the company employed approximately 550 workers, most of whom lived in the company town of Edgemoor.

In 1900, the Edge Moor Bridge Company was acquired by the American Bridge Company, a monopoly formed by J. P. Morgan & Company. Edge Moor was one of 24 bridge companies folded into the new corporation, which was intended to dominate the metal bridge fabrication industry. William H. Conuel, who succeeded Sellers as president of Edge Moor, was the first treasurer of the American Bridge Company. In 1901, American Bridge was itself acquired by U.S. Steel Corporation. American Bridge continued to operate the Edge Moor works until 1921, when the plant was closed. Its operations were consolidated at more up-to-date facilities at Trenton, New Jersey, and Ambridge, Pennsylvania. The Edge Moor Iron Company continued as a separate organization concentrating on the production of steam boilers until its liquidation in 1933. The last of its bridge and iron works structures and buildings were demolished in the 1970s. ■

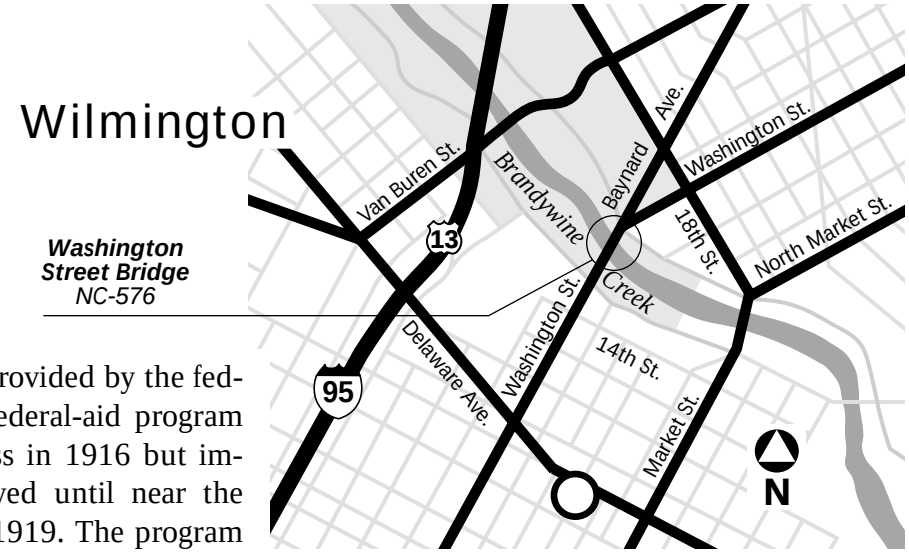
in tension and the timber verticals in compression. The Pratt truss easily adapted into an all metal truss, and it was popular because of its simplicity of design, especially the use of eye bars and pins to facilitate field erection. It provided the long-sought-after "stiff truss" that after 1880 came to be fabricated with standardized members, made by building up standard shapes like rolled plates, angles, or channels. The Pratt truss design dominated the last quarter of the 19th century for both thru and pony truss bridges.

Most metal truss bridges built before 1895, from light Pratt pony trusses to heavier thru truss railroad spans, were assembed in the field (at the site) with pinned connections. Better knowledge of the strength of materials and metallurgy in the 1880s combined with the improvement of field pneumatic riveting equipment by 1899 leading to the transition from pinned to riveted connections. This resulted in a rapid shift from the Pratt to increased use of the Warren truss design by 1905. Patented in 1848 by British engineers James Warren and

The Washington Street Bridge over Brandywine Creek in Wilmington was a deck truss bridge fabricated by the Edge Moor Bridge Works in 1893. The bridge served until 1921 when it was replaced by the present reinforced concrete open spandrel arch (State Bridge NC-576). Local residents and land developers objected to the truss bridge's narrow roadway.

