

PERRY & ALLEN PATENT BOWSTRING TRUSS BRIDGE  
Spanning unnamed tributary of Yellow River  
Frankville vic.  
Winneshek County  
Iowa

HAER No. IA-10

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PHOTOGRAPHS

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EUREKA BRIDGE  
(Perry & Allen Patent  
Bowstring Truss Bridge)  
Iowa Bridges Recording Project  
City Park (moved from Frankville vic.)  
Castalia  
Winnesheik County  
Iowa

HAER No. IA-10

ADDENDUM TO  
PERRY & ALLEN PATENT  
BOWSTRING TRUSS BRIDGE  
Spanning unnamed tributary of Yellow River  
Frankville vic.  
Winnesheik 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

ADDENDUM TO  
PERRY & ALLEN PATENT BOWSTRING TRUSS BRIDGE  
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HISTORIC AMERICAN ENGINEERING RECORD

EUREKA BRIDGE

(Perry & Allen Patent Bowing Truss Bridge)

Location: City Park in Castalia, Winneshiek County, Iowa  
(moved from previous location spanning a tributary  
of the North Fork of the Yellow River, Bloomfield  
Township, Winneshiek County, Iowa)  
UTM: 15.608200.4773820  
USGS: Castalia, Iowa, quadrangle  
(7.5 minute series, 1981)

Date of  
Construction: c. 1872

Designers: William H. Allen and Oliver H. Perry

Fabricator/  
Contractor: Allen, McEvoy & Company, Beloit, Wisconsin

Owner: City of Castalia, Iowa

Present use: On display on flat ground (formerly county road  
bridge)

Significance: The wrought-iron Eureka Bridge is an example of  
the bowstring bridge, called bowstring truss or  
iron arch in the nineteenth century. Bowstring  
bridges were widely built in Iowa in the period  
1860-1880. As with other iron bridges, they were  
usually produced in the shops of large bridge  
companies. The Eureka Bridge represents the small  
minority of such bridges designed and built by  
local entrepreneurs in regional machine shops.

Historian: James C. Hippen, 1996

Project  
Information: This document was prepared as part of the Iowa  
Historic Bridges Recording Project performed  
during the summers of 1995 and 1996 by the  
Historic American Engineering Record (HAER). The  
project was sponsored by the Iowa Department of  
Transportation (IDOT). Preliminary field  
measurements on this bridge were performed by a

The Eureka Bridge is an example of one of the most common bridge types in late nineteenth-century Iowa. It is what engineers and historians call a "bowstring" bridge, referring to its shape in profile and its fundamental structural action.<sup>1</sup> This form of wrought-iron bridge was widely used for wagon road crossings of both small streams and, in multiple-span arrangements, major rivers. It was built from the late 1860s until the early 1880s. Bowstrings, being of relatively light construction, were rarely, if ever, used for railroad purposes.<sup>2</sup>

The name "Eureka" comes from the proprietary name given to the type by the manufacturer, initially a small firm in Wisconsin. The history of the Eureka type in general and of this particular bridge, apparently the only known surviving example, is not easy to discover. But, the bridge is there; despite the gaps in the paper trail we can get a fair idea of the entrepreneurial dynamism that found such a focus in technological innovation during the last century. As Eric DeLony puts it, "this bridge is a classic example of the prefabricated iron-truss bridge patented

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<sup>1</sup>There is a great deal of material on the bowstring bridge. As an example, one could not start with a better short discussion than that of John C. Trautwine, The Civil Engineer's Pocket-Book (Philadelphia: Claxton, Remsen & Haffelfinger, 1872), pp. 286-287. Trautwine's handbook was widely used and reached its twentieth edition in 1919. He classed bowstrings as a type of truss. The major manufacturers tended to emphasize that it was an iron arch: "column" or "column and channel" or "column, plate and channel arch" (Wrought Iron Bridge Co.); "tubular arch" (King Iron Bridge & Manufacturing Co.). The best recent discussion is by Eugene M. Farrelly under the direction of Professor Dario Gasparini, "Iron Bowstring Bridges," prepared for HAER, August 1996. Farrelly and Gasparini (pp. 8-9) conclude that the typical bowstring bridge as designed in the nineteenth century was a hybrid between the tied arch and the pin-connected, curved upper chord truss.

