

**HISTORIC STRUCTURES REPORT
TIDAL BASIN INLET BRIDGE
WASHINGTON, D.C.**

Contract No. CX-3000-5-0031

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Introduction

The Historic Report on the Tidal Basin Inlet Bridge in Washington, D.C., was prepared in accordance with the guidelines issued by the National Park Service in its Request for Proposals (No. 3-5-31). The focus and content of the report were further refined in a series of work-review meetings between the National Park Service and the KressCox Associates Team. The project team consisted of KressCox Associates, P.C., architects and planners; Perry Gerard Fisher, historian and archival consultant; Nassaux-Hemsley, Inc., engineering consultants; and Mortensen, Lewis & Scully, Inc., landscape architects.

The primary emphasis of the report is on the specialized engineering aspects of the original construction of the Inlet Bridge, and on the extensive subsequent modifications of the structure. However, the fascinating mechanical systems of the bridge cannot be separated from the structure's role in the Potomac River flood-control projects and concomitant development of the waterfront parks system of Washington at the turn-of-the-century. The Tidal Basin Inlet Bridge is, moreover, an important work of early-20th-century Washington architecture, and a distinguished example of the style and versatility of Nathan C. Wyeth, its designer.

The Inlet Bridge, begun in 1908, joins two large areas of federal parkland created from the Potomac River marshes by the massive dredging and filling operations carried out during the last two decades of the 19th century. The actual configuration of the lands comprising East and West Potomac Park and their improvement as public recreational

areas were by no means settled matters until well into the first decade of the 20th century. Indeed, the reclamation of the tidal "flats," commenced in 1882 by the Army Corps of Engineers, and in truth "a vital sanitary measure,"¹ was seen for many years principally as a project to enhance the commercial life and port economy of Washington, D.C., by controlling flooding, improving river navigation, and creating a vast new acreage for speculative urban development along the waterfront.

Ultimately, a combination of national pride, concern for the appearance of the capital, and the development by the Corps of Engineers of a comprehensive public works plan for public buildings, parks, bridges, and landscaped highways led to the March 3, 1897 Act of Congress preserving the 628 acres of reclaimed lands and 111 acres of Tidal Basin as "Potomac Park ... to be forever held and used as a park for the recreation and pleasure of the people."² The erection of the Inlet Bridge in 1908, and the major alterations to the structure made in 1926, reflect the changes in the character and intensity of use of the parklands.

The Historic Structure Report outlines the turn-of-the-century planning and development issues that form the historical context of the construction of the Tidal Basin Inlet Bridge. This overview is followed by a discussion of the historical and existing landscape settings of the bridge; and by sections dealing in detail with the original engineering design, techniques, and construction, and the design and mechanical

¹ Constance McLaughlin Green. *Washington: Capital City, 1879-1950*. Princeton, N.J.: Princeton University Press, 1962. p. 20.

² *U.S. Statutes at Large*. Fifty-fourth Cong., 2d sess., Chapter 375.

modifications of 1926. The concluding segment of the text of the report is an assessment of the repairs to the bridge underway at the time this document was prepared (1985-1986).

The Inlet Bridge is an intriguing structure from several points of view. It helps to document the long process of alteration of the Potomac River and to convey the story of the changes in the nature of the Washington waterfront and the treatment of the man-made parklands. Because of its highly specialized role in controlling the effects of the ebb and flow of the river tides, the Inlet Bridge is evidence of the urban engineering that made the existence of the modern city possible. The provision in the original design of the removable floor over the tidal lock bears witness to the earlier need for passage of larger vessels into the Tidal Basin from the river. Although the bridge is primarily an element of the Corps of Engineers' Washington harbor improvements, care was taken to incorporate sophisticated engineering into a classical, ornamental bridge design suitable to the plans for the appearance and intended recreational uses of Potomac Park. The inexorable pressure of increased automobile traffic led inevitably to the 1926 widening of the bridge that had been intended for equestrians and the pleasure of a carriage drive.

