

ANDREW J. SULLIVAN BRIDGE
(Kentucky Route 904 Bridge)
Spanning Cumberland River
Williamsburg vicinity
Whitley County
Kentucky

HAER No. KY-31

HAER
KY
118-WILBU.V,
2-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

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**ANDREW J. SULLIVAN MEMORIAL BRIDGE
(Kentucky Route 904 Bridge)**

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Location: State Highway 904 spanning the Cumberland River
Southeastern section of Whitley County, Kentucky

U.S.G.S. 7.5 minute Saxton, Kentucky Quadrangle,
Universal Transverse Mercator coordinates
16.758660-4069840

Date of Construction: 1928

Engineer: Daniel J. Luten

Builder: Luten Bridge Company, York, Pennsylvania

Present Owner: Kentucky Department of Highways
Old State Office Building
Frankfort, Kentucky 40601

Present Use: Vehicular Bridge
To be demolished in 2000

Significance: The Kentucky 904 Bridge spanning the Cumberland River is one of only two surviving bridges in Kentucky constructed by the Luten Bridge Company. The bridge was determined eligible for the National Register of Historic Places as part of a statewide bridge study, *A Survey of Truss, Suspension, and Arch Bridges in Kentucky*, completed in 1982.

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DESCRIPTION:

The KY 904 Bridge over the Cumberland River is a three span, concrete arch, deck truss constructed by the Luten Bridge Company in 1928. Determined eligible for the National Register of Historic Places in 1982, the structure was originally one of only four Luten Bridges erected in the state. Presently only two concrete arches attributed to this company are extant in Kentucky, both located within the borders of Whitley County.

The KY 904 Bridge is a three span, concrete arch, deck truss that crosses the Cumberland River in the southeastern part of rural Whitley County. The bridge lies just south of the intersection of KY 904 and KY 92, an older east/west arterial serving southeastern Kentucky. At 335 ' x 18.7 ' the bridge deck is extremely narrow, barely accommodating two lanes of traffic. The concrete arches, visible only from below, support the cantilevered, reinforced, floor beams which in turn support the deck. The hollow, or dirt filled arches rest atop concrete piers. The floor beams are either I-beams or heavily reinforced steel rods encased in concrete. The floor beams on this structure do not extend across the shallowest part of the arch. The parapet side walls are undecorated save for incised panels on both the exterior and interior facades. The interior surface displays three bridge dedication plates imbedded in the concrete surface. Two of these plates are located on the east parapet wall: the first records the date of construction and bridge company. The second presents the county fiscal court members, county judge, attorney, clerk, and engineers who contracted with the Luten Bridge Company. The third designates the structure as the Sullivan Memorial Bridge, in memory of Andrew J. Sullivan, born August 18, 1852 and died August 17, 1924.

The 1982 Kentucky Department of Highways inventory documented forty-one concrete arch bridges in the Commonwealth, thirty-five deck arches, five open spandrel, deck arches, and only one open spandrel, through arch. Four of those were constructed by the Luten Bridge Company of Pennsylvania and Tennessee. Only two Luten structures are extant on the Kentucky system, and both are located in Whitley County. The *Survey of Truss, Suspension, and Arch Bridges in Kentucky (1982)* documented 35 bridge companies, that constructed 190 identifiable structures within the state. Although these firms were located in nine different states, the majority of Kentucky's bridges were built by Ohio companies. Only two companies from Tennessee, the Luten Bridge Company and the Nashville Bridge Company were documented as having built any trusses in Kentucky.

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During the last part of the nineteenth century developments in the professions of architecture and engineering began a movement that came to be known as the City Beautiful. This movement owed a large debt to the 1893 World Columbian Exposition in Chicago. Designed to celebrate the four-hundredth anniversary of the first voyage to the western hemisphere by Christopher Columbus, the exposition took on a secondary and perhaps more important focus on the arts, manufactures, and architecture. An ensemble of buildings known as the White City was planned by the nation's top architects and engineers, and boasted over one hundred miles of concrete walkways and bridges, designed to connect the exposition buildings. The overall theme for the exposition was classical design, and the concrete arch fit well into this stylized plan.