<sup>2</sup>The catalogs of bridge manufacturers list a high proportion of bowstring bridges built in Iowa. See, for example, Book of Designs of Wrought Iron Bridges Built by the Wrought Iron Bridge Co. of Canton, Ohio (1874) and King Iron Bridge & Manufacturing Co., Manufacturers of Wrought Iron Bridges, Catalogue (1884). The pictorial record left by postcards from the period 1900 to 1915, when the nineteenth-century bowstrings were beginning to be replaced, but still survived in large numbers, documents their widespread use. See also FRASERdesign, Iowa Historic Bridge

and manufactured by local entrepreneurs for local farm-to-market road use."<sup>3</sup>

Considering the surviving bridge itself, the artifact, we are faced with two questions. First, is this structure identifiable with the bridge patented in 1871 by Oliver H. Perry and William H. Allen? And, second, what is the provenance of this particular example?

A beginning difficulty is that the Perry and Allen patent was issued on Tuesday, October 24, 1871, while cast into one of the parts (numbered "5"; there are 17 examples on the bridge) is: "PATD OCT 24 1872." A check of the patent office Gazette reveals no patents to Perry and Allen on Tuesday, October 22, 1872, the nearest patent issue date appropriate to the cast year.<sup>4</sup> We must therefore assume that the pattern maker made a mistake and placed a "2" instead of a "1" in the year date on the pattern. The lettering style was a common one used in foundries, and Beloit, Wisconsin, the home of the patentees, had a large foundry.<sup>5</sup> Thus 1872, while not the true patent date, probably represents the year in which the pattern was fabricated and the iron cast.

A second difficulty is that the existing bridge apparently does not actually demonstrate a use of the patent granted. The claim of Perry and Allen was for "coupling clamping-seats...arranged to receive and support the adjacent ends of the arched rods [upper chord]...and form a connection for the brace-rods [web members] thus dispensing with separate or tubular couplings for this purpose."<sup>6</sup> There is no evidence that the upper chord is in segments, which is what the "coupling clamping-seats" were meant

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<sup>3</sup>Landmark American Bridges (New York: American Society of Civil Engineers, 1993), 66.

<sup>4</sup>Patents were issued on Tuesdays.

<sup>5</sup>The lettering is a "Roman Style," and was sold as the "leading style" among foundrymen; S. Obermayer Co., Catalogue... "Everything You Need in Your Foundry" (Cincinnati: 1904), p. 65. Beloit had an iron foundry as early as 1855; Lippincott's... Gazetteer (Philadelphia: 1855), p. 200. In 1883 the Merrill & Houstin Works Foundry in Beloit made "paper machinery and jobbing castings"; Thomas D. West, Moulders' Text-Book (New York: Wiley, 1885), p. 357.

to join.<sup>7</sup> Furthermore, the cast-iron clamps as actually made are much lighter than shown on the patent drawing. They suffice to hold the chords and web members together, but could hardly be expected to take the stress developed by the butt joint of two segments of the upper chord. The clamps as drawn on the patent are massive blocks of iron. In addition, the pattern of the web members of the truss are not the same on the patent as in practice. The patent shows alternate panels in the web as four-sided figures, therefore not properly designed for truss action. The bridge as built follows the web pattern of a Pratt truss.

We are left with a bridge that, as built, is not even covered by the patent which identifies it. Yet there is little real doubt that this is a bridge whose design has its origin in the Perry and Allen patent. It looks like the patent drawing in its overall scheme of construction. The date is correct, allowing for a foundryman's mistake. Such a casual attitude toward patent claims may not be to our liking, but it was not so unusual. Many patentees, especially in the bridge business, tended to patent relatively minor features and then give the impression that the entire bridge design was patented.<sup>8</sup> Thus we can conclude that all the evidence points strongly toward this being a Perry and Allen patent bridge, even though it represents just about every feature described in the patent except the sectional arch-rods which were the basis for the claim.

