

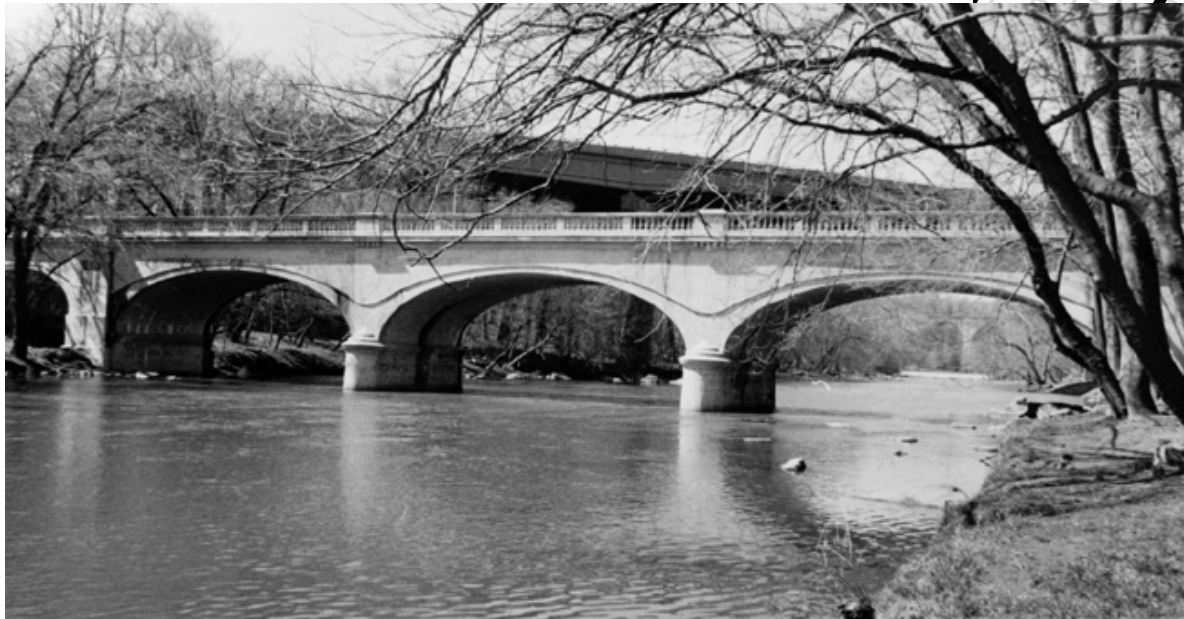


**LEFT:** Wilmington's urban progressive reformers, who led the movement for city parks and an improved water system at the turn-of-the century, wanted to improve city life by merging engineering, architecture, and landscape architecture in a City Beautiful Movement. The neoclassical architectural treatment of the Van Buren Street bridge reflected period tastes and was considered appropriate for its setting in Brandywine Park. This photo shows the bridge in its park setting in 1958.



