Alfred Pancoast Boller

A Gentleman of the Highest Type

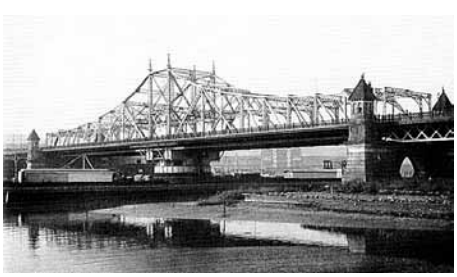
By Frank Griggs, Jr., Ph.D., P.E., P.L.S.

Alfred Boller was born in Philadelphia, Pennsylvania on February 23, 1840. After attending local schools, he received an A.B. from the University of Pennsylvania 1858 and a C.E. degree from Rensselaer Polytechnic Institute in Troy, New York in 1861.

Alfred began his engineering career as a surveyor mapping anthracite coalfields for the Lehigh Coal and Navigation Company in Pennsylvania and in 1863 joined the Department of Bridges of the Philadelphia and Erie Railroad Company. On April 24, 1864 he married Katherine Newbold. They had five children while living in East Orange, New Jersey.

In 1865, Boller built a suspension highway bridge at Williamsport, Pennsylvania across the Susquehanna River that lasted until 1886, when he designed a replacement span. In 1866, he was appointed Engineer of Bridges on the Atlantic and Great Western Railroad. Later he became Chief Engineer of the Hudson River Railroad for a short time. Then he and Samuel Millikin became agents of the Phoenix Iron Company. During the four years of this partnership, Alfred built the Bridgeport, Connecticut Bridge, the first of many swing bridges he designed. The swing span was 210 feet long, with the entire bridge being 845 feet long.

In 1871, Boller became Vice-President and Engineer of the Phillipsburg Manufacturing Company in New Jersey. He built the Central Avenue Bridge over the Morris Canal in Newark, New Jersey in 1871, the High Bridge across the Passaic River in Chatham, New Jersey in 1874 and designed, but did not build, the Eastern Avenue (later the Congress Street) Bridge across Fort Point Channel in Boston in the same year.



Thames River Bridge.

After bankruptcy of the company, Alfred opened his own office in New York City. In 1876, he published *Practical treatise on the construction of iron highway bridges, for the use of town committees*. This comprehensive little book expanded his reputation and led to many commissions to build bridges in the northeastern United States.

Boller's first large bridge was across the Hudson River at Troy, New York. It had long fixed Whipple double intersection truss spans of 244, 244 and 226 feet, with the swing span being 258 feet.

In 1882, he designed and built the Albany and Greenbush Bridge across the Hudson River to carry carriages and pedestrians on a lower deck and a railroad on an upper deck.

The Phoenix Bridge Company fabricated steel for the bridge that had a swing span of 401 feet, flanked by fixed spans of 252 feet. It opened January 24, 1882 and was replaced by a lift bridge in 1933 without ever carrying traffic on its upper deck. In 1890, Alfred designed and built foundations for the Arthur Kill Bridge connecting New Jersey to Staten Island, New York. It was the longest swing bridge in the United States. His most well known swing bridge was the Thames River Bridge built in New London, Connecticut to cross the Connecticut River. Construction started in June 1888 and was completed in 16 months, with a grand opening October 10, 1889. With its 503-foot swing span, it was designed to carry two tracks and remained the longest swing span in the country until 1893.

In 1881, Boller began a long association with swing bridges across the Harlem River in New York City. His first bridge was built for West Side and Yonkers Railway. It had a 300-foot swing span and 10 deck truss approach spans ranging in length from 58 to 100 feet. He designed the Park Avenue Bridge in 1891, a four-track swing bridge, the Broadway Bridge in 1895 and the Macomb's Dam Swing Bridge in 1895. The latter bridge is a rim-bearing swing bridge, with a total length swing span of 412 feet, allowing 150 feet of clearance on each side of the swing span pier and 25 feet of vertical clearance. The bridge opened to traffic May 1, 1895 and still serves today.

In 1905, Alfred designed the 45th Street Bridge with work beginning April 1901.

A. P. Boller.

It was opened to traffic August 24, 1905. His next bridge over the Harlem was the University Heights Bridge, 1908 (formerly the Harlem Ship Channel Bridge). Although it was not fully completed, it opened to traffic January 8, 1908. His last bridge over the Harlem River was the Madison Avenue Bridge built in 1910. It is a four-lane swing bridge, carrying traffic between Madison and Fifth Avenues, East 138th Street in Manhattan and East 138th Street and Grand Concourse in the Bronx. It opened July 18, 1910.

Boller designed a major swing bridge over St. Louis Bay at Duluth, Minnesota in 1897 for the Great Northern Railroad. It opened July 13, 1897 and was the fourth longest, 491 feet, swing bridge in the United States when built. It was, unfortunately, struck by a steamer in 1906 and collapsed into the Bay. Two years later he designed a swing bridge across the Arkansas River at Little Rock for the Choctaw and Memphis Railroad. It consisted of three fixed spans and a swing span with a total length of 1,614 feet. The bridge opened December 10, 1899. In 1972, the swing span was replaced by a vertical lift span. The bridge is currently scheduled to reopen as a pedestrian bridge to serve the Clinton Presidential Library.

In 1898, Boller formed a partnership with Henry M. Hodge under the name of Boller and Hodge. Two of their major bridges were cantilever bridges for the Pittsburgh, Carnegie & Western Railroad, commonly called the Wabash line. They were the Wabash Bridge across the Monongahela River at Pittsburgh and the Mingo Junction Bridge across the Ohio River.

