UPPER MADISON BRIDGE
(Varney Bridge)
Spanning the Madison River at Milepost 7.8, Secondary Highway 249
Ennis vicinity
Madison County
Montana

HAER MT-64
HAER MT-64

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

UPPER MADISON BRIDGE

(VARNEY BRIDGE)

HAER No. MT-64

I. INTRODUCTION

Location:	Upper Madison (Varney) Bridge Spanning the Madison River at Secondary Highway 249 at Milepost 7.8 Ennis Vicinity Madison County Montana
Quad:	Varney, Montana (1988)
UTM:	12/441002/5009069
Date of Construction:	1897
Present Owner:	Madison County Virginia City, Montana
Present Use:	Highway Bridge
Significance:	The Upper Madison (Varney) Bridge is significant as one of the oldest surviving steel truss bridges in Montana. The bridge is representative of the type of pin-connected Pratt through truss that was commonly constructed by the counties on Montana's roads between 1891 and 1915 when the Montana State Highway Commission standardized a different truss design. The bridge is significant for its association with the King Bridge Company of Cleveland, Ohio, a firm of national prominence and a prolific bridge-building company in Montana during the last decade of the nineteenth century.
Historian:	Lon Johnson and Frederic L. Quivik, Renewable Technologies, Inc. June 1989 Jon Axline, Montana Department of Transportation May 2014 (revisions)

II. HISTORY

The upper Madison River valley was well-known to trappers and traders in the first half of the nineteenth century. Brigades from the Rocky Mountain Fur Company and its competitors were frequent visitors to the area. In October 1832, a brigade under the command of Jim Bridger and Tom Fitzpatrick purposely led trappers captained by rival Henry Vanderburgh into an ambush by the Blackfeet Indians a few miles south of the future site of the bridge. With the decline of the Blackfeet in this area because of small pox epidemics beginning in the mid-1830s and the waning of the western fur trade after 1840, the valley was less frequented by non-Indians. Shortly after the gold strike at nearby Alder Gulch in May 1863, however, individuals established ranches in the Madison Valley to sell cattle and sheep in the mining camps. By the mid-twentieth century, the valley had become important as a route to West Yellowstone and the northwest entrance to Yellowstone National Park. The Madison River is also significant as a blue ribbon trout stream. Consequently, the area has attracted recreationalists and the establishment of expensive residences, many of which are summer homes for out-of-state fishermen and hunters and their families.[1]

Varney Area

Partners Osmund Varney and Thomas Farrell amassed a substantial horse herd in the Madison Valley in the vicinity of the bridge by the late 1860s. By the 1880s, other individuals had established horse, cattle, and sheep ranches in the area. In 1897, however, Varney and Farrell dissolved their partnership and Varney settled on a small ranch just east of the bridge. He died in 1903.[2]

The abundant water supply in the valley drew the attention of Virginia City banker and entrepreneur Henry Elling in the late 1890s. He hired a Dillon surveyor to investigate the hydroelectric possibilities of nearby Blaine Springs Creek "where the water did not freeze in the winter."[3] Elling intended to build a power plant to provide electricity to his Easton, Pacific, and Prospect mines and to light Virginia City. Unfortunately for Elling, he died in 1900 before the plant was completed. It wasn't until June 1908 that his son, Karl, incorporated the Economy Electric Power and Light Company and completed the project his father had started nearly a decade before. The company electrified Virginia City in November 1908. The power plant building is on private land southwest of the bridge.[4]

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[1] Bernard DeVoto, *Across the Wide Missouri*, (Boston: Houghton Mifflin, 1947), 89; Michael P. Malone, Richard B. Roeder and William L. Lang, *Montana: A History of Two Centuries*, Rev. ed. (Seattle: University of Washington Press, 1991), 59; Hiram Martin Chittenden, *The American Fur Trade of the Far West*, Vol. I (New York: Press of the Pioneers, 1935), 301.