*Van Buren  
Street Bridge  
NC-698*

Wilmington



*The Van Buren Street bridge built in 1906 is Delaware's only Melan arch.*

### Van Buren Street over Brandywine Creek

*State Bridge NC-698*

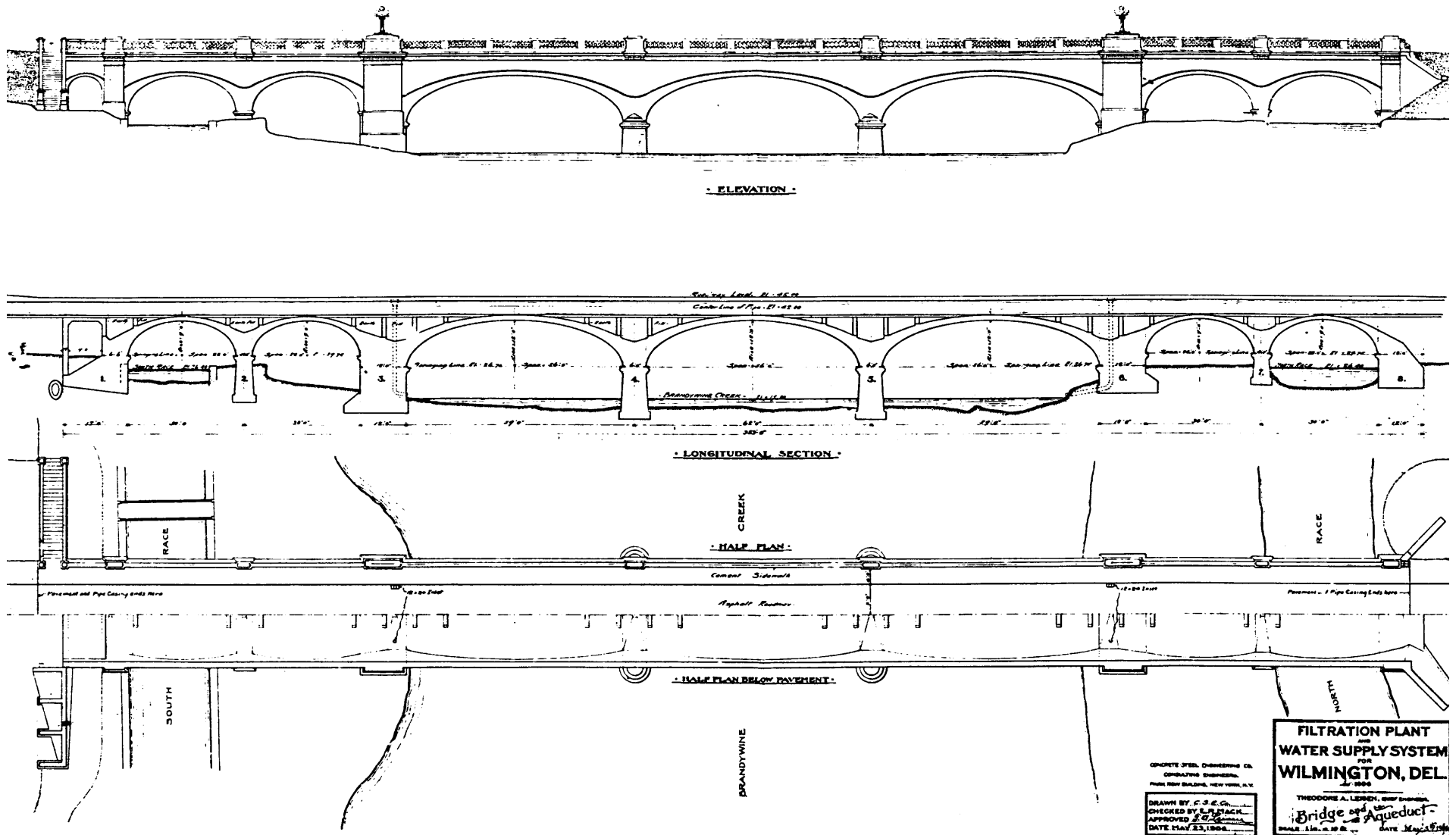
*Wilmington, New Castle County*

*Designer/Builder: Concrete-Steel  
Engineering Company*

**1906**

**T**he Van Buren Street bridge is Delaware's only identified example of a Melan arch. Built in 1906 under the joint auspices of Wilmington's water and parks commissions, the bridge was designed by the Concrete-Steel Engineering Company of New York, established by Edwin Thacher

# Reinforced Concrete Bridges



Elevation and plan from the original 1906 drawings for State Bridge NC-698 prepared by the Concrete-Steel Engineering Company. The plans are for "a bridge and aqueduct" for the Wilmington water supply system, indicating the bridge's dual function as a vehicular bridge and an aqueduct for a water main pipe buried in the arch's fill.



*DelDOT recently completed a rehabilitation of the Van Buren Street bridge. Although much of the concrete in the spandrels was in an advanced state of deterioration and had to be removed, extraordinary efforts were made to replicate the architectural features and maintain the historic character of the bridge.*