The other important question concerns the origin and history of this particular bridge. A search of the Winneshiek County Bridge Expense Journal, 1872-1899, yielded no record whatever of any Eureka Bridge erected in Bloomfield Township (where the bridge was last in service) or elsewhere.<sup>9</sup> Since the journal began in the earliest possible year that the bridge was fabricated, this means that the county did not pay for it. This does not, however, close off all possible explanations. In Iowa the township

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<sup>7</sup>See Virginia M. Price, drawings (3 sheets) of HAER No. IA-10, Eureka Bridge (1996).

<sup>8</sup>Comparison of patents of the Wrought Iron Bridge Co. with built examples, or the patent escapades of Daniel B. Luten, make the point.

<sup>9</sup>Manuscript journal in Winneshiek County Historical Society Archives, located (in 1996) in Luther College Library, Decorah,

government had control over the roads until about 1900.<sup>10</sup> Therefore, a township might have contracted for a small bridge on its own, especially if county aid was unavailable. An example is recorded in 1871 in the Winneshiek County Auditor's Bridge Calendar where three requests by townships for county bridge funds were "Refused. Apr 4.1871. Being under 30 ft Span."<sup>11</sup> (The Eureka Bridge has a span of 28"- 8 1/2".)

The question remains as to a documentary connection between this bridge and the patentees. While the career of Oliver H. Perry is unknown, that of William H. Allen is documented. We know that subsequent to receiving the patent Allen, who was "a member of the firm of Allen, McEvoy & Co., machinists and general jobbers,...was for a time engaged" in the manufacture of the Eureka Bridge "and introduced a number in Iowa and Wisconsin."<sup>12</sup> However, by 1876 he had apparently sold the design to the Eureka Bridge & Iron Co. of Chicago, D. A. Courter, president.<sup>13</sup> Thus Allen's involvement in the manufacture of the bridge lasted from approximately 1872 to 1876.

Allen's career before he was issued the patent prepared him for marketing bridges. He had come to Rock County, Wisconsin, in 1841 as a boy of 13. Before the Civil War he traveled, as a buyer of agricultural produce and on trips to the goldfields of Colorado (1859) and to drive horses for sale in California (1860-1861). He was commissioned in a Wisconsin regiment, but was forced to resign because of ill health. He then returned to the conflict as sutler of the 15th Wisconsin. This military supply service lasted until early 1863. After the war he eventually got into the machine and jobbing business, as noted above, as well as selling

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<sup>10</sup>George S. May, "The Good Roads Movement in Iowa" 46 (February 1965): 85.

<sup>11</sup>Page 3. This calendar, also in the Winneshiek County Historical Society Archives, is fragmentary and contains a modest number of items from 1870-1875; no reference to Eureka Bridge.

<sup>12</sup>Portrait and Biographical Album of Rock County, Wisconsin (Chicago: Acme Publishing Co., 1889), 209.

<sup>13</sup>Advertisement in Engineering News 5 (January 3, through February 14, 1878). The woodcut in the advertisement, allowing for the scale and the license of the engraver, is a fair representation of the Eureka type bridge as constructed. The company is listed for the year 1876 only in Victor C. Darnell, A Directory of American Bridge-Building Companies, 1840-1900

building supplies throughout the country. One of Allen's projects was that he "founded and built the now prosperous town of Ridgeway [in Winneshiek County], in Iowa, and placed it on a firm financial basis."<sup>14</sup> This connection with a town some twenty miles northwest of the Eureka Bridge site, in the same county, can hardly be a coincidence. In fact, Allen's connection with the county, which may well have opened up his opportunities to develop the town of Ridgeway, is easy to explain. He was the sutler of the 15th Wisconsin, which had a large number of recruits from Winneshiek County, Iowa.<sup>15</sup>

The standard county histories are silent on William H. Allen. Ridgeway, founded in 1866, began its real growth in 1867, the year that the Chicago, Milwaukee & St. Paul was completed from Milwaukee to Minneapolis and St. Paul. Being on this main line, Ridgeway had bright prospects. A few years changed all this. In 1869 Decorah, the county seat, which the railroad had passed by, was connected to the system with a short branch, thus ensuring that it had little to fear from some upstart railroad town (like Ridgeway). Then in 1874 the business district of Ridgeway was destroyed by fire.<sup>16</sup> It is probable that Allen's interest in the town, along with his property there, went up in smoke. If the bridge was erected in conjunction with Allen's development efforts in Ridgeway and Lincoln Township, it was probably during the time period 1872-1874.

