

# MOVABLE BRIDGE HALL OF FAME

## J.A.L. Waddell

### Inventor of the Vertical Lift Bridge



John Alexander Low Waddell was born in Port Hope, Ontario, Canada, on January 15th, 1854. He attended public school in Port Hope and then attended Rensselaer Polytechnic Institute, in Troy, New York, where he graduated with a degree in civil engineering in 1875. He began his professional career as a draftsman in the Marine Department of Ottawa, Canada, where he spent a few months designing buoys, lanterns, and similar marine appliances.

He had a series of jobs after that, including rodman on the Canadian Pacific Railway in western Canada, engineer for a coal mining company in West Virginia, where he did the surveying both above and below ground, and designed and built a ventilating shaft and other mine structures; and chief engineer for a bridge building firm in Iowa.

In 1882, Waddell was invited by the Japanese government to take the position of Chair of Civil Engineering in the Imperial University of Tokyo. He remained there for four years, writing his first book, *The Designing of Ordinary Iron Highway Bridges*, (1884, Wiley & Sons) and his second book, *A System of Iron Railroad Bridges for Japan*, published in 1885.

Upon his return to the United States, he became the western representative for the Phoenix Bridge Company in Kansas City, Missouri. On January 1, 1887, he opened his own private practice located in St. Louis MO. The firm name evolved over the next several decades as Waddell took on partners. In 1897 it became Waddell & Hedrick and in 1908 it became Waddell & Harrington. After parting ways with Harrington in 1915, Waddell teamed with his son Needham Everett Waddell to form Waddell & Son and soon after moved the firm to New York City. After the departure of his son, he partnered with longtime employee Shortridge Hardesty to form Waddell & Hardesty (changed to Hardesty & Hanover in 1945).

One of Waddell's first jobs was the reconstruction of the bridge over the Missouri River at Fort Leavenworth, Kansas. Waddell soon became widely known for his movable bridge designs. In 1893, his Halsted Street Bridge over the South Branch of the Chicago River, constructed for the City of Chicago, became the world's first modern vertical lift bridge. In the years that followed, Waddell continued to be an innovator in movable bridge design and took out numerous patents for improvements to movable bridges. Over the years, he



THE HALSTED STREET BRIDGE WAS THE WORLD'S FIRST MODERN VERTICAL LIFT BRIDGE.

continued to apply innovative thinking to his bridge designs. The Armor, Swift, Burlington Bridge in Kansas City, for example, completed in 1917, was designed as a double-decker vertical lift bridge with the lower level carrying rail traffic and the upper level vehicular traffic. When the lift was raised, the lower level telescoped upwards so as not to prevent disruption of upper level car traffic while boats passed below.

Waddell's patents included the following:

1893: The modern vertical lift bridge

1894: The Waddell "A" Truss



ONE OF TWO SURVIVING EXAMPLES OF A WADDELL "A" TRUSS.

1898: Improvements to suspension bridges

1898: An automatic jetty for deepening tidal ways – featuring a continuous door, hinged at the top, which would open readily and permit the tide to flow into the harbor freely, but close automatically and force the outgoing tide to flow through a narrow channel (with Ira Hedrick)

1909: A lift bridge where the motive power for raising and lowering a movable span may be supported by and travel with the span structure (with John Harrington)

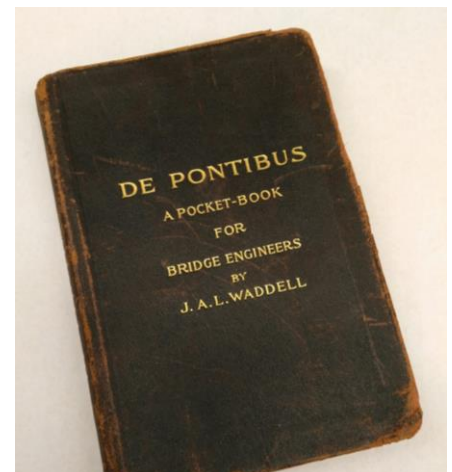
1910: A double-deck lift bridge where the upper level is permanent, and the lower level is movable

1910: A lift bridge where the movable span is raised and lowered from separate and disconnect towers

1910: An improved carrying axle and mounting for bascule bridges

1913: Means for carrying a fluid conduit between the towers of a lift bridge.

Over the course of his career, Waddell designed or oversaw the design of more than 70 bridges. Though he favored vertical lift over others, he also designed numerous bascule and swing bridges. His first swing span design was in 1895 over the Missouri River at East Omaha, Nebraska. He wrote a great many papers and presented them to a variety of groups, especially favoring graduating engineering students. He also published several important books, including *De Pontibus* (1898), a pocket book of bridge engineering; and the follow-up, the massive and comprehensive *Bridge Engineering* (1916), among others. One of his primary missions was to share his knowledge with the engineering community in whatever ways he could. He traveled the world extensively and met with foreign dignitaries as well as offering lectures to eager audiences.



DE PONTIBUS WAS JUST ONE OF MANY BOOKS THAT JAL WADDELL WROTE.

Waddell received numerous honors from foreign governments, including the Order of the Rising Sun with the rank of Knight Commander from the Emperor of Japan. Waddell passed away at his home in New York City in 1938, at the age of 84.