railroad depots.

The need for new bridges is documented in the endless petitions for bridges presented to the county boards of supervisors who were the primary form of local government in Iowa. It fell to each county to provide its own infrastructure of roads and bridges. Rather than plan for the provision of such roads, the boards responded to citizens' requests for new roads and bridges. Bridge petitions were presented to the board, which would then take the requests under consideration depending on the state of the county Bridge Fund, the size and cost of the bridge, and whether the bridge could be built by county labor or would require an outside bridge contractor. The type of bridges built in any given county depended on county funds and the preferences of the board which served.

When a large-scale bridge was needed, the county would call for bids from bridge contractors. These could be only the large regional companies or include local bridge contractors. The contract would then be awarded to the firm with the best design and lowest bid. This normally went to the lowest bidder, although occasionally the counties chose a different, yet still low bidder because they preferred that company's design. This process left the board at the hands of the contractors and led to few standards for quality or design.

This period of growth in Iowa coincided with the growth in the construction of iron bridges. The decades before and after the Civil War saw many patents on new truss designs and chord members. The first all-metal bridge to achieve wide acceptance in the United States was the bowstring arch. Bridge companies such as Wrought Iron and King Iron developed proprietary bowstring designs and marketed them throughout the Midwest. By the 1870s, however, the bowstring was superseded by parallel chord trusses such as the Pratt.⁵ New bridge companies, such as Western Bridge Works, proliferated to meet the growing need for these iron or combination wood and iron bridges in local counties.

THE DEVELOPMENT OF HARDIN COUNTY

Hardin City was an enthusiastically founded, but short-lived city. The county was first settled in 1849 by Greenberry Haggin. Hardin City is located on the eastern border of Jackson Township

⁵Eric DeLony, "Surviving Cast- and Wrought-Iron Bridges in America," IA: The Journal of the Society for Industrial Archeology, 19:2, 28-9, 34-5.

in the center of the county. It is surrounded on three sides by the Iowa River with its abundant trees, giving the area the water and timber so important to early settlers. Jackson Township was settled in October 1850 by the family of Jacob Kidwiler, who had moved from Indiana. Because of its topography, Jackson Township was the most quickly settled township in the county.⁶

Hardin City was born through the efforts of Lewis Hayden, who built in 1853 both a saw mill and a grist mill along the banks of the Iowa River. He enlisted John Shepherd, the County Surveyor, to lay out the plat for his new town, which was filed on February 14, 1854. In 1854, Hayden added a hotel to his burgeoning town, and soon after other merchants were attracted to the area. As stated by the Eldora Ledger in 1880, "A year later [1855], next to Marietta, Hardin City was the largest town in Central Iowa."⁷ In 1859, however, Lewis Hayden's mill was destroyed by fire. A new mill was built by Edward Hiller in 1865. It was sold that same year. By 1880, the mill was a dilapidated wreck, owned by a local doctor, and the town had begun to be given over to farm land.⁸

The demise of Hardin City as a town seems to be the result of the railroad. When the railroad came through Hardin County in the 1860s, both lines, the Dubuque and Pacific and the Central Iowa Railway, missed Hardin City, most likely because it was surrounded by the Iowa River. In 1868, Eldora, in Eldora Township, was named the county seat, and received a railroad depot, both of which drew business to it and away from Hardin City.⁹

As Hardin City had already virtually disappeared by 1879, it may seem puzzling that the Hardin City Bridge was erected at that time. The county records give no clue as to the intentions of the supervisors in building the bridge. Maps, however, from the period in which the bridge was built give an answer. The Hardin City Bridge is one of the few bridges across the Iowa River in this area of the county. For the residents in Hardin City and other farmers caught within the bend of the Iowa River, the

⁶History of Hardin County, Iowa, (Springfield, Illinois: Union Publishing Co., 1883), 787-8.

⁷Eldora Ledger, February 13, 1880, quoted in History of Hardin County, 813.

⁸History of Hardin County, 814.

⁹William J. Moir, ed., Past and Present of Hardin County, Iowa, (Indianapolis: B.F. Bowen & Company, 1911), 301.

Hardin City Bridge opened a much more direct route to Eldora and its merchants, services, and railroad depot.

SQUIRE WHIPPLE AND THE DEVELOPMENT OF THE IRON TRUSS

Configured as a pin-connected Whipple (or double-intersection Pratt) through truss, the Hardin City Bridge is one of only eight bridges of this truss type still intact in Iowa. The truss has 10 panels and a span of 140', with a roadway width of 16'. The upper chords and inclined end posts are constructed of two channels with cover and batten plates. The lower chords are rectangular forged eyebars. The verticals are built-up I-beams, and the diagonals are looped square eyebars. The portal has a lattice design and a company plate which reads "Western Bridge Works / Fort Wayne, IND / 1879."

By 1879, the Whipple truss was a popular choice for long-span bridges. Squire Whipple, the developer of the Whipple truss, is a pivotal figure in the development of the iron truss bridge in the United States. Trained as an engineer at Union College, where he received a bachelor's degree in 1830, he was the first American engineer to rationalize the analysis of iron trusses. Whipple began his career as a surveyor, first for the Baltimore and Ohio Railroad, and later for the New York State Canal System, before turning to bridge design.