Willoughby Monzani, the straightforward truss is particularly well suited for rigid connections. It is distinguished by its simplicity of design, ease of construction with equal-sized members, and ability of some of the diagonals to act in both tension and compression. Capacity could be increased by adding a second set of diagonals (double intersection Warren), and it could be stiffened by the addition of verticals.

Despite the large number of metal truss bridges that once existed in Delaware, today only six remain in service on public



with $20,000 funding provided by the federal government. The federal-aid program was created by Congress in 1916 but implementation was delayed until near the end of World War I in 1919. The program marked a major shift in national highway policy and spurred the creation of state highway departments, including Delaware's in 1917, to manage and maintain state highway systems and administer federal aid. The state and federal highway programs led to an accelerated and centralized program of road and bridge improvements designed to upgrade the state's primary roads for automobile and truck traffic.

Plans for the arch bridge over Clear Creek were prepared by the state highway department in April 1918. It is representative of the type of plain, utilitarian structures advocated by the federal highway bureau and state highway departments.

Washington Street (Road 43) over Brandywine Creek

State Bridge NC-576
Wilmington, New Castle County
Designer/Builder: Benjamin H. Davis & Vance W. Torbert/Walsh Construction Company

1920-21

The skewed, five-span, 720'-long Washington Street bridge consists of a 250'-long, ribbed open spandrel arch main span, flanked to each side by two closed spandrel arches of 85' and 75'. The roadway is 40'-wide from curb to curb with 14'-wide sidewalks on either side. The bridge is the only open spandrel arch bridge in Delaware, and it is noteworthy for its elaborate architectural treatment. The arch ribs of the main span are scored to appear as stone voussoirs. Pilasters with dentils rise from the piers to form pylons. The spandrel

New York architect Vance W. Torbert designed the Washington Street bridge's architectural features, including the pylons pictured here, as a fitting memorial to Delaware's veterans.

The Washington Street bridge (1920-21) is the only open spandrel arch bridge in Delaware. The high-level crossing of Brandywine Creek provided an ideal location to show the handsome open spandrel arch design.

The view from below the Washington Street bridge.

columns are arcaded, and the balustrades have urn-shaped balusters. The bridge has eight pylons: four, 40'-high pylons over the piers of the main span, and four 23'-high pylons at the portals. The bridge is supported on concrete abutments and piers; a stairway at the southwest corner of the bridge leads to the river walk and Brandywine Park below. It is located in the Brandywine Park Historic District and is rated as a contributing resource to the district.

The Washington Street bridge was designed as a memorial to Delaware's war veterans. Four, 40'-tall, pylons of the main span carry bronze tablets commemorating the Revolutionary War, the War of 1812, the Mexican War, the Civil War, and the Spanish-American War. Two tablets commemorate World War I, one with the names of battles in which Delaware troops fought, and the other inscribed with the names of men from Delaware killed in the war. The pylons are further embellished by carved stone eagles and shields, ornamental bronze lanterns, and inscribed quotes from famous Americans.

Open spandrel arch bridges were first built in the United States in the last half of the first decade of the 20th century, and the technology remained popular through the 1950s, especially for bridges that were at prominent locations or park settings where an aesthetic design was desirable. The Washington Street bridge is a classic example of the bridge type, designed by Benjamin H. Davis, one of America's foremost engineers of open spandrel arch bridges, with the assistance of architect Vance W. Torbert. From 1906 to 1910, Davis gained his reputation as a bridge engineer for the Delaware, Lackawanna & Western Railroad (DL&W),

assisting with the design of open spandrel arch bridges for the line's New Jersey Cut-off between Hopatcong, New Jersey, and Slateford, Pennsylvania. The DL&W was the first railroad in the United States to turn to the use of reinforced concrete for all of the structures on a major section of its main line, earning it the name "The Concrete Railroad." The DL&W's decision to use reinforced concrete won the material widespread acceptance and popularized the open spandrel arch design. Davis went on to design a number of other monumental open spandrel arch bridges in the region, including bridges in Conshohocken, Wilkes-Barre, and Allentown, Pennsylvania; Richmond, Virginia; Chattanooga, Tennessee; and Lawrence, Massachusetts.