The bridge, of course, has long been located in Bloomfield Township, some twenty miles southeast along the railroad from Ridgeway. So, why talk about its possible initial location in Ridgeway? Without a doubt the Eureka Bridge was not in its original location when it was taken out of service in the early 1990s.<sup>17</sup> It was, at that time, supported by wood pile and plank abutments which were clearly of fairly recent origin. In

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<sup>14</sup>Biographical Album of Rock County, 206-209.

<sup>15</sup>The Winneshiek County connection with the 15th Wisconsin is documented on the Civil War Memorial in Decorah, and confirmed by local tradition.

<sup>16</sup>W. E. Alexander, History of Winneshiek and Allamakee Counties, Iowa (Sioux City, Iowa: Western Publishing Co., 1882; reprinted Decorah, 1992), 219, 248, 251, 308; F. H. Johnson, The Milwaukee Road (Chicago: Milwaukee Road, 1944), 21, 22, 25, 26.

<sup>17</sup>The author examined the bridge in detail in March, 1986, and March, 1990, in its location in the NE quarter of section 3,

addition, the course of the North Fork of the Yellow River and its tributary which the Eureka Bridge spanned changed in about 1905, so the bridge had to have been moved at least once.<sup>18</sup>

We are left with the possibilities that the bridge was initially used at or near Ridgeway, then sold to Bloomfield Township, or that it was always somewhere in Bloomfield Township, but moved within the township at least once.

A tempting hint at the possible family involvement of the patentees--Perry and Allen--in the area is provided by the plat maps. In 1886 we find E. T. Allen owning land on the eastern edge of Ridgeway; he came from upstate New York (not born in the same county as William H. Allen) and went to Rock County, Wisconsin, in 1855. Turning to Bloomfield Township, we find in 1886 no less than three landowners with the surname Allen and five with the surname Perry.<sup>19</sup> Of course, other than knowing that none of these are children of William H. Allen, we are unable to prove or disprove a connection with him or Oliver H. Perry.<sup>20</sup>

The Eureka Bridge itself did little to advance the craft of bridge engineering.<sup>21</sup> It was tied to a patent which it did not embody, and which its very existence proved unnecessary. There was no need for sectional "arch-rods" [upper chord] in such a short bridge, and the "patented" joint castings as built would not have been strong enough to join and hold sectional upper chord elements if they had been used. The design, as shown in the patent drawing, did not even consistently use three-sided panels, a fundamental necessity in truss design of the time. And, in neither patent design nor "as-built" state nor Eureka Bridge & Iron Co. advertisement is there any apparent indication of lateral bracing. Reliance seems to have been placed on the width

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<sup>18</sup>Some nine maps have been examined, ranging in date from 1875 to 1981. The key ones are: Geo. E. Warner and C. M. Foote, Plat Book of Winneshiek County, Iowa (Minneapolis: Warner & Foote, 1886), 7; Standard Historical Atlas of Winneshiek County, Iowa (Davenport, Iowa: Anderson & Goodwin, 1905), 9; U.S.G.S., Postville NW Quadrangle (1981).

<sup>19</sup>Plat maps in Warner and Foote, Plat Book, 7, 31. E. T. Allen is in Alexander, History, 551.

<sup>20</sup>Of Allen's children, the only one to survive infancy did not marry; Biographical Album of Rock County, 208-209.

<sup>21</sup>Refer to the three sheets of HAER drawings of the Eureka

of the lower chords for lateral stability. (In recent times the floor beams, probably not original, were tack welded to the bottom chord.)