On April 24, 1841, Whipple obtained his first patent for a cast-iron bowstring arch-truss. In 1847, he published A Work on Bridge Building, the first book in America to apply scientific methods to measure the stresses of trusses. This same year, he developed his trapezoidal truss, of which the Hardin City Bridge is an example. Whipple described this development:

Prior to 1846, or thereabouts, I had regarded the arch-formed truss as probably, if not self-evidently, the most economical that could be adopted; and at about that time I undertook some investigations and computations with the expectation of being able to demonstrate such to be the fact, but on the contrary the result convinced me that the trapezoidal form, with parallel chords and diagonal members, either with or without verticals, was theoretically more economical than the arch, and that the trapezoid was more economical *without than with* vertical members - there being shown a less amount of action (sum of maximum

strains into lengths of respective long members) under a given load.¹⁰

The truss Whipple developed was a variation on the Pratt truss, which had been patented by Thomas Pratt in 1844. The Pratt truss is a trapezoidal form with vertical compression members and diagonal tension members. The Whipple truss differed from the more common Pratt in that its diagonal members extended across not one, but two panels. Although more costly, this variation provided greater lateral support for the diagonals, a critical consideration on deep, long-span trusses.

The Whipple truss was a popular choice for long-span crossings between 1850 and 1890, most often used for spans over 150'. By the turn of the century, Parker and Camelback trusses (Pratt variants with polygonal upper chords) had supplanted the Whipple as the truss of choice for longer span crossings. Accordingly, all of Iowa's extant Whipples date from before that time.¹¹

WESTERN BRIDGE WORKS

Western Bridge Works, located in Fort Wayne, Indiana, began in 1877 when C.L. Olds, owner of a Fort Wayne iron company, and Alpheus Wheelock, a former agent of the Toledo, Ohio based Smith Bridge Company, joined together their expertise. Wheelock had begun his own bridge company in 1870, but this company mainly constructed timber bridges. Western Bridge Works was committed to building iron bridges exclusively, and quickly had four gangs to erect bridges and seventy employees in its plant.¹²

By 1879, Western Bridge Works was thriving and earned two mentions in Engineering News. One, from May 10, 1879, reported two new contracts in Iowa, including the Hardin City Bridge. "The Western Bridge Works, of Fort Wayne, Ind., have recently been awarded the contract for building an iron bridge 1,200 feet long, over the Des Moines River, at Ottumwa, Ia. They also have a contract for an iron bridge 140 feet long at Hardin City, Iowa. This is one of the foremost bridge companies of the West, having

¹⁰Squire Whipple, "The Development of the Iron Bridge," Railroad Gazette, April 19, 1889, 253.

¹¹Fraserdesign, HARD21 "Hardin City Bridge," Iowa Historic Bridge Inventory, prepared for the Iowa Department of Transportation, 1993.

¹²James L. Cooper, Iron Monuments to Distant Posterity: Indiana's Metal Bridges, 1870-1930, (Greencastle, Indiana, 1987), 16.

completed the first year over 5,000 feet of bridges, and have now more than that amount of work ahead."¹³ From this auspicious beginning, however, the firm quickly faded. By 1885, C.L. Olds, the sole owner at that time, sold the bridge works.¹⁴ During the 1880s, Olds had become involved in new businesses such as an electric light company and a construction company.¹⁵ The Hardin City Bridge seems to be a product from the height of the short-lived Western Bridge Works.

The quick rise and fall of Western Bridge Works demonstrates the brutal competition in bridge contracting and fabrication in the late nineteenth century. The 1870s were a particularly difficult period due to the economic slowdown after the Depression of 1873.¹⁶ In the Midwest, the business was dominated by the large Ohio firms such as the Wrought Iron Bridge Company and King Iron Bridge Company. The industry was highly competitive and rife with bid rigging and other only semi-legal activities. No indication is left as to why Western Bridge Works did not succeed, except perhaps that C.L. Olds lost interest in this particular investment.

With its Whipple web configuration, cast-iron hip blocks and bearing shoes, and rolled wrought-iron components, the Hardin City Bridge typifies wagon truss construction of the late 1870s. Its recent move has diminished its historical integrity by obscuring the important transportation role it played for the farmers of this area. It still, however, stands as a tribute to the once bright promise of both Western Bridge Works and Hardin City.

¹³"Bridges," Engineering News, May 10, 1879, 152.

¹⁴Cooper, 16.

¹⁵Professor James L. Cooper of DePauw University, author of Iron Monuments to Posterity, gave me this additional information in a telephone conversation.

¹⁶Eli Woodruff Imberman, "The Formative Years of Chicago Bridge and Iron Company," (Ph.D. Dissertation, University of Chicago, 1973), 153-4.

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ADDENDUM TO
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Pedestrian area beside County Road
Steamboat Rock vic
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This appendix is an addendum to a 8-page report previously transmitted to the Library of Congress.

APPENDIX: ADDITIONAL REFERENCES

Interested readers may consult the Historical Overview of Iowa Bridges, HAER No. IA-88: "This historical overview of bridges in Iowa was prepared as part of Iowa Historic Bridges Recording Project - I and II, conducted during the summers of 1995 and 1996 by the Historic American Engineering Record (HAER). The purpose of the overview was to provide a unified historical context for the bridges involved in the recording projects."