When completed, the 812-foot span bridge exceeded the span of Morison's Memphis Bridge by 22 feet and held the title of the longest cantilever bridge in the country and third longest in the world. Unfortunately, business was not what was expected. The

Municipal Bridge, now called the MacArthur Bridge.

line was abandoned and the bridge removed for scrap during World War II. The Mingo Junction Bridge was built for the Cross Creek Railroad. Its design was very similar to that of the Monongahela River Bridge. The total bridge length was 1,296.5 feet with anchor arms of 298.5 feet cantilever arms of 194.75 feet and a suspended span at 310.5 feet in length, making the central span approximately 700 feet. It still serves today.

From 1900 to 1906, Boller worked on a design for a monumental bridge to commemorate the 300th anniversary of Henry Hudson's discovery of the river named after him. His first design was a three hinged, relatively short span, trussed arch with monumental masonry portals on each abutment and multiple span masonry arches on the approaches. On April 9, 1906, the Board of Estimate appropriated $3,000,000 to build an updated design with a longer span arch and no monumental portal. In spite of support of the Board of Estimate, the Bridge Department and the *New York Times*, the Art Commission rejected the plans. It would be 20 years before construction started on a bridge at the site.

Boller was then serving as a consulting engineer on a masonry arch bridge at Hartford, Connecticut, now called the Bulkeley Bridge. He and the bridge architect studied numerous ancient European bridges, and decided that uncomplicated geometry and restrained architectural detailing would create the proper sense of "strength, beauty and dignity." "The Bulkeley Bridge's tremendous scale, plain but graceful lines, arched form, and simple classical ornament make it one of the state's pre-eminent examples of Neo-Classical architecture."

In 1909, Boller and Hodge were appointed engineers for the Port Authority of New York and New Jersey. One of their first findings was, "All things considered, it is the firm opinion of your engineer that a bridge located in the neighborhood of 59th Street will best conform to the needs of population density and requirements on both sides of the river, and such location is recommended for adoption." In their 1913 report they proposed a 2,880-foot span braced eye-bar plan similar to some earlier Gustav Lindenthal plans. The bridge would carry eight tracks, two 36-foot wide roadways and two 8-foot sidewalks.

In 1911 Boller and Hodge designed the Connecticut River Bridge at Old Saybrook-Old Lyme, Connecticut. This 1,800-foot long deck bridge included a double Scherzer Rolling Lift span.

The engineer Edward Bush and Boller considered both the Rolling Lift Bridge and a swing bridge but determined "the Scherzer Rolling Lift type best fitted our local conditions, and also made a better looking bridge." It was removed in 1948 and replaced by the Raymond Baldwin Bridge at the same site.

In the same year they built a viaduct for the Algoma Central and Hudson Bay Railroad in Canada, 91 miles north of Sault St. Marie, where the railroad crossed Agawa Canyon formed by the Montreal River. They had designed a viaduct 1,550 feet long and up to 130 feet high with sharp curves at each end in 1901, but due to funding problems its construction was delayed. It opened for travel in October 1911 and still serves.

A municipally owned bridge across the Mississippi River at St. Louis to compete with the Eads and other bridges was considered as early as 1906, when a bill was submitted to Congress with the city authorizing the sale of bonds to build it. Boller and Hodge submitted their plans, which were approved on May 20, 1909 with construction work starting in late 1909. They designed three channel spans of 688 feet, the longest simple trusses in the world, with railroad tracks on the lower level and roadways for carriages and walkways on the upper level. The total length of bridge, including approaches, was 18,261 feet and was opened January 20, 1917. The bridge was renamed the General Douglas MacArthur Bridge in 1942 and is currently scheduled for demolition.

In 1912, Howard C. Baird, who was connected with work of the office for some time, was admitted to the firm. Construction work was then completed on a number of structures, including the Municipal Bridge at St. Louis, the bridge over the Connecticut River at East Haddam, Connecticut, and the concrete bridge over the Hillsborough River at Tampa, Florida. These bridges were designed prior to Boller's death, so it is likely he was involved.

Boller died December 9, 1912. His memoir in the *Transactions of ASCE* noted he was "recognized as standing in the front rank of structural engineers and as an expert in bridge engineering. Familiar with the technical side of the art and science, he was especially noted for his practical good sense and sound judgment. Not a few of his bridges were characterized by their originality and boldness of design…Mr. Boller was especially well qualified by natural endowments, culture, and training for his vocation. His mind was keen, logical, and persistent. His judgments and opinions were the result of careful and deliberate consideration, rather than of hasty impulse or impression…His appreciation of architectural symmetry had a marked influence on his bridge designs, his constant effort being to combine technical principles and practical utility with symmetrical and pleasing outlines."

His obituary in *Engineering News* ended with, "The structures he built will form lasting monuments to him, as they are in many cases the greatest of their type so far built… He was both an engineer and a gentlemen of the highest type, and all who knew him will earnestly join in the commendation, 'Well done, good and faithful servant.'"▪

Dr. Griggs specializes in the restoration of historic bridges, having restored many 19th Century cast and wrought iron bridges. He was formerly Director of Historic Bridge Programs for Clough, Harbour & Associates LLP in Albany, NY, and is now an independent Consulting Engineer. Dr. Griggs can be reached at ***fgriggs@nycap.rr.com****.*