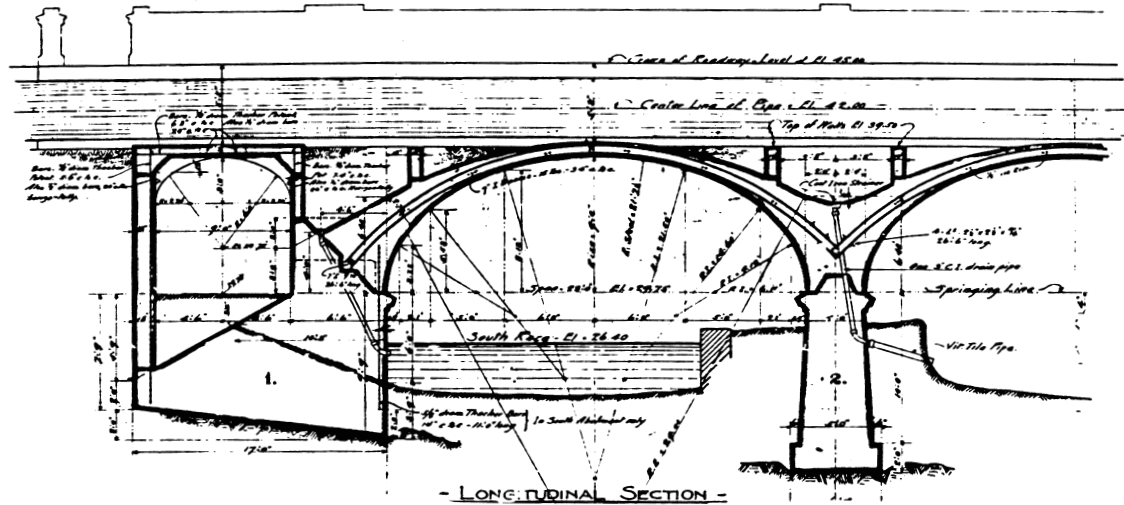


in 1901. The 353'-long Van Buren Street bridge has eight arch spans with the longest spans measuring 56' and spanning the creek. The shorter western spans cross over a park walkway and the Brandywine canal raceway. The Melan system consists of metal beams embedded in the concrete. In the 56'-long spans, the curved beams are built-up riveted lattice girders, and in the shorter spans they are rolled I-beams. In actual structural action, Melan arches are more like steel arches encased in concrete than true reinforced concrete arch structures. The spandrel walls and west wingwall staircases are reinforced with twisted reinforcing bars with a textured finish that were patented by Thacher in 1899.

The Van Buren Street bridge is one of Wilmington's finest examples of the influences of the City Beautiful Movement. The Progressive-era, nationwide, urban reform movement merged engineering, architecture, and landscape architecture in an at-

# Reinforced Concrete Bridges

*Plans for the Melan arch show the embedded steel beams characteristic of the Melan system.*



tempt to improve city life by planning cities with parks and parkways, as well as laying out to a master plan all sewers, water systems, public transit and other public improvements. The Van Buren Street bridge was an integral part of a major project undertaken to improve Wilmington's water supply by carrying water across the Brandywine River from Porter Reservoir to the filter station at 16th and Market streets. The Water Commission first suggested submerging the 48"-diameter water main in the Brandywine River, but planners finally decided in consultation with the Parks Commission to afford the pipe better protection in an aqueduct that would also carry vehicles and pedestrians between the east and west sides of Brandywine Park. The water main was supported on a concrete pedestal built on top of the arch ring and buried in the arch backfill. Brandywine Park was established in 1886 with the original design by Samuel Canby, city parks en-

gineer, in collaboration with America's leading late-19th-century landscape architect, Frederick Law Olmsted.

The neoclassical architectural treatment of the Van Buren Street bridge reflects the period taste of urban progressive reformers. The bridge is finished with ornate concrete balustrades with urn-shaped balusters. The balustrade posts are adorned with dentils, and the end posts have decorative scrolls. The arches are accented by scored arch rings. The piers have rounded ends, and every other pier has a plain pilaster extending upward to form a balustrade post. The west wingwalls serve as the base for parapeted staircases leading to the park.

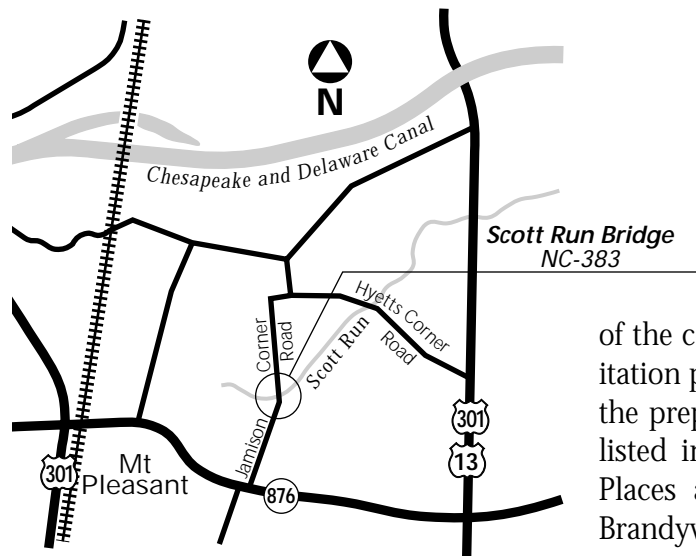
The Van Buren Street bridge cost \$40,000, one-third paid by the Parks Commission and two-thirds by the Water Commission, according to a 1900 agreement. The two commissions shared maintenance of the bridge until 1958.

