

James Buchanan Eads

Engineer, Innovator and Inventor Extraordinaire

By Richard G. Weingardt, P.E.

Although most widely known as the builder of the great triple-arch steel Mississippi River bridge that bears his name, James B. Eads's range of influence reaches well beyond this accomplishment. As a true Renaissance man of his day, this self-educated engineering genius amassed a fortune of \$500,000 (in 1857 dollars) before he was 40 and became one of most outstanding civil engineers of the 19th century.

James was born May 23, 1820, in Lawrenceburg, Indiana, the third child of Thomas and Ann (Buchanan) Eads. Thomas moved his family from town to town following different ventures that regularly failed, so James and his older sisters Eliza Ann and Genevieve received sporadic educations and did not develop lasting childhood friendships.

On September 6, 1833, the Eads family steamed into St. Louis, Missouri, aboard the *Carrolton*, bringing all their possessions to settle there. As the *Carrolton* approached the docks, its chimney flue collapsed, engulfing the ship in flames and destroying all cargo on-board. Eight people died. The Eads, uninjured, landed with only the clothes on their backs.

To help support his suddenly destitute family, 13-year-old James sold apples on the street and then ran errands for a store. The owner let James read books on technology and machines in his library. Intrigued with inventors and the latest inventions, the boy tinkered with some of his own, among them a six-foot-long scale-model steamship.

When James was 17, his family moved to Le Claire, Iowa, but he refused to go, instead getting a position as clerk on the steamboat *Knickerbocker*. Nineteenth-century Mississippi riverboat travel was a perilous proposition. The river was full of debris (called snags) that caused serious boating accidents and wrecks. When steamships sank, their cargos littered the Mississippi riverbed. Young James realized that a fortune could be made by retrieving sunken steamships and their treasures. But how could he do it? By inventing a salvaging tool.

Eads's efforts to build salvaging equipment intensified on December 11, 1839, when the *Knickerbocker* itself hit a massive snag and quickly sank with a valuable shipment of lead. Still, he needed another two years of experimentation to work out the kinks of his first salvaging invention. Finally, in 1842, Eads re-

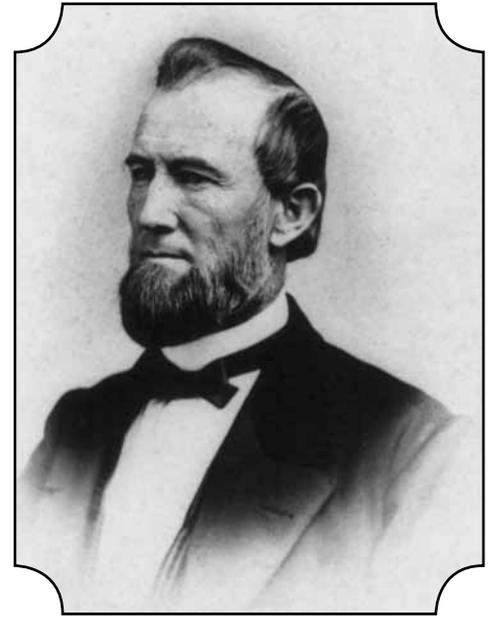
ceived a U.S. patent for a special boat equipped with a diving bell that allowed workers to walk on the dangerous river bottom. Relying on this invention, he convinced two established St. Louis boat builders, Calvin Case and William Nelson, to partner in a river salvaging business – which achieved immediate success.

Within two years, a prospering Eads sought a woman to marry. Martha Nash Dillon – an intelligent, sultry, attractive debutante – turned James's head. Martha came from a prominent St. Louis family. Her mother had died when she was young; her father, Colonel Patrick Dillon – a highly successful St. Louis businessman – had married Eliza Eads, James's first cousin, who made the introductions. From the start, the Colonel violently disapproved of his daughter dating this poorly educated salvage boat captain, so James and Martha met in secret. After months of courtship, Eads proposed and Martha accepted – *if* her father would consent. He refused.