It is our intention that the Inlet Bridge Historic Structure Report will serve to aid National Capital Parks in its interpretive programs. Furthermore, we hope that the data included on the original design; its technical, engineering, and landscape features; and discussions of later changes to the structure and its setting will assist in the preservation and proper maintenance of the bridge.

Chapter 1 – Historical Background and Issues

Reclamation of the Potomac Flats

The notorious Potomac River "flats" at Washington, D.C., were large shallow-water areas produced by the silting of the river below Georgetown, where the Potomac dramatically widens and makes a turn of approximately sixty degrees. The sudden increase in river width from about 900 feet at Easby's Point (near the foot of New Hampshire Avenue) to some 5,000 to 6,000 feet immediately below, led naturally to the deposit of great quantities of silt and debris--especially huge in times of flooding--at the site of the federal city. Throughout the 19th century the Potomac flats were growing in size as a result of these natural factors, but their spread was greatly intensified by upstream deforestation and agricultural practices, and to some extent by the construction of bridges and causeways at Washington. Frequent dredging throughout the 19th century was necessary to keep the several channels in the river at Washington open, but navigation continued to deteriorate, threatening the already-suffering port economies of Washington and Georgetown. Freshets were frequent, and particularly as the city grew and developed after the Civil War, every flood took a larger toll in damage to private and federal property.

The old Washington City Canal on the line of today's Constitution Avenue--long non-functional, stagnant, and a health hazard--was converted to a sewer during the early 1870's. It discharged at the foot of Seventeenth Street, N.W., directly onto the tidal flats. During low tide the flats were largely exposed, along with "putrid masses" of sewage and

other debris. "The vicinity of the outlet of this sewer became a pestilential swamp, the stench from which was at times almost intolerable."¹ In early spring dense growths of eel grass began to spread across the hundreds of acres of flats, reaching heights of five or six feet by July. In the dry months of mid-summer the flats were garbage-clogged areas of muck and mosquitos, choked by carpets of thriving eel grass. Moreover, the deterioration of river conditions had a profound impact on navigation: the Virginia channel of the river was obstructed by two bars, with ruling depths of only eight and fourteen feet; and the depth in the Washington channel had been reduced by silting to a depth of ten feet.²

Between June 11, 1870 and March 3, 1881, Congress appropriated \$290,000 for the improvement of the harbors of Washington and Georgetown. The project was carried out by the Army Corps of Engineers,³ and consisted of little more than the removal of the most dangerous rocks from Georgetown harbor and the dredging of the river channels to a depth of sixteen feet and width of 200 feet. Not until the

¹ Peter C. Hains, "Reclamation of the Potomac Flats at Washington, D.C." American Society of Civil Engineers. *Transactions*, Vol. XXXI, January 1894. p. 57.

² *Testimony before the Senate Select Committee ... appointed to investigate and report as to the condition of the Potomac River Front in Washington.* (Senate Misc. Doc. No. 133). 47th Cong., 1st sess. Washington: Gov't Printing Office, 1882.

³ An Army Engineer was made Officer in Charge of Public Buildings and Grounds in 1867, replacing the previous civilian administration. In 1875, as a result of the great amount of river and harbor work required at Washington, the Washington Engineer District was created and given responsibility for these improvements.

disastrous freshet of February 1881--when flood waters literally lapped at the foot of Capitol Hill and the business section of the city was under water--could Congress be convinced to fund large-scale modifications of the Potomac River at Washington. The projected cost of the project was \$2,716,365, and included "the improvement of the navigation of the river by widening and deepening its channels, the reclamation of the flats by depositing on them the material dredged from the channels, the freeing of the Washington channel of sewage, and the establishment of harbor lines." The flats were to be reclaimed to a height of three feet above the flood level of 1877 (a water level exceeded by another three feet in the freshet of 1889