Research restores credit for an engineering feat

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a world-class feat of engineering that stands a couple miles northwest of Washington - are the names of builders and officials of the day.

A key name, however, is missing.

New research shows that Virginian Alfred R. Rives led the design and construction of the Cabin John Bridge. Also called the Union Arch Bridge, the aqueduct and roadway reaches 220 feet across Cabin John Creek in a single span - the world's longest single-span masonry bridge for nearly 40 years and the nation's longest still today.

Rives had the training and knowledge to design and build such a span, and records, drawings and structural analyses show he did the work, say Dario Gasparini, a professor of civil engineering at Case Western Reserve University, and David A. Simmons, a bridge expert at the Ohio Historical Society. Their research is published in the new issue of the American Society of Civil Engineers' *Journal of Performance of Constructed Facilities*.

"This is a unique bridge in the United States that no one before 1850 and no one afterward had the audacity to try," said Gasparini, who studies structures and the history of structural engineering. "Rives had a unique set of theoretical skills and construction skills that no other engineer in the U.S. had at that time."

After digging through records in Washington, Virginia, North Carolina,

and France, "We don't have any smoking gun but all the documents point to Rives," Simmons said. "The reason the bridge is there is Rives suggested it… and had the knowledge to actually do it."

The essential structure was complete when Rives, a government civil engineer, resigned to join the confederacy. While the name of then-Secretary of War Jefferson Davis, who left the government to become president of the confederacy, was removed and later restored to the bridge, Rives has not received the same recognition.

His absence among the names reflects a deeply personal rift created by the war, the researchers say.

Rives was a graduate of Virginia Military Academy. With the help of his father, William Cabell Rives, the U.S. minister to France, he was the first American admitted to the Ecole des Pont et Chausees, the world's leading structural engineering school in the 19th Century. He graduated at the top of the class of 1854.

Lieutenant Montgomery C. Meigs, a West Point graduate and member of the Corps of Engineers, hired Rives in 1855. Meigs was the chief engineer of the Washington Aqueduct project to supply Washington, D.C., with drinking water from the Potomac River at Great Falls, Md..

He had planned a six-arch bridge over Cabin John Creek, and Rives quickly showed it could be done with five arches. Rives, according to records of a colleague in the engineering department, then suggested a design based on the Grosvenor Bridge, a 200-foot single span bridge in Chester, England.

Meigs wrote in his journal he'd like to build "such a one."

Meigs and Rives worked together on a design that called for granite

from Quincy, Mass., for the main arch. The researchers found that Rives drew plans for the 131 wedge-shaped stones, called voussoirs, that support the arch. These were detailed down to one-one thousandth of an inch, requiring the stones be finished on a rubbing bed as was done for some of the stonework for the Capitol. More documents show Rives' conceptual design, calculations and structural analyses, and detailed designs of the single span.

Rives was put in charge of construction in 1857 and wrote with pride to family members about the progress made that year and the next, when the keystone, or the central voussoir, was installed to complete the arch and make the span stable.

Over the next four years, funding interruptions and the change to the Lincoln administration put construction on hold. With a small amount of funding, Meigs and Rives began to collaborate again; some of the sandstone walls and interior brickwork were completed, and on March 18, 1861, Meigs issued an order for an inscription that included both their names.

But, Virginia seceded April 17, 1861 and Rives resigned and left for home, where he eventually served as acting chief of the Engineer Bureau of the Confederate States.

Meigs served as quartermaster general of the Union Army. He shunned his former assistants who joined the South and his feelings were hardened when his son, John Rodgers Meigs, a recent West Point graduate, was killed in the war.

During the war, the Department of the Interior took over the bridge project, which began carrying water to the Capitol in 1864.

Instead of Rives' name, Civil Engineer Esto Perpetua's name was

inscribed along with Meigs' on the east bridge abutment.

After the war, Meigs refused to see Rives. When challenged on his claims that he designed and built the bridge, Meigs vehemently argued that others played nothing more than a draftmans ' role.

Historians who have given Meigs credit for the design and construction of Cabin John Bridge relied heavily on Meigs' journals alone, the researchers say. Gasparini, a veteran professor of bridge engineering, and Simmons, who has been reviewing historic bridges for decades, find that Meigs sketched the bridge, but the records show Rives suggested the design, did the structural analysis as he learned in France, oversaw or did the detailed designs himself and led the construction of the structure that continues to carry water to Washington nearly 150 years later.

Provided by Case Western Reserve University