The bridge has been transferred to state ownership. In 1970, the roadway was widened by 3' by removing the curb and sidewalk on one side. Over time, the bridge has developed numerous spalls and deteriorated and cracked concrete, caused in part by moisture trapped inside the fill. In 1996, DelDOT began a project to rehabilitate the structure, saving as much of the historic fabric as possible given the advanced state



**ABOVE:** The Jamison Corner Road bridge as it appeared in 1921.

**RIGHT:** State Bridge NC-383 is Delaware's oldest Luten arch bridge, built in 1910.



of the concrete's deterioration. The rehabilitation project was completed at the time of the preparation of this book. The bridge is listed in the National Register of Historic Places as a contributing resource to the Brandywine Park Historic District.

### Jamison Corner Road (Road 413) over Scott Run

*State Bridge NC-383*

*Northwest of Boyd's Corner,  
New Castle County*

*Designer/Builder: Luten Bridge  
Company of York*

**1910**

The Jamison Corner Road bridge is a one-span, 14'-long, closed spandrel reinforced concrete arch bridge built in 1910 by the Luten Bridge Company of York, Pennsylvania. The 18'-wide bridge has paneled concrete parapets and is supported on concrete abutments with flared wingwalls.





# HABS/HAER INVENTORY

See "HABS/HAER Inventory Guidelines" before filling out this card.

## 1. NAME(S) OF STRUCTURE

State Bridge Number 698

## 2. LOCATION

Van Buren Street over Brandywine Creek & Flume  
Wilmington, New Castle County, Delaware

## 3. DATE(S) OF CONSTRUCTION

1906

## 4. USE (ORIGINAL/CURRENT)

Vehicular

## 5. RATING

CA

## 6. CONDITION

Fair: Spalling, cracking and calcium stains on arches, piers and abutments.

State Highway Bridge 698 (Van Buren Street Bridge) is a 353 feet long, eight span filled, solid spandrel concrete arch bridge and aqueduct. The spans vary in length, measuring 9'-0", 28'-0", 28'-0", 56'-0", 56'-0", 56'-0", 33'-0" and 33'-0". Arch reinforcement consists of I beams in the short spans and latticed, riveted girders in the long spans; Thacher bars reinforce the stairs and retaining walls. The bridge carries two lanes of traffic with a total horizontal clearance of 24'-0"; the concrete deck is supported on compacted fill over the arch ribs. The Van Buren Street Bridge is highly embellished, from the concrete substructure to the ornate balustrade. The bridge is topped with an ornate, urn-shaped concrete balustrade divided into sections which mirror the spans by dentiled short square columns and end posts. All piers are corbeled at the top and rounded below, while four are extended up through the parapet and topped with decorative light posts. The west wing walls serve as the base for a straight staircase that leads to the bridge deck from the park. At the stairs the parapet is extended to act as a railing and is decorated with incised geometric shapes. Square columns serve as the newels at the bottom of the stairs. When viewed in elevation, the detailed ornamentation is augmented by decorative arch rings which emphasize the arch structure, and the corbeled fascia. A marble bridge plate, located between spans 1 and 2 on the south elevation, documents the 1906 date of construction and lists the members of the Board of Water Commissioners and the Chief Engineer, Theodore A. Leisen.