Architect Vance W. Torbert was a graduate of Drexel Institute, Philadelphia, and a former member of the prominent architectural firm of Carrere & Hastings in New York, specializing in Beaux-Arts designs. In the early 1910s, Torbert established his own practice and was noteworthy for his work on the residences of the exclusive suburb of Tuxedo Park, New York, and the annex to the Aura Grata Cathedral of the Ancient Accepted Scottish Rite, Brooklyn (1915). Torbert worked with Davis on more than a half-dozen bridges in the 1910s and 1920s.

The Washington Street bridge replaced a metal deck truss bridge fabricated in 1893 by the Edge Moor Bridge Works of Wilmington and erected by the Wilmington Construction Company. The North Side Improvement Company, incorporated in 1891 as a development corporation for suburban residences on the highlands north of the Brandywine River, influenced the county Levy Court to build the 1893 truss bridge. By 1919, increased traffic associated with suburban development had rendered the old bridge obsolete because of its narrow width. Plans were made to replace it with a wider structure that would accommodate a double streetcar track, automobile and truck traffic, and pedestrians.

Early in the planning for the replacement bridge, it was decided that the new bridge would be dedicated as a memorial to war veterans and that its prominent location over Brandywine Park required an aesthetic

The Washington Street bridge has arch ribs, which result in economy of material in comparison with a continuous arch ring.

design. In order to raise the estimated half-million dollars for construction, the Delaware General Assembly authorized the creation of a Washington Street Bridge Commission in March 1919 to issue bonds backed by the credit of New Castle County and the state. Preliminary surveys and designs were prepared by Charles E. Grubb, New Castle County Engineer, and John E. Greiner of Baltimore. The local newspaper called the Washington Street bridge project the city's "first successful effort to combine an artistic treatment of a municipal bridge with structural solidity and dignity."

A competition was held for the final design; the commission's invitation to bid was sent to a preselected list of nationally prominent candidates in May 1919 and stipulated: "A substantial, durable bridge is essential, but the location and the desire to give the structure or its surroundings a memorial character make imperative careful consideration of the aesthetic features of the design." Davis responded enthusiastically by telegram two days later: "very much interested in your proposition just rec'd... bridge site magnificent; possibilities great; am delighted to receive your invitation and accept it with pleasure." A number of prominent engineers, including Daniel Luten, presented designs, but the final choice of the commission was the collaborative effort of Davis and Torbert based on their submission's aesthetic value and price.

In February 1920, the commission chose the Walsh Construction Company of Davenport, Iowa, and Syracuse, New York, as the general contractor for a price of $747,700. Worked commenced in August 1920. The personal finances of bridge commission chairman Alfred I. duPont were placed at the disposal of the commission at several different junctures. He advanced $90,000 to cover architectural and engineering fees to avert a delay of up to 18 months caused by a slow bond market, and he guaranteed the payment of $300,000 to the contractor when the estimated cost exceeded the $500,000 authorized by the county and state. DuPont also underwrote the additional cost of executing the balustrades and pylons in Litholite cast stone rather than concrete to achieve better appearance.

The bridge opened to traffic on November 24, 1921, but cosmetic work continued through the early part of 1922. The formal opening was deferred until Memorial Day, 1922. The opening ceremonies were a major city event with an invocation, speeches, and a pagent depicting the history of the Brandywine Valley in allegory. At the close of the ceremonies, the bridge was formally handed over to New Castle County by the bridge commission, and the memorial tablets were unveiled. This was followed by a parade of 1,200 girls, strewing flowers on the waters of the Brandywine River. In 1924, *Scientific American* featured the Washington Street bridge in a one-page article stressing the appropriateness of the bridge as a veterans' memorial and a practical transportation improvement.