

HAER
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WEST AUBURN BRIDGE
(Turkey River Bridge)
Iowa Bridges Recording Project
Spanning Turkey River at county road,
5 miles Northwest of West Union
West Union Vicinity
Fayette County
Iowa

HAER No. IA-55

BLACK & WHITE PHOTOGRAPHS

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 Turkey River at county road;
5.0 miles northwest of West Union,
Fayette County, Iowa.
UTM: 15.591380.4763020
USGS: St. Lucas, Iowa quadrangle
(7.5 minute series, 1981)

Date of Construction: 1880-81

Designer/
Contractor: Horace E. Horton, Rochester, Minnesota

Present Owner: Fayette County, Iowa

Present Use: Roadway bridge

Significance: Configured as a pin-connected Whipple
(or double-intersection Pratt) through
truss, the West Auburn Bridge is one of
only eight such structures remaining in
Iowa. The bridge was designed by Horace
Horton, an engineer based in Rochester,
Minnesota, whose creative bridge
designs, particularly for long spans,
were well known in the Midwest.

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 June 1880, the Fayette County board of supervisors called for bids on the stone substructure for a bridge over the Turkey River in West Auburn, Auburn Township. West Auburn was a vital mill town, for a time providing the only flour mill between Minnesota and Elkader in Clayton County. In September the county solicited proposals for the bridge's superstructure, and awarded the contract to design, fabricate, and erect the 165-foot all-iron span to the Minnesota-based engineer Horace E. Horton. Horton completed the West Auburn Bridge in 1881 for a total cost of \$7598.79.¹ Since that time the structure has functioned in place in essentially unaltered condition.

The bridge built by Horton was a Whipple truss, a less common wagon truss type in Iowa. Based in Rochester in the 1880s, Horton was a brilliant civil engineer whose creative bridge designs, particularly long spans, were well known in the Midwest. He designed a number of Iowa's most distinctive structures during this period, a handful of which remain in use today. With its superstructure, substructure, and setting all intact, the West Auburn Bridge is an outstanding early example of wagon truss construction in Iowa.

BACKGROUND

After receiving statehood in 1846, Iowa received a flood of settlers to occupy this fertile land. The population tripled between 1850 to 1860, and continued to more than double in the next decade.² 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 1880.³ As the railroads began to arrive in the 1860s and 70s, the infrastructure was set to move Iowa's produce to outside markets. This growth also created the continual need for new and improved roadways to move crops and livestock to local railroad depots.

Iowa is graced by dozens of rivers and streams. While these waterways supported its transformation from a frontier to one of

¹Fayette County Board of Supervisors Minutes, Book 5, June 10, 1880 (p. 100), September 15, 1880 (111), January 6, 1882 (229).

²Leland L. Sage, A History of Iowa, (Ames, Iowa: The Iowa State University Press, 1974), 92.

³Joseph Frazier Wall, Iowa: A Bicentennial History, (New York: W.W. Norton & Company, Inc., 1978), 127.

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 to facilitate Iowa's growing agricultural commerce. The railways which brought settlers in and took out Iowa's crops became the vehicle for the solution to spanning these streams. The railroads brought in the iron resources to enable the construction of longer span metal truss bridges.⁴

FAYETTE COUNTY AND AUBURN

Fayette County is located in the northeast corner of Iowa. It is made up of twenty townships and covers 730 square miles. The terrain of the county varies greatly, from the relatively flat lands of the southwest half to the hilly and more rugged terrain of the northeast. The topography changes quickly in the northeast, particularly along the Turkey and Volga rivers, with elevations varying by up to 200 feet.⁵ Auburn Township, where the West Auburn Bridge is located, lies in the hills of the north-central area of the county.

The town of West Auburn was a flourishing mill town when the West Auburn Bridge was erected. Settled in 1849, the first resident, James B. Earll, established a saw mill on the banks of the fast flowing Turkey River. In 1851, Earll, with his sons, built a flour mill, the first in the county. The town quickly began to grow, adding within the year a hotel, general store, plow factory, and brewery.⁶

The bridge spanned the Turkey River between West Auburn and a residential settlement known as Massillon, upstream from the flour mill and dam erected by James Earll. Before the bridge was built, the residents of Massillon forded the river. On August 13, 1866, however, four local residents, including two children, drowned when their skiff went over the dam. This incident sparked local outcry and ignited the desire for a permanent bridge.⁷ Built in 1880-81, while it was still a thriving town, the West Auburn Bridge served an important role as a connection

⁴Carl W. Condit, American Building, (Chicago: The University of Chicago Press, 1968), 93-4.

⁵Helen Moeller, ed., Out of the Midwest: A Portrait, Marceline, Missouri: Walsworth Publishing Company, 1976, 89-90.