Delaware Department of Transportation records state that Bridge 698 was built in 1906; original drawings are filed at the Department. The drawings indicate that the nationally prominent Concrete-Steel Engineering Company of New York served as consulting engineers; from 1901 to 1912, preeminent American engineer, Edwin Thacher, a reinforced concrete pioneer, was associated with the firm. Constructed as a joint project by the Water Commission and the Park Commission, the Van Buren Street Bridge was an integral part of a major project undertaken to improve the city's water supply. The concrete arches encased a pipe, 48 inches in diameter, carrying water across the Brandywine from Porter Reservoir on Concord Pike to the filter station at 16th and Market Streets. The first concept developed by the Water Commission involved submerging the water main across the Brandywine River. Planners decided to incorporate the large main within a bridge, affording the pipe better protection and linking two sections of Brandywine Park to make the Zoo more readily accessible to visitors. The cost of this combination highway bridge and aqueduct was \$40,000, paid according to a 1900 agreement: the Parks Commission paid for one-third of the cost and the Water Commission paid for two-thirds. The two agencies which had cooperated in constructing the bridge continued to share jurisdiction over its maintenance until 1958, when the Park Board took full control. At that date, an inspection of the structure undertaken by the State Highway Department indicated that the bridge required repairs and improvements totaling \$200,000. The Department's inspection found the substructure in unexpectedly good condition, but recommended removing the deteriorating deck, sidewalks, and balustrades, and replacing the roadway with a modern, wider thoroughfare. In 1970, the roadway was widened 3'-0" by removing the curb and sidewalk on one side; the existing balustrade was carefully preserved.

State Bridge 698 is the only example of a multiple span solid spandrel, filled concrete arch bridge. This highly embellished structure is also the earliest concrete bridge surveyed in the state. Among the first structures in Wilmington to utilize the relatively new technology of reinforced concrete, or "concrete-steel", construction, the Van Buren Street Bridge represents an early application of this technology to a multiple span bridge set in a city park. It demonstrates the aesthetic potential of the new material, as well as the versatility of design possibilities in the unobtrusive incorporation a 48-inch water main within this monolithic structure. The Van Buren Street Bridge also has considerable technological significance, reflecting the variety of early twentieth century concrete reinforcement types in its reinforcing scheme: beam reinforcement (both latticed and Melan-type rolled I-beam) and bar reinforcement (Thacher bars). Consulting engineers were the Concrete-Steel Engineering Company of New York City, which had achieved national prominence in the field of reinforced concrete bridge construction. In the decade ending in 1904, this company and its predecessors had constructed 300 reinforced concrete spans across the country. Among the American engineers who contributed to the development of reinforced concrete bridge technology during its formative period was Edwin Thacher (1840-1920), associated with Concrete-Steel Engineering Company from 1901 to 1912. Thacher became interested in steel-reinforced concrete construction in the late 1880s, and by 1895 had made this a specialty. He designed and constructed viaducts and bridges for leading southern railroads during the period 1889-1904. Also during this period, he became the western representative of Fritz von Emperger's company, and was instrumental in disseminating the Austrian engineer's technological innovations in the United States. Among Thacher's numerous patents are designs for deformed steel bar reinforcement, early examples of the reinforcement used in current design. The bridge drawings specify that Thacher bars were used as reinforcement in the stairs and buttresses of the Van Buren Street Bridge.