[2] Black, Don. *Varney, Montana: A Condensed History*, (Virginia City: Madison Valley History Association, 2011); 2, 4; Phyllis Smith, *Montana's Madison County: A History,*(Bozeman: Gooch Hill Publishers, 2006) 78; *Pioneer Trails and Trials: Madison County, 1863-1920.* (Virginia City: Madison County History Association, 1976), 192.

[3] Smith, *Montana's Madison County*, 121.

[4] Smith, *Ibid*, 121-122; Black, *Varney, Montana*, 18.

Homesteading also developed in the vicinity of the bridge beginning in the late 1890s. In 1892, Madison County created the Wigwam School District, which encompassed the site of the bridge. The school, located southwest of the bridge, also functioned as a community hall and church. In 1914, a post office opened in the small settlement of Varney. William Wilcox was the first postmaster. He operated a saw mill a short distance west of the Upper Madison (Varney) Bridge. The Economy Power Company plant, the nearby Ennis Fish Hatchery (established in 1930), and homesteading provided the basis of the local economy. The recreational opportunities of the Madison River and its tributaries resulted in the opening of a gas station and bait shop at Varney in the 1930s. The post office closed in 1944 and the gas station has since disappeared.[5]

The Upper Madison (Varney) Bridge

The General Land Office conducted its survey of Section 8, Township 7 South, Range 1 West in May 1870. The GLO map, published in July 1870 shows roads to Henry's Lake (in present Idaho) bracketing Section 8 on the approximate alignments of U.S. Highway 287 and a county road. In September 1897, the Madison County Commissioners approved a petition that created a road between the west side of the Madison River south of Ennis and the main route east of the river between Ennis and Henry's Lake. The county built bridges on the road over Blaine Spring Creek (HAER No. MT-63) and the Madison River (Varney Bridge) in 1892 and 1897. English immigrant Samuel Coad obtained title to 120 acres encompassing the site of the bridge in June 1903, five years after the Varney Bridge was constructed. He obtained title to the land under the 1862 Homestead Act.[6]

On June 14, 1897, the Madison County Commissioners received a petition for a bridge over the Madison River near the community of Varney, about eight miles south of Ennis. The petitioners added an inducement for immediate approval by offering to donate $1,000 if the bridge was completed in 1897. On June 24th, the Commissioners advertised for the bridge, seeking bids for either two 95-foot spans or a single 190-foot span. The Commissioners' specifications were quite detailed, listing all requirements from the type of truss and the diameter of the pier and abutments to the species of wood for decking and joists. The bidders included three of the large regional bridge building companies that were active in Montana (the Missouri Valley Bridge and Iron Works of Leavenworth, Kansas, the Gillette-Herzog Manufacturing Company of Minneapolis, and the King Bridge Company of Cleveland), three out-of-state firms which were not very active in Montana (Andrews Bros. of Omaha, C.E.H.

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[5] *Pioneer Trails and Trials: Madison County, 1863-1920.* (Virginia City: Madison County History Association, 1976), 5; Cheney, *Names on the Face of Montana*, 278-279; Black, *Varney, Montana*, 18; 119; *Madison County, Montana: Its Resources, Opportunities and Possibilities.* (Virginia City: Board of County Commissioners, 1912), 34, 36.

[6] Land Patent Records, viewed at www.glorecords.blm.gov on 27 January 2014; Smith, *Montana's Madison County*, 119; United States Census Records, viewed at www.ancestry.com on 27 January 2014; County Commissioners Journal, book P, pp. 81-82.