⁶The History of Fayette County, Iowa, (Chicago: Western Historical Company, 1878), 534-35.

⁷History of Fayette County, 535.

both for local residents who lived across the Turkey River, as well as for wagon traffic from the south headed to the flour and saw mills.

SQUIRE WHIPPLE AND THE DEVELOPMENT OF THE IRON TRUSS

Configured as a pin-connected Whipple (or double-intersection Pratt) through truss, the West Auburn Bridge is one of only eight such structures known to exist in Iowa. The bridge has nine panels and is constructed of wrought iron. The truss has a 165' span, with a total bridge length of 181'. The upper chord and inclined end posts are made up of two channels with double lacing. The verticals are two smaller channels with lacing. The diagonals are two punched rectangular eyebars and the lower chord is single and paired eyebars. The portal is designed with a simple pattern of open diamonds that extends almost halfway down the opening.

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.⁸ Whipple began his career as a surveyor, first for the Baltimore and Ohio Railroad, and later for the New York State Canal System. While working for the Canal System, he built his first cast-iron arch truss, and on April 24, 1841, he obtained a patent for a cast iron bowstring arch-truss.

In 1847, Whipple 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

⁸Eric DeLony, "Surviving Cast- and Wrought-Iron Bridges in America," IA: The Journal of the Society for Industrial Archeology, 19:2 (1993), 28.

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.⁹

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.¹⁰

HORACE E. HORTON

Horace E. Horton is an important figure in the history of bridge building in the Midwest. He was the founder of the Chicago Bridge and Iron Company, which he created in 1889 by combining his own company, Horace Horton and Company, with the Kansas City Bridge and Iron Company. Chicago Bridge and Iron is still in operation today as a subsidiary of CBI Industries. The West Auburn Bridge is a product of Horton's early career before Chicago Bridge and Iron.

Horace Horton, born on December 20, 1843, was a native of New York. His father became successful in land speculation in Iowa and Minnesota, and when Horace was 16, moved his family to Rochester, Minnesota. In 1863, Horton went back to Utica, New York, to attend Fairfield Seminary where he studied civil engineering. Upon graduation in 1866, he returned to Rochester,

⁹Squire Whipple, "The Development of the Iron Bridge," Railroad Gazette, April 19, 1889, 253.

¹⁰Fraserdesign, FAYT43 "West Auburn Bridge," Iowa Historic Bridge Inventory, prepared for the Iowa Department of Transportation, 1993.

becoming county surveyor in 1867, the same year he built his first bridge, a timber deck arch.¹¹

Throughout the 1870s, Horton worked primarily in the area surrounding Rochester, Minnesota, receiving two important contracts for bridges over the Mississippi at the end of the 1870s. The Fort Snelling Bridge in St. Paul was Horton's first major commission, one received in competitive bidding among thirty companies. Horton's competition included some of the largest bridge construction companies in the country: Phoenix Bridge, Keystone Bridge, Wrought Iron Bridge, and American Bridge Company. This major bridge occupied most of Horton's time from 1878 to 1880.¹²

In the period after the Fort Snelling Bridge, Horton's business expanded. Horton seems to have begun work in Iowa during the 1870s.¹³ There is no indication of how Horton came to bid upon the West Auburn Bridge. Fayette County, however, is only 80 miles south of Rochester, Minnesota, so it would be an obvious area in which to expand his burgeoning company. The West Auburn Bridge began a long and frequent relationship between Fayette County and Horton (later as the proprietor of the Chicago Bridge and Iron Company).

While Horace Horton eventually left bridge building to focus his abilities on water towers, he was highly respected as a bridge engineer. In a memorial published in the Journal of the Western Society of Engineers, the writer noted: "Mr. Horton possessed unusual ability as a designer. He was amongst the foremost in the production of new features of design, seeming to grasp the requirements of each particular case and equally ready to plan the finished structure adapted to each case, and to devise the plant and methods of fabricating and erecting the material."¹⁴

The West Auburn Bridge is lovely example of the wrought-iron Whipple truss. In its setting, it stands as a reminder of a town

¹¹Eli Woodruff Imberman, "The Formative Years of Chicago Bridge and Iron Company," (Ph.D. Dissertation, University of Chicago, 1973), 85-87, 97-100.

¹²Imberman, 122-126, 159.

¹³Imberman, 173-74.

¹⁴"In Memoriam: Horace Ebenezer Horton, Past-President, W.S.E.," Journal of the Western Society of Engineers, 18:5 (May 1913), 443.

now lost in history. Its attractive design and proportions, as well as its survival, are a tribute to the engineering skills of Horace Horton. It is scheduled to be replaced by a concrete bridge in 1996, but will be left in its location as a historic landmark.

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ADDENDUM TO
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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."