The pair cooled their heels for a time. Eads traveled east to research a glass-making venture. In his many descriptive letters home, James showed his fascination with the U.S. Patent Office and its models of patented inventions. After Eads returned to St. Louis, their frustration over the Colonel's objections reached a breaking point and they married anyway on October 21, 1845. Not surprisingly, this did not endear Eads to his new in-laws.

Once married, Eads rethought his life's work and its treacherous nature. He started a glass-manufacturing factory in St. Louis, again traveling east to purchase equipment and materials. Martha, still at odds with her father, stayed with Eads's parents in their small cottage in Iowa. Eads discovered that establishing a new business required constant attention, so the newlyweds decided that he would live in St. Louis and she in Le Claire – a living arrangement that became permanent. The separated couple exchanged hundreds of tender letters, hers imploring Eads to come "home" more often. He explained how the pressures of business prevented him from doing so, though he was home in Iowa when Martha gave birth to their first child, Eliza Ann, in August 1846.

Ead's glass factory never got off the ground, and its doors closed in 1848. Overwhelmed with debt, James went back into the lucrative but hazardous salvage business, plunging full-



James B. Eads. Courtesy of Library of Congress Prints and Photographs Division.

bore into it even though Martha was pregnant again. When she gave birth to their only son, James, Jr., Eads was away at a salvage site. Focused on keeping up with his escalating empire, Eads built more salvage boats, each one more sophisticated than the last. By 1849, his fleet could raise an entire steamship.

On May 17, 1849, disaster struck when the steamer *White Cloud* caught fire at the St. Louis city wharf. Its flames engulfed 15 blocks and destroyed 23 steamers – a boon for Eads's business that made him wealthy and allowed him finally to receive his father-in-law's acceptance. But tragedy tinged his newfound prominence when his infant son died on June 15, and again in 1852, when Eads's mother passed away. A year earlier, Martha had given birth to their third child, another daughter. Exhausted from caring for her ailing mother-in-law and running the household, she went to Brattleboro, Vermont, for a much-needed rest – but too late. The former debutante, only 31 years old, succumbed to cholera.

After mourning for two years, on May 2, 1854, Eads married Eunice Hagerman Eads, the widow of his cousin Elijah Clark Eads. He adopted her three young children, Genevieve, Josephine and Adelaide, expanding his family of daughters to five.

In 1855, when the U.S. government stopped removing snags from the Mississippi, Eads purchased five of its snag boats and converted them into salvage boats, further expanding his fleet. In 1856, a Congressional proposal to clear snags from western rivers and keep them open year-round passed the House

of Representatives but failed in the Senate. Undeterred, Eads formed the Western River Improvement Company, a syndicate of 50 insurance companies that let him finance the operation privately.

After profiting in the river salvaging business for ten years straight, a prospering 39-year-old Eads retired – but not for long. The Civil War threatened. Eads anticipated the strategic importance of the Mississippi to both sides and advanced a radical idea – that the U.S. Army develop steam-powered, ironclad warships.

It was coolly received at first. But shortly after the Confederate forces attacked Fort Sumter in April, 1861, Eads got a telegram from President Lincoln's Attorney General, Edward Bates. It read, "Be not surprised if you are called here suddenly." That August, Eads was awarded a contract to build seven iron-plated gunboats from which Union forces could conduct their Western campaign and control the Mississippi. Eads rapidly built the Union's first ironclad armada, employing up to 4,000 men and turning out his first ironclad in only 45 days. By November 1861, four gunboats equipped with Eads-designed gun turrets roamed the Mississippi.

The following February, these gunboats were tested at the bombardments of Fort Henry and Fort Donelson. Backed by firepower from Eads's ironclads, Union troops captured both



Eads Bridge from the top of the St. Louis Jefferson Memorial Arch. Courtesy of Richard Weingardt Consultants, Inc.