Campbell of Council Bluffs, Iowa, and the Michigan Bridge Co. of Portland, Michigan), and three Montana-based bridge building companies (O.E. Peppard of Missoula, Perham Brothers, Thompson & Co. of Butte, and M. S. Parker of Great Falls). C.E.H. Campbell submitted the low bids for both a single-span and two-span bridges, at $4,200 and $5,100 respectively. The Commissioners, however, without comment in the minutes, awarded the contract for a two-span bridge to the King Bridge Company for $4,999. The Commissioners' minutes and the official county map of 1902 refer to this bridge as the Upper Madison Bridge, although it appears to have been popularly called the Varney Bridge.[7]

III. THE BRIDGE

A. DESCRIPTION

The Upper Madison (Varney) Bridge is a two-span, steel pin-connected through truss structure. The bridge has a total length of 191.2 feet and is fifteen feet wide with a 14-foot roadway width. The bridge rests on steel tube abutments and the pier is also two steel tubes filled with concrete. The abutments and pier are partially encased in concrete.

Substructure
The bridge consists of steel tube abutments and a pier; all are partially encased in concrete.

Abutment No. 1 (west) consists of two 3′ diameter steel tubes filled with concrete. The west end of the bridge is bolted to the abutment. The abutment is one foot wide. Madison County partially encased the tubes in concrete in 1911. Approximately 3′ 7" of the tubes are exposed above the concrete. Wood plank backwalls are located behind the tubes above the concrete. The concrete has been extended diagonally to the north and south to function as a fender.

Pier. The pier also consists of two 3′ diameter steel tubes filled with concrete. Madison County partially encased the pier in concrete in 1911, which functions as a fender. Approximately 4′ of the steel tube piers are exposed above the concrete. A steel angle section is fixed to the south side of the fender. The east and west ends of the spans rest on steel plates on top of the pier tubes.

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[7] Madison County Commissioners' Journal, book P, pp. 50, 56-57, 62-64; Bullard and Van Hook, "Official Map of Madison County," (Helena: Bullard and Van Hook, 1902), on file at the Montana Historical Society Research Center, Helena, Montana.

Abutment No. 1 (east) consists of two 3′ diameter steel tubes filled with concrete. The east end of the bridge is bolted to the abutment. The abutment is 21′ wide. Madison County partially encased the tubes in concrete in 1911. Approximately 3′ of the tubes are exposed above the concrete. Wood plank backwalls are located behind the tubes above the concrete. The concrete has been extended diagonally to the north and south to function as a fender.

Superstructure
The Upper Madison (Varney) Bridge is a two-span pin-connected Pratt through truss structure. The bridge consists of two 95′ 10" steel truss spans for a total length of 191.2 feet. The bridge is 15 feet wide with a roadway width of 14 feet. The trusses are 18 feet in height from the lower chord to the upper chord. Each span of the bridge consists of five panels each 19′ 2" in length. The 10" x 6" upper chords have continuous metal plates riveted to the top flanges of the channel sections with batten plates to the bottom flanges of the chords. The lower chords are paired punched eyebars that are ⅝" thick and three inches deep. The structure's hip verticals are paired forged ⅞" square rods. The remaining verticals are 4" x 9½" and consist of two laced channel sections. The counters are eyebars and eyebars with turnbuckles. Diagonal members are paired .6" x 2" bars. The sixteen pin-connections at upper and lower chords on both spans are 1⅝" in diameter. The angle section portal braces are arranged in a lattice pattern and cost of paired and single angle sections. Top stop struts are channel sections with laces riveted to the flanges; the top lateral braces are eyebars. Decorative steel builder plates are attached at the east and west portal braces. The plates read: "1897/The King Bridge Co./Cleveland, Ohio." Steel builder's plates are also attached on the right side of the inclined endposts on the east and west portals. Not as ornate as those on the portal bracing, they read: "Built by King Bridge Co./Cleveland Ohio/1897."

The deck is supported by sixteen lines of 4" x 12" timber stringers resting atop a total of eight steel 5" x 12" steel I-beam floor beams. The floor beams are suspended from the vertical posts by U-bolts. Wood planks with running boards function as decking. The guardrails are not original to the structure. They consist of U-shaped steel beams that are salvaged highway guardrails. It is likely the guardrails date to the 1960s or before.