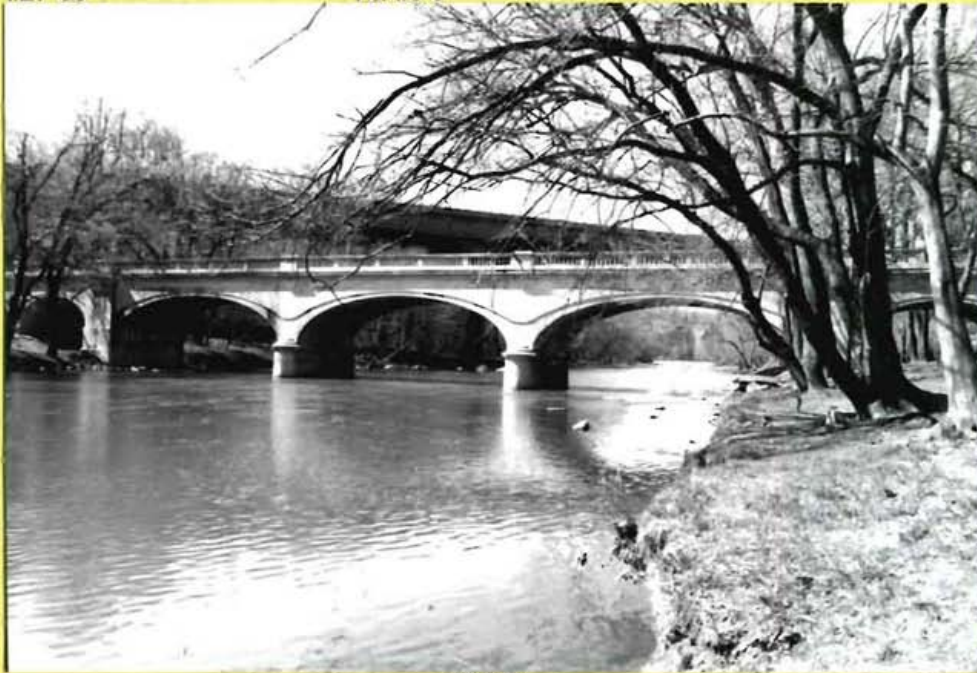
**10. NAME(S) OF STRUCTURE**

State Bridge Number 698

**11. PHOTOS (W/ FILM ROLL & FRAME NO.) AND SKETCH MAP OF LOCATION**

75A:27-36

76A:3-8



76A:3

Mack, Warren W. "A History of Motor Highways in Delaware", in Reed, Henry Clay, Delaware: A History of the First State, vol.2, pp.535-550 (NY: Lewis Historical Pub. Co., 1947).  
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Federal Writers' Project. Delaware: A Guide to the First State. (New York: Viking Press, 1938).  
Spero, Paula A. C. A Survey and Photographic Inventory of Concrete and Masonry Arch Bridges in Virginia. (Charlottesville, Virginia: Virginia Highway & Transportation Research Council, 1984).  
Wilmington Morning News, 20 March 1936.  
Wilmington Evening Journal, 1 February 1958; 13 June 1958.

Delaware State Archives. State of Delaware, New Castle County Levy Court, Specifications, Proposals, Contract and Bond. ms., State Archives, Dover, DE.  
Delaware State Archives. New Castle County Road Commissioners Papers, various years 1750-1940, ms. State Archives, Dover, Delaware.  
Delaware DOT records: Contract files.