No other Perry-Allen patent "Eureka" bridges are known in Iowa, although an old "freak bridge" of bowstring form, built of bars with cast-iron joint fittings, was reported in the engineering press some sixty years ago.<sup>22</sup> Whether this structure was one of those of which Allen "introduced a number" in Iowa is doubtful. But the Eureka Bridge and all the others like it, although hardly examples of expert bridge design, demonstrated both the entrepreneurial ferment and the wide spread of the industrial revolution which were characteristic of nineteenth-century America.

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<sup>22</sup>"Curious Old Bridge Suggests Hybrid Origin," Engineering News-Record 114 (January 10, 1935): 54-55. Another bridge of local design and similar structural method, although not a bowstring, is the Middle Creek Bridge, Mahaska County, Iowa, HAER

SOURCES CONSULTED

- Alexander, W. E. History of Winneshiek and Allamakee Counties, Iowa. Sioux City, Iowa: Western Publishing Co., 1882 reprinted Decorah, Iowa, 1992.
- Book of Designs of Wrought Iron Bridges Built by the Wrought Iron Bridge Co. of Canton, Ohio. Canton, Ohio: Hartzell & Saxton, 1874.
- "Curious Old Bridge Suggests Hybrid Origin." Engineering News-Record. 114 (January 10, 1935): 54-55.
- Darnell, Victor C. A Directory of American Bridge-Building Companies, 1840-1900. Washington, D.C.: Society for Industrial Archeology, 1984.
- DeLony, Eric. Landmark American Bridges. New York: American Society of Civil Engineers, 1993.
- Eureka Bridge & Iron Co. [Advertisement.] Engineering News 5 (January 3, through February 14, 1878).
- Farrelly, Eugene M. and Dario Gasparini. "Iron Bowstring Bridges." Prepared for HAER, August 1996.
- FRASERdesign. Iowa Historic Bridge Inventory, Final Report. 1993.
- Johnson, F. H. The Milwaukee Road. Chicago: Milwaukee Road, 1944.
- King Iron Bridge & Manufacturing Co., Manufacturers of Wrought Iron Bridges. Catalogue. (Cleveland, Ohio: 1884).
- Lippincott's...Gazetteer. Philadelphia: 1855.
- May, George S. "The Good Roads Movement in Iowa." 46 The Palimpsest (February 1965): 65-122.
- Obermayer Co., S. Catalogue... "Everything You Need in Your Foundry". Cincinnati: 1904.
- Perry, Oliver H., and William H. Allen. "Letters Patent No. 120,319, dated October 24, 1871."
- Portrait and Biographical Album of Rock County, Wisconsin. Chicago: Acme Publishing Co., 1889.
- Price, Virginia M. Drawings of Eureka Bridge, HAER No. IA-10. 3

Standard Historical Atlas of Winneshiek County, Iowa. Davenport, Iowa: Anderson & Goodwin, 1905.

Trautwine, John C. The Civil Engineer's Pocket-Book. Philadelphia: Claxton, Remsen & Haffelfinger, 1872.

U.S.G.S. Postville NW Quadrangle, Iowa. 7.5 minute series, 1981.

Warner, Geo. E., and C. M. Foote. Plat Book of Winneshiek County, Iowa. Minneapolis: Warner & Foote, 1886.

West, Thomas D. Moulders' Text-Book. New York: Wiley, 1885.

Winneshiek County Auditor's Bridge Calendar, 1870-1875.  
Manuscript journal in Winneshiek County Historical Society Archives, Decorah, Iowa.

Winneshiek County Bridge Expense Journal, 1872-1899. Manuscript journal in Winneshiek County Historical Society Archives, Decorah, Iowa.

ADDENDUM TO  
EUREKA BRIDGE  
(Perry & Allen Patent Bowstring Truss Bridge)  
Iowa Historic Bridges Recording Project II  
Spanning Yellow River (Moved to City Park, Castalia)  
Castalia  
Winneshiak County  
Iowa

HAER No. IA-10

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service

1849 C Street, NW

Washington, DC 20240

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This appendix is an addendum to a 10-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."