

HISTORIC AMERICAN ENGINEERING RECORD

WARD'S CROSSING BRIDGE (Ward's Bridge)

HAER No. AR-70

LOCATION: Spanning Fourche LaFave River at Sunlight Bay Road (CR 8), Plainview vicinity, Yell County, Arkansas
UTM: 15.470047.3866944, Plainview, Arkansas Quad.

AHTD #: 17693

STRUCTURAL TYPE: Camelback through truss

CONSTRUCTION DATE: 1905

FABRICATOR: Converse Bridge Company, Chattanooga, Tennessee

OWNER: Yell County, Arkansas

USE: Vehicular bridge

SIGNIFICANCE: Ward's Crossing Bridge is highly representative of the late nineteenth century era of metal truss bridge technology and the period of Arkansas history that saw the development of county road systems, prior to the establishment of the Arkansas State Highway Commission. It is one of the only three surviving camelback truss bridges in Arkansas.

HISTORIAN: Researched and written by Lola Bennett, Summer 2005

PROJECT INFORMATION: The Arkansas Historic Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program that documents and interprets historically significant engineering sites and structures in the United States. HAER is administered by the Heritage Documentation Programs Division of the National Park Service, United States Department of the Interior. The Arkansas State Highway and Transportation Department cosponsored and funded this project.

Chronology

- 1819 Arkansas Territory created from part of Louisiana Purchase
- 1824 Le Fevre River appears on 1824 map of Arkansas
- 1836 Arkansas admitted to the Union
- 1840 Yell County established
- 1840 America's first all-iron bridge built on Erie Canal at Frankfurt, New York
- 1844 Thomas and Caleb Pratt patent the Pratt truss
- 1845 Augustus M. Ward settles in Yell County
- 1850 First all-metal Pratt truss constructed
- 1874 Structural steel first used in bridge construction in the Eads Bridge, St. Louis, Missouri
- 1875 Arkansas State Legislature authorizes counties to build and maintain bridges
- 1876 Ward's Crossing appears on Frank A. Gray's map of Arkansas
- 1879 Yell County begins building metal truss bridges
- 1890 Yell County population 18,015
- 1890 William Converse establishes Converse Bridge Company at Chattanooga, Tennessee
- 1904 *Dardanelle Post-Dispatch* reports work on road from Ward's Crossing to Hot Springs
- 1905 Ward's Crossing Bridge completed
- 1906 Dardanelle, Ola & Southern Railway Co. builds line from Dardanelle to Ola, Arkansas
- 1906 Town of Plainview platted on railroad line northwest of Ward's Crossing Bridge
- 1908 *Dardanelle Post-Dispatch* calls Plainview "a prosperous and enterprising little city"
- 2005 Ward's Crossing Bridge recorded by the Historic American Engineering Record

Introduction

Bridges were rare in Arkansas until the late nineteenth century. Crossings over most rivers were by ford or ferry, both often unreliable and dangerous. Although wood and stone spans were built in some instances, there were few bridges in Arkansas until after the Civil War, by which time iron and steel truss bridges dominated American bridge building.

The rise of specialized bridge building firms in the 1860s and 1870s occurred in response to the rapid growth of American railroads and the concomitant demand for strong, economical, and efficient railroad bridges. Iron manufactories specialized in the fabrication of standard truss bridge designs that could be shipped to the site by rail and erected quickly by local workmen. These companies found an eager market in town and county governments seeking strong and affordable prefabricated iron bridges.

Ward's Crossing Bridge is highly representative of the era of metal truss bridge technology, when standardized bridges were mass-produced in fabrication shops, shipped by rail to sites throughout the country, and erected by local workmen. Yell County had the bridge built in accordance with the *Acts of Arkansas* of 1875, which authorized counties to build and maintain bridges. It represents the period of Arkansas history that saw the development of county road systems, prior to the establishment of the Arkansas State Highway Commission. Ward's Crossing Bridge is one of three surviving camelback truss bridges in Arkansas:

HAER AR-70	#17693	Ward's Crossing Bridge	Yell County	1905	160'	Converse Bridge Co.
HAER AR-44	#20103	Little Missouri River Bridge	Clark County	1908	177'	Southwestern Bridge Co.
HAER AR-66	#15731	Nimrod (Wallace) Bridge	Perry County	1908	180'	Southwestern Bridge Co.

Description

Ward's Crossing Bridge is a single-span, pin-connected camelback through truss bridge on concrete filled cylinder piers. The bridge has a 159'-9" span and is 240' long overall, including a timber stringer approach span at each end. The trusses are spaced 15' apart, with a roadway width of 14'. The bridge is 26' high at center span and 20'-3" high at the portals. Clearance is 12'-0".

The nine-panel trusses have polygonal upper chords of five straight segments, including the inclined endposts. The upper chords and inclined endposts are riveted, built-up 8"x12" members, comprised of back- to-back channels connected by a solid plate on top and lacing bars underneath. The lower chords are paired forged eyebars, measuring 7/8"x2" in panels 1, 2, 8 and 9, 7/8"x2½" in panels 3 and 7, and 7/8"x3" in the center panels. The upper and lower chords are connected by built-up 6¼"x12" posts and paired 1" square loop-ended tension bars angling up towards the ends. The four center panels have paired ¾" diameter tension rods with turnbuckles angling in both directions. The trusses are braced overhead with web panels, comprised of

angles and gussets, at each panel point. The trusses are connected at the upper chord with 1¼" diameter pins and at the lower chord with 2½" or 2¾" diameter pins. The pins pass through (from the outside) the lower lateral bracing, the eye of the lower chord, the eye of the diagonal rod, and the deck beam hangers. The pins are secured with a 3/8"x5" cotter pin at each end.

The deck system consists of transverse steel deck beams, longitudinal steel stringers and a transverse wood deck. The 6-7/8"x12" steel deck beams are suspended below the lower chord by U-bolt hangers that loop over the pins at each lower chord panel point and are fastened underneath with a plate and nuts. There are six lines of 4"x10" steel stringers on top of the deck beams. The wearing surface of the deck is wood planks laid transversely on the stringers with wood plank running boards.

Upper lateral sway bracing consists of 1"-diameter rods with threaded ends, which cross between panel points. Lower lateral bracing consists of 1"-diameter rods crossing between the deck beams and secured their ends with brackets and nuts. There is additional sway bracing over the portals. A builder's plate is attached to the portal bracing at each end of the bridge.

History

Until the late nineteenth century, the Fourche LaFave and Petit Jean rivers were the main transportation corridors in Yell County. According to historian Wayne Banks, roads were "*little more than trails and some of these not too well marked.*"¹ There were few, if any, bridges, and fords or ferries were used to cross rivers. In 1879, four years after the Arkansas State Legislature authorized counties to finance, build and maintain bridges, Yell County constructed its first metal truss bridges over the Petit Jean River.²

While no written documentation has been found regarding the history of Ward's Crossing, Yell County land records and census records show that Samuel Ward and Augustus Ward were among the early settlers of this region. The name "Ward" shows up near this location on maps from the 1870s on, and this site was presumably a ford or ferry crossing.³ Shortly after the turn of the century, Yell County initiated a series of bridge construction projects that included erecting a bridge at this site. Although details of its construction are lacking, county records and contemporary newspaper accounts suggest that the county appropriated funds to construct an iron bridge "*at or near Ward's crossing*" in the fall of 1904, and that the bridge was completed the following year at a cost of \$9,998.⁴

¹ Wayne Banks, *History of Yell County, Arkansas* (Van Buren: The Press-Argus, 1959), 62.

² Banks, 68.

³ Further research in *Yell County Court Records* might determine whether there was a licensed ferry here.

⁴ *Dardanelle Post-Dispatch* (Dardanelle, Arkansas), 24 November 1904.

Builder

In 1890, William H. Converse formed the Converse Bridge Company at Chattanooga, Tennessee. The firm erected metal truss bridges in Tennessee, North Carolina, Alabama, Arkansas, and presumably other southern states. The firm's practice held steady until the Depression, when it began to concentrate more on structural steel for buildings. The firm was sold in 1957 to the Mississippi Valley Steel Company. The Sisken Steel & Supply Company of Chattanooga now owns it.

Design

In 1844, railroad engineer Thomas Pratt and his father, Boston architect Caleb Pratt, received a patent for a wood and iron truss with vertical members in compression and diagonal members in tension. A reversal of the 1840 Howe truss, the Pratt truss shortened the compression members and reduced the danger of buckling. Developed at a time when railroads were placing new demands on bridges and the structural action of trusses was just beginning to be understood, the Pratt truss was one of several truss types that heralded the transformation from empirical to scientific bridge design. While the type was not immediately popular for wood spans, the Pratt truss came to be favored for its straightforward design, strength and adaptability, and by 1870, in a simplified all-metal version, it had become the standard American truss for moderate road and railroad spans, and remained so well into the twentieth century.

In the latter decades of the nineteenth century, engineers introduced a number of modifications to the standard Pratt truss, in order to use the configuration in a wider range of structures. One such modification was a polygonal upper chord, which increased the depth of the truss at the center of the span where the greatest bending moments occur, thereby permitting longer spans without substantially increasing the cost. As bridge engineer Charles H. Hoyt observed in 1911:

The Pratt type of truss, more or less modified frequently in consequence of the varying depth of truss, is much used and makes an excellent style of bridges. It is adapted to almost any length of span from 100 feet up.⁵

The most economical variation of the "curved chord" Pratt truss was the camelback truss, with a polygonal upper chord of exactly five slopes, the minimum number needed to achieve the benefits of the polygonal shape. The camelback truss was popular well into the twentieth century for spans of about 130' to 200'.

⁵ Charles H. Hoyt and William H. Burr, *Highway Bridges and Culverts* (Washington: U.S. Department of Agriculture, Office of Public Roads, 1911), 20.

Appendix A: Field Photographs



Perspective view
above; detail to right.
Field photographs
taken by Lola Bennett.



Sources

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