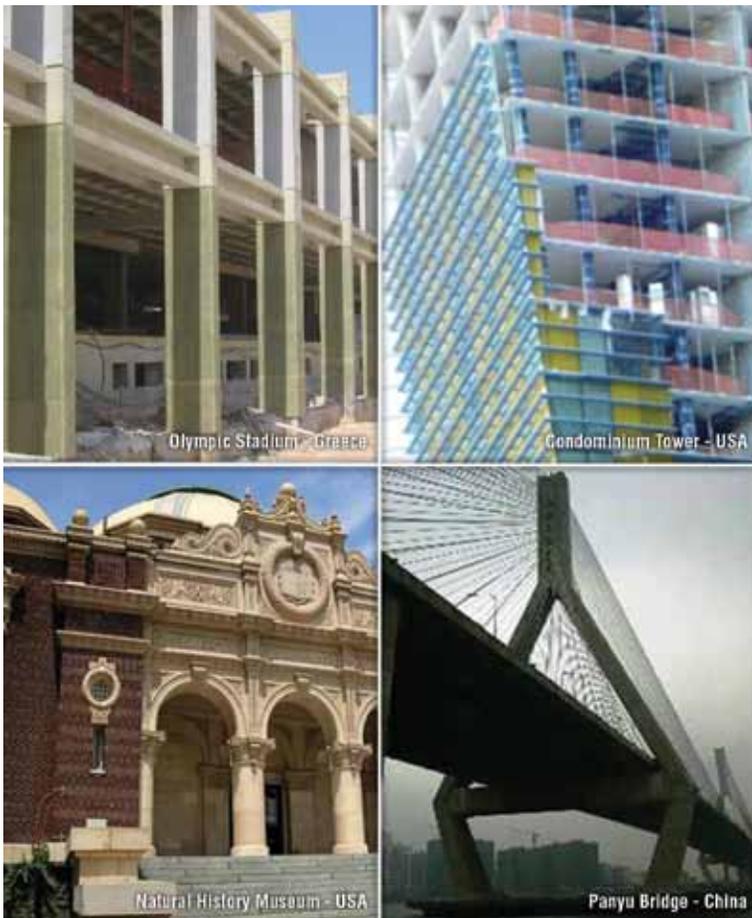
forts. On July 4, 1863, Eads's gunboats also played a role in seizing Vicksburg, Mississippi, which gave Union forces a decisive victory and control of the Mississippi. Eads's Civil War contributions won him powerful friends in Washington, DC, among them General Ulysses S. Grant, the future president.

After the war, the powers-that-be in St. Louis fretted about the city's status as the gateway to the west. Transferring goods, animals and people via river ferries between the railway stations in St. Louis and East St. Louis was an ordeal. When water was low or the river frozen, crossing it proved impossible, delaying commerce for weeks at a time. To build a

massive bridge across the Mississippi, the city petitioned the federal government for approval.

One year after Congress authorized construction of the proposed bridge, the St. Louis and Illinois Bridge Company was formed. Although he had never built a bridge, Eads became its chief engineer. He revolutionized U.S. bridge-building circles by engineering a multi-arched structure with three spans, each exceeding 500 feet. His specifications called for structural steel rather than wrought iron. The three arches – then the largest in the world – were supported on four piers (caissons) extending deep into bedrock below the riverbed. The 18-inch-diameter hollow tubes

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for the arches used 60,000-psi steel from Andrew Carnegie's steel works. To meet his high standards, Eads frequently returned the steel to Carnegie to be re-rolled or replaced.

On October 25, 1868, Eads' 74-year-old father passed away. The elder Eads had basked in the respect his son commanded, even from St. Louis elites like the Dillons. When his granddaughter Eliza Ann – James's oldest – married Major James F. How, the son of a former St. Louis mayor, 800 well-heeled people attended the wedding.

Amid this uplifting activity, a federal board headed by U.S. Army Corps of Engineers Chief Andrew Humphreys convened in September 1872 to hear complaints from steamboat interests about Eads's bridge. Humphreys ordered a canal to be built around the bridge to appease ship-owners. Eads rushed to Washington to convince President Grant that the proposed canal was unnecessary. Grant overruled Humphreys's order, setting up a long-standing adversarial relationship between Humphreys and Eads.