Plans on file at Delaware DOT: Contract #BNC-7, 70-05-002, 80-071-02

**13. INVENTORIED BY:**

**AFFILIATION**

P.A.C. Spero & Company with Kidde Consultants for Delaware DOT

**DATE**

April-November 1988



*Bridge 698: Van Buren Street Bridge*

## STATE BRIDGE NUMBER 698

**Van Buren Street over Brandywine Creek & Flume**  
**Wilmington, New Castle County, Delaware**  
**1906**

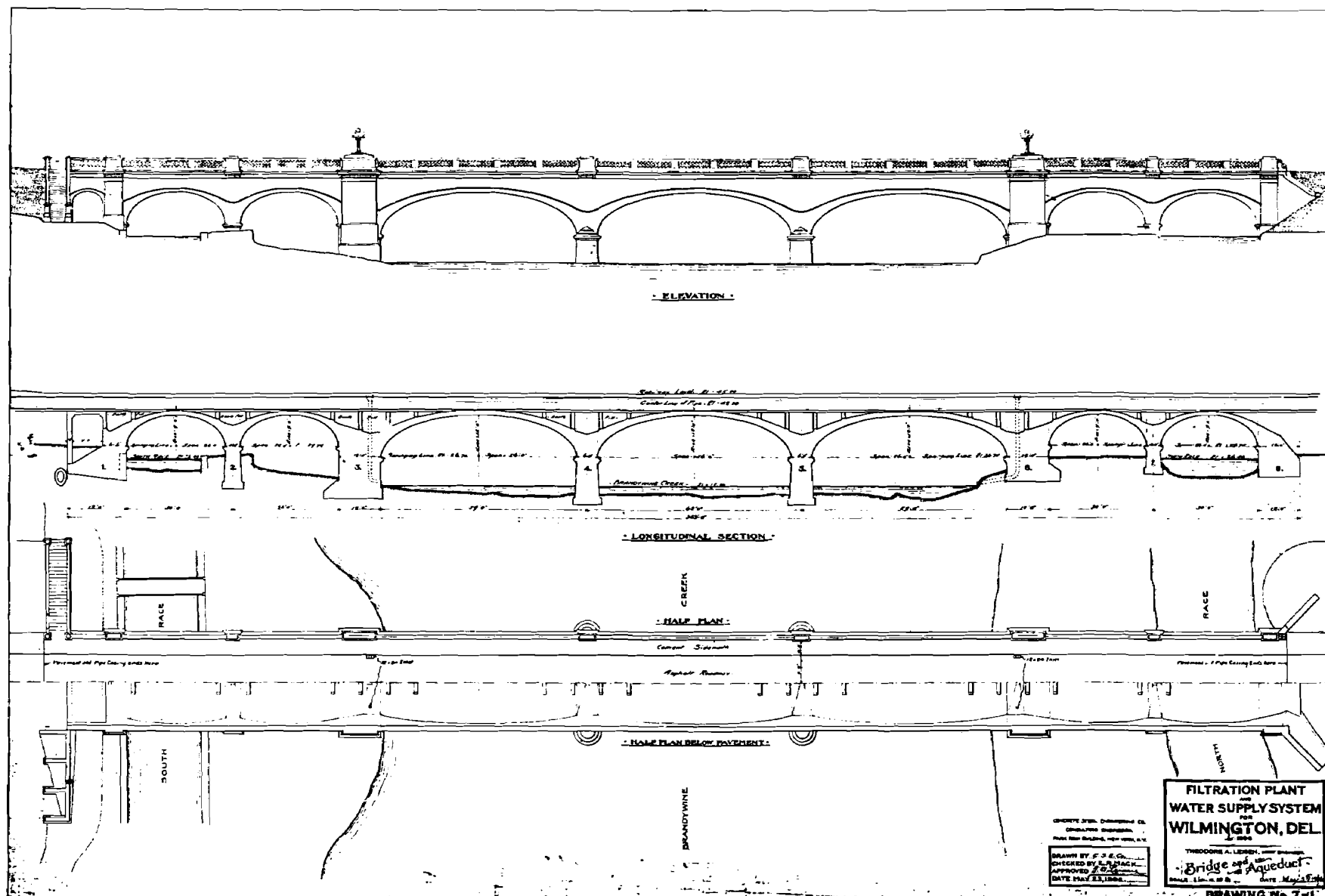
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Elevation, section and plan from original 1906 drawings for Bridge 698.

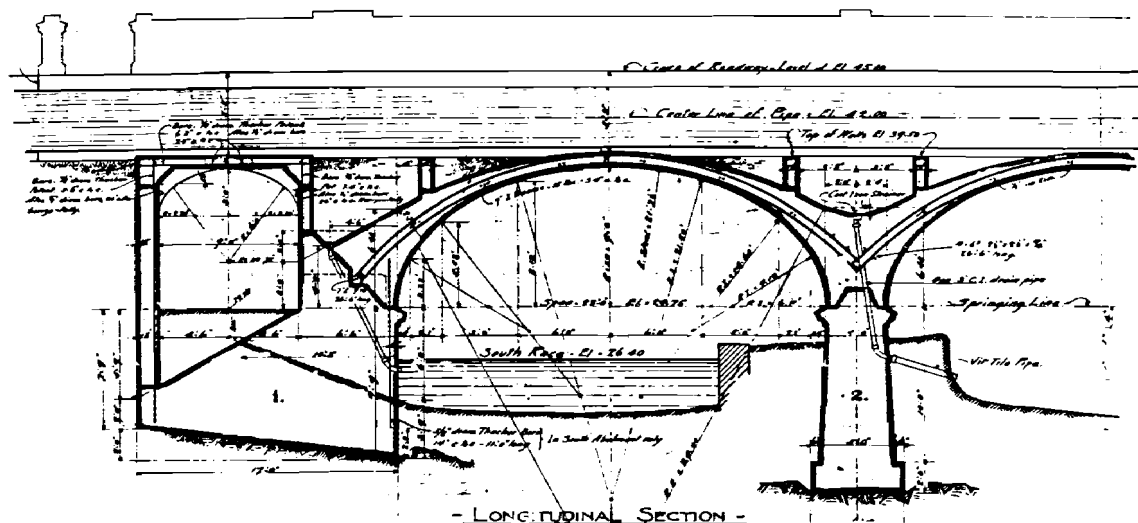
# CONCRETE

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Details from original 1906 drawings for Bridge 698 showing placement of Thacher bars.