Material
The bridge was constructed by Madison County and it is not known how much steel was utilized by the contractor for its construction.

B. MODIFICATIONS

Other than the sporadic replacement of the timber deck and the removal of the original guardrails, there do not appear to be any modifications to the bridge. All of the original

structural components are intact and functional. Sometime before 1979 the original guardrails were replaced with old steel highway guardrails.

C. OWNERSHIP AND FUTURE

The Upper Madison (Varney) Bridge is owned and maintained by Madison County. The Montana Department of Transportation determined the bridge eligible for the National Register of Historic Places in April 1985. The department programmed the bridge for replacement in 1989, but that project was shelved in 1992 because of public opposition to the project and difficulties associated with an archaeological site located west of the bridge. In 1989, a draft HAER document was prepared by Lon Johnson and Fredric L. Quivik of Renewable Technologies, Inc. of Butte, Montana. The document, however, was never completed and submitted to the National Park Service. Madison County has applied for Treasure State Endowment Program (TSEP) funds to replace the bridge, which would be accomplished entirely with State money. This document was completed in anticipation of the imminent replacement of the structure. It is projected Madison County will replace the bridge is either 2014 or 2015.

IV. BIOGRAPHICAL MATERIAL

The King Bridge Company
Formed by self-taught bridge engineer Zenas King in Cleveland, Ohio in 1858, the King Bridge Company was one of the most prolific builders in the United States by the end of the nineteenth century. Like many of his contemporaries, King was a trained carpenter who later put his expertise to practical use as a bridge builder. King went to work as a salesman for Cincinnati bridge builder Thomas Mosely in 1857 before establishing his own company, the King Iron Bridge & Manufacturing Company, in Cleveland the following year. King specialized in the construction of iron bowstring arch bridges, for which he obtained a patent in 1861. A shrewd businessman, he also hired sales agents all over the eastern and Midwestern United States, including Iowa, Missouri, and Texas to sell the company's products. After the completion of the first transcontinental railroad in 1869, he tried to break into the bridge-building business west of the Mississippi River. To that end, he established fabrication factories in Kansas and a field office in Des Moines, Iowa by the mid-1870s. By 1882, King claimed to have constructed 5,000 bridges – mostly in New England and the Mid-Atlantic states.[8]

By the 1880s, competition between the bridge construction companies was intense throughout the United States as the railroads and local governments sought to improve their infrastructures. Like their counterparts in the railroad and steel industries, the bridge companies were compelled to form pool arrangements whereby certain firms would, in a sense, monopolize the industry in specific areas in the states in which they were active. The pool participants would contribute thirteen percent of their profits on specific projects into the pool "which would then distribute the

[8] Allan King Sloan, "Discovering Zenas King," paper presented at the annual meeting of the Society for Industrial Archeology, Savannah, Georgia, June 1999.

accumulated sums to the participants based on the size of the company."[9] Although never entirely legal, this was a method companies used in highly competitive markets to ensure work and maximize profits. While the county governments often conspired with the bridge companies, they did not always receive a good bridge in the bargain. In at least two instances, bridges constructed by King's company suffered catastrophic failures. Zenas King and six other companies formed a successful bridge pool in 1883. Bridge pooling was certainly a common practice in Montana beginning in the 1890s. Still, there is no direct evidence that the King company was a participant in the practice in the state. Other companies active in the state at that time, such as William S. Hewett of Minneapolis, the Billings, Montana-based Security Bridge Company, and O. E. Peppard of Missoula, Montana, were inarguably involved in bridge pooling during this period.[10]

Just prior to his death in October 1892, Zenas King finally broke into the Montana bridge market with the construction of two bridges in Madison County. Both were pin-connected Pratt through trusses. One crossed the Big Hole River near Twin Bridges and the other the Jefferson River near Iron Rod (MT-63). With Zenas's death, his son, James, took over control of the firm and renamed it the King Bridge Company. Under James's leadership the company finally became a prolific bridge builder in the western United States. Evidence suggests that while the company frequently bid on county bridge projects, it was not often successful because of the state's pre-existing bridge pool agreements. For the Upper Madison (Varney) Bridge, however, pooling apparently played a role in King obtaining the contract to build the structure. Although C. E. H. Campbell submitted the low bid for the bridge, the Madison County Commissioners still awarded King the contract.[11]