Portland Cement had been patented in Leeds, England in 1848, and in 1871 an American, David O. Saylor patented an equivalent material and built a mill to manufacture the product. The nation's first concrete arch bridge was constructed by Frederick Law Olmstead in a Brooklyn park in the 1870s. The development of high tensile steel allowed the construction of reinforced concrete trusses which were superior to plain concrete. Concrete has the same properties as stone, strong in compression and weak in tension. The steel reinforcing permitted the economic construction of longer trusses without the added cost of materials. The elasticity of the concrete with the strength of the steel also gave engineers a greater freedom of design. The masonry arch, which has been used in bridge construction since its inception, reached a design zenith with the reinforced concrete system.

The reinforced system of steel ribs encased in concrete had its inception in France in 1873 when Joseph Monier patented a bridge composed of iron rods in concrete or "armed concrete." Several U. S. patents were issued for reinforced concrete systems and one of the first was given to Daniel Luten, who became one of the nation's most influential concrete bridge engineers of the early twentieth century.

Daniel Luten was born in 1869 near Grand Rapids, Michigan, and studied engineering at the University of Michigan from 1890 to 1894. After graduation he served as instructor of Civil Engineering and Surveying at that university for about one year. He then moved to Purdue University in Indiana and taught Architectural and Sanitary Engineering. While at Purdue he married, Edith Hull of Lafayette, Indiana. Luten believed that college professors were too preoccupied with scientific theory and therefore not generally leaders in engineering. In 1900, Luten secured his first patent for a reinforced arch bridge. Luten had generally felt that earlier reinforced

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structures relied too heavily on the use of metal rods, and not enough on the elasticity of the concrete and the proper placement of the rods. To advertise his newly acquired patent, Luten published a catalog for the "Timber-Tie Concrete Arch Company." Although he acquired a contract to build one of his patents near Lafayette, no other orders came in as a result of the catalog. Luten continued to develop his design and with money advanced from his wife and sister-in law organized the National Bridge Company. Luten moved his headquarters to Los Angeles and designed and built three concrete bridges during the first part of 1901. By the end of that year, Luten had contracted and built seventeen bridges, in California, Michigan, and Indiana. In 1902, the family moved to Indianapolis, and secured the services of a Chicago patent attorney to protect some of Luten's early designs. Seven patents were awarded between 1902 and 1911 including the steel-tied arch, the ring-stiffening spandrel, and a Luten-designed arch-ring reinforcing method.

The early years of the National Bridge Company were not profitable ones, but by 1903 Luten secured a contract with Indianapolis Northern Traction Railway for nearly forty percent of the seventy-five bridges that the company erected that year. To improve profits, Luten organized the National Concrete Company, separating bridge construction from the design process. The spring flood of 1913 did much to promote Luten and his designs. Although more than one hundred steel and timber bridges were destroyed, all of Luten's twenty-two hundred trusses survived.

The catalog Luten published in 1908 featured bridges constructed in twelve states. By 1915, Daniel Luten held thirty-nine U.S. patents, more than all other bridge patentees combined and had designed about six-thousand bridges throughout the United States, Canada, and Mexico. That same year he published a pamphlet titled *Why Indiana leads the World in Concrete Bridges*. Considering the influence of this one man and the impact he had upon bridge engineering and architecture in the first quarter of the twentieth century, he could easily be allowed to boast .

Although Luten designed all three types of reinforced concrete arch, the filled deck, the open spandrel deck, and the open spandrel through arch, he consistently preferred to build the massive, filled, deck arch. The KY route 904 bridge in Whitley County is a fine example of the type of elegant, but strong structures designed by this engineering master.

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