When Eads' Bridge opened on July 4, 1874, more than 300,000 people joined the celebration, treating its namesake like a hero. The structure – a magnificent triumph for St. Louis – became the harbinger of its prominent role in transporting cargo between the east and west coasts. One reporter wrote, "No work of man on the globe so thoroughly combines the useful and the beautiful as the grand steel bridge that stretches its graceful line across the Mississippi at St. Louis."

Those days, people believed that elephants had uncanny instincts and would never cross an unsafe structure. So, to gain publicity before the bridge opened, an elephant was led across its deck. To prove its safety even further, 14 locomotives were driven continuously over its rail deck two weeks later.

Little time passed before Eads embarked on his next project – a year-round navigation channel at the mouth of the Mississippi. Near New Orleans, the river spreads out and gradually slows at the Gulf of Mexico, depositing enormous amounts of sediment that create sandbars perilous to ship travel. In the 1860s, sandbars blockaded the port of New Orleans for weeks and caused massive amounts of food to rot on the docks. The exasperated U.S. Army Corps of Engineers could not maintain a clear channel through the sandbar area.

In 1874, under tremendous pressure, the head of the Corps (and Eads's nemesis) Andrew Humphreys proposed building a deep canal from below New Orleans to the Gulf. Eads thought the scheme ludicrous, instead suggesting jetties or underwater walls parallel to the river's current. This less costly plan would create a narrow channel, speeding up the water running between the walls. The faster

the water flowed, the more troublesome sediment it would carry into the Gulf.

Eads made his offer irresistible by proposing to build the jetties without an advance; the government would pay only if the jetties worked. In January 1875, by a 6 to 1 vote, a board of Army and civilian engineers handed Eads a second victory over Humphreys. Congress agreed to pay him as the canal reached certain depths. When it reached the final 30-foot depth, Eads received \$4.25 million.

Ultimately, Eads had proven his point over Humphreys. His jetties ensured that ships could travel into and out of the mouth of the Mississippi. Because of them, New Orleans quickly advanced from being America's ninth largest port to its second largest (after New York). The news of Eads's New Orleans success sealed his reputation as a river engineering master and placed him in the foremost ranks of engineers internationally. He was invited to consult on river control and navigation problems around the U.S. and in South America, Canada and Europe.

A decade later, in February 1887, an exhausted 67-year-old Eads followed doctors' orders and sailed to the Bahamas to rest. Aware that he was dying, his wife Eunice and her daughter Adelaide accompanied him. On March 8, the self-made American civil engineer passed away. American reporters called him a giant of inventiveness and reasoning to whom the nation owed a debt of gratitude. Eads's passing was mourned around the world.

The recipient of countless honors, Eads had earned his most prestigious one in 1884, becoming the first American to receive the Albert Medal from the British Royal Society of the Arts "for services rendered to the art of engineering." In 1920, Eads was inducted into the Hall of Fame for Great Americans in New York City, where Americans whose vitality, ingenuity, and intellect contributed to the country's growth and prosperity are honored. A bronze bust of Eads was placed in its 630-foot open-air colonnade beside 98 notables including Alexander Graham Bell, Eli Whitney and George Westinghouse. In 1932, the Deans of American Colleges of Engineering named Eads one of the five greatest engineering minds of all time, along with Leonardo da Vinci and Thomas Edison. To this day, Eads remains a notable legend in engineering history. ■

Richard G. Weingardt, P.E., is Chairman of the Board for Richard Weingardt Consultants, Inc. in Denver, Colorado. Mr. Weingardt is the author of nine books. His latest, Circles in the Sky: The Life and Times of George Ferris, is the one-and-only biography of Ferris and how he built his 1893 Ferris Wheel. Mr. Weingardt can be reached at rweingardt@aol.com.

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