The company was successful in Lewis and Clark County, obtaining the contract to building the Dearborn River High Bridge (HAER No. MT-23) in 1897, the Elk Creek (24LC1168), Smith Creek, and Flat Creek (24LC1167) bridges in the northern part of the county in 1901. The company also constructed bridges across the Jefferson River in 1897, the Blaine Springs Creek Bridge (HAER No. MT-63) in 1898, and the Musselshell River in central Montana in 1900. There are, undoubtedly, more King-built bridges in Montana that have either been demolished or have not, as yet, been identified. But as the pooling agreements solidified after the turn-of-the-twentieth century, the King Bridge Company was increasingly edged out of the Montana market by the Montana and Minnesota based companies. The Minnesota companies had direct access to Montana over the Northern Pacific and Great Northern railroads. They also had active field offices in the state, while the King Bridge Company did not. There was also a definite swing by

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[9] Sloan, Ibid.

[10] Sloan, Ibid; Jon Axline, *Conveniences Sorely Needed: Montana's Historic Highway Bridges, 1860-1956*, (Helena: Montana Historical Society Press, 2005), 31, 34; Fredric L. Quivik, *Historic Bridges in Montana*, (Washington DC: National Park Service, 1982), 33, 38-39, 41, 43.

[11] Sloan, "Discovering Zenas King; Axline, *Monuments Above the Water: Montana's Historic Highway Bridges*, (Helena: Montana Department of Transportation, 1992), 8, 10.

the county commissioners in favor of the Montana-based firms, specifically the Security Bridge Company and O. E. Peppard.[12]

With the inclusion of markets in the western United States, the King Bridge Company increased its bridge shop output from 18,000 to 30,000 tons of steel per year between 1894 and 1903. It was the largest bridge company based in Ohio and was, nationally, second only to the Pennsylvania-based American Bridge Company. During the first decade of the twentieth century, the federal government aggressively sought to break up the bridge pools through enforcement of the 1890 Sherman Anti-Trust Act. Because the pool agreements, however, were not formal pacts, but were more "gentleman's" agreements, the government had a difficult time eliminating something that was advantageous to industry and the county governments. Consequently, other means were sought to break the power of the pools. The Good Roads movement and the U.S. Department of Agriculture tried to remedy the situation by promoting modern, scientifically engineered bridges and the creation of state highway departments to oversee road and bridge construction in the states. Standardized and efficient bridges that would best serve the public good were an important part of the Progressive reform movement of the early twentieth century. Through legislation beginning in 1903 and culminating in the Federal Aid Road Act of 1916, the federal government sought to end the "good old boy" system by giving the state and federal governments more influence on road and bridge construction.[13]

In 1913, the Montana State Legislature formed the Montana State Highway Commission. Two years later, the highway commission created a bridge department to standardize bridge designs in the state and provide oversight to the counties for the bridge construction process. This development spelled the doom of the bridge construction companies in Montana, including the King Bridge Company. Instead of highly individualized structures built, essentially, by non-professional engineers, the state's infrastructure was increasingly dominated by riveted Pratt and Warren through and pony truss bridges. The loss of a previously lucrative market is likely what caused the King Bridge Company to branch out into the construction of prefabricated steel building frames rather than concentrating only on bridges. By 1923, declining revenues caused the King Bridge Company to go out of business.[14]

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[12] Sloan, "Discovering Zenas King;" Axline, *Conveniences Sorely Needed*, 40-41.
[13] Axline, *Ibid*, 59.
[14] Sloan, "Discovering Zenas King;" Axline, *Conveniences Sorely Needed*, 60-61; Federal Highway Administration, *America's Highways, 1776-1976*, (Washington DC: U.S. Department of Transportation, 1976), 80-81; State Wide Highway Planning Survey, *History of the Montana State Highway Department, 1913-1942*, (Helena: Montana State Highway Commission, 1943), 9-11; Quivik, *Historic Bridges*, 43-44;George R. Metlen, *Report of the Montana State Highway Commission, 1915-1916*, (Helena: Montana State Highway Commission, 1916), 4-8.

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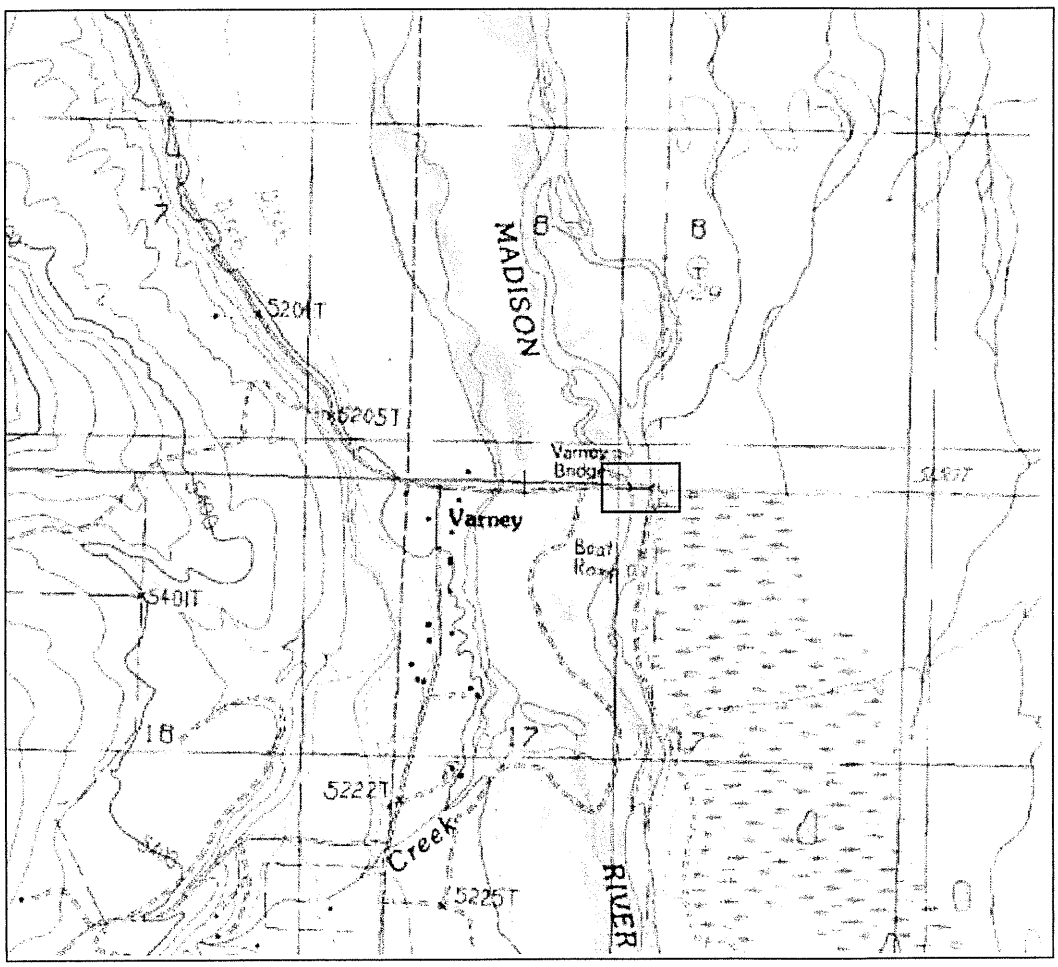

Varney, Montana USGS Quadrangle Map, 1988