

BARON FORK BRIDGES
Arkansas Bridges 2005
Spanning Baron Fork Creek and Bush Creek Tributary
Morrow vicinity
Washington County
Arkansas

HAER AR-69
AR-69

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

BARON FORK BRIDGES¹

HAER No. AR-69

Location: Spanning Baron Fork Creek and Bush Creek Tributary, Morrow vicinity, Washington County, Arkansas
Bush Creek Bridge spans Baron Fork, Bush Creek, at Old CR 11 while Bush Creek Tributary Bridge spans Bush Creek Tributary at CR 3412

UTM: Bush Creek Bridge: 15.368808.3971024, Lincoln, Arkansas Quad.
Bush Creek Tributary Bridge: 15.368786.3970983, Lincoln, Arkansas Quad.

Structural Type: Concrete arch

Construction Date: 1922

Builder: Luten Bridge Company, Knoxville, Tennessee

Owner: Washington County, Arkansas

Use: Vehicular bridges

Significance: The Baron Fork Bridges are highly representative of the designs of engineer Daniel Luten, a pioneer in reinforced concrete bridge construction.

Project Information: The Arkansas Historic Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program that documents 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, Richard O'Connor, Manager. The Arkansas State Highway and Transportation Department sponsored this project.
Lola Bennett, HAER Historian, 2007

¹ Baron Fork Bridges is a collective name for two structures: Bush Creek Bridge and Bush Creek Tributary Bridge. Baron is also sometimes spelled "Barron" or "Barren."

Chronology

- 1803 Louisiana Purchase doubles size of the United States
- 1816 World's first major concrete arch bridge built at Souillac, France
- 1819 Arkansas Territory created from part of Louisiana Purchase
- 1828 Washington County formed
- 1836 Arkansas becomes 25th state to join the Union
- 1867 Joseph Monier experiments with reinforced concrete in France
- 1869 Daniel B. Luten born at Grand Rapids, Michigan
- 1871 David O. Saylor of Philadelphia begins manufacturing Portland cement
- 1872 America's first concrete bridge built at Brooklyn, New York
- 1873 Arkansas Legislature authorizes counties to build and maintain bridges
- 1889 America's first reinforced concrete arch bridge built at San Francisco, California
- 1894 Daniel Luten earns civil engineering degree at University of Michigan
- 1896 Delegates from 44 counties form the Good Roads League of Arkansas
- 1900 Daniel Luten receives the first of 39 patents for reinforced concrete bridge construction
- 1902 Daniel Luten organizes the National Bridge Company at Indianapolis, Indiana
- 1909 Luten Bridge Company incorporated at York, Pennsylvania
- 1913 Arkansas State Highway Commission created
- 1916 Federal Aid Road Act appropriates federal funds for state road construction
- c1920 C.S. Daugherty establishes Luten Bridge Co. branch office at Knoxville, Tennessee
- 1922 Baron Fork Bridges erected
- 1945 Daniel Luten dies at Indianapolis
- 1955 Baron Fork Bridges bypassed
- 1994 Baron Fork Bridges listed on National Register of Historic Places

Description

The Baron Fork Bridges are single-span closed-spandrel reinforced concrete deck arch bridges located nearly perpendicular to each other. Bush Creek Bridge is 80' long, 14' wide and 20' high. A builder's plate, embedded in the parapet wall, reads: "DESIGNED AND BUILT BY LUTEN BRIDGE CO., KNOXVILLE, TENN., 1922." Bush Creek Tributary Bridge is 23' long, 14' wide and 12' high. Both bridges have concrete parapets and wing walls.

The concrete reinforcing system is presumably typical of other filled-spandrel Luten bridges: a set of longitudinal rods placed near the lower edge of the arch ring at the crown (and near the top edge of the arch ring at the haunches) and woven together with an accordion-like transverse strap. Additional sets of tension rods integrate the arch with the spandrels and abutments.²

History

On October 27, 1921, the Washington County Court heard thirteen petitions requesting new bridges throughout the county. Judge Ernest Dowell appointed H.C. Evins and Bruce Holcomb commissioners to examine the proposed locations and determine which sites required bridges. This site, used as a ford since the mid-nineteenth century, was one of the locations selected by the bridge commissioners. On March 23, 1922, the county awarded a contract to Luten Bridge Company for the erection of seven bridges:

*Clear Creek bridge, one-fourth mile south of Johnson; Moore Creek bridge, six miles northeast of Prairie Grove; Bush Creek bridge, six miles south of Lincoln; Jordan Creek bridge, one mile west of Lincoln; Farmington-Viney Grove Road bridge, four miles north of Prairie Grove; Fayetteville-Zion road bridge, three miles north of Fayetteville.*³

The Baron Fork Bridges were completed in the fall of 1922.

In 1955, Washington County widened and straightened County Road 11 and erected a modern concrete slab bridge approximately 75 yards west of this site. The Arkansas Highway Department supervised this project under the Federal Aid program. The Baron Fork Bridges were retained for use by local traffic, but only Bridge No. 2 remains in service.

Design

Concrete bridges first appeared in Europe in 1840 and in the United States in 1872, but the technology remained largely experimental until the end of the nineteenth century.⁴ Concrete has little tensile strength, so early concrete bridges were constructed as solid barrel, filled arches that worked solely in compression and relied on a substantial mass of material to carry loads. Beginning in 1854, when William Wilkinson obtained a British patent for reinforcing concrete with wire rope, European and American inventors experimented with ways of combining the

² Daniel B. Luten, U.S. Letters Patent No. 649,643, 15 May 1900.

³ "Eight New Bridges Planned for County," *Fayetteville Daily Democrat*, 8 March 1922 and "Contract for Seven Bridges Awarded," *Fayetteville Daily Democrat*, 23 March 1922, 1.

⁴ The 39' Caronne Canals Bridge at Grisoles, France, is reportedly the world's first concrete bridge. The first in the United States was Cleft Ridge Span in Brooklyn, New York (see HAER No. NY-336).

compressive properties of concrete with the tensile strength of iron, to produce stronger, lighter, more cost efficient structures. In 1875, French gardener Joseph Monier (1823-1906) became one of the first individuals to apply reinforced concrete technology to bridges.⁵

In 1889, a decade and a half after Monier's pioneering experiments, concrete contractor Ernest L. Ransome (1844-1917) built America's first reinforced concrete bridge in San Francisco.⁶ The modest 20' span was scored and roughened to imitate a traditional masonry bridge and even had artificial stalactites on the intrados. Beneath the facade, however, was a modern concrete structure, with twisted iron rods embedded in the specific areas where tension forces occur. Ransome's concrete reinforcing system was widely used throughout the United States in the twentieth century.

Throughout the 1890s and early 1900s, other engineers, including Joseph Melan (1853-1941), Fritz von Emperger (1862-1942), Edwin Thacher (1840-1920) and Daniel Luten (1869-1945), aggressively developed and promoted the new technology. Reinforced concrete bridges were durable, aesthetic and cost effective. They used readily available materials, could be built by local laborers and required less maintenance than other types of bridges. In the early twentieth century, with the advent of the automobile and demand for improved roads, reinforced concrete became the preferred material for bridges in the United States.

Builder

Michigan native Daniel B. Luten (1869-1945) was a pioneer in reinforced concrete bridge construction. Luten received a degree in Civil Engineering from the University of Michigan in 1894 and subsequently taught arch design and hydraulic theory at Purdue University. In 1900, he moved to Indianapolis, where he organized a consulting practice specializing in the design and construction of concrete arch bridges. After a period of experimentation, Luten settled on an integrated reinforcing system using a large number of small reinforcing bars that allowed a reduction in the structure's overall mass.⁷ By 1915, Luten held thirty-nine patents, had agents in thirty-six states, was widely published in engineering journals and was credited the design of about 6,000 bridges in the United States, Canada and Mexico.⁸

In 1909, A.B. Whittaker, John Whittaker, Lucius G. Brown and G.W. Drury incorporated the Luten Bridge Company at York, Pennsylvania. The firm, which specialized in the construction of reinforced concrete buildings and bridges, established branch offices throughout the eastern United States and soon was one of Daniel Luten's most successful agent companies. Around 1920, Scott (C.S.) and Harold (D.H.) Daugherty established branch offices at Knoxville, Tennessee and Little Rock, Arkansas. Both of these offices conducted extensive work in Arkansas, where at least a dozen Luten bridges survive.

⁵ The Pont de Chazelet (1875), a 52' reinforced concrete pedestrian bridge, still survives in France.

⁶ See HAER No. CA-33, Alvord Lake Bridge.

⁷ James L. Cooper, *Artistry and Ingenuity in Artificial Stone: Indiana's Concrete Bridges 1900-1942* (Greencastle, Indiana: Depauw University, 1994), 47.

⁸ Daniel B. Luten, *Reinforced Concrete Bridges* (Indianapolis: National Bridge Co., 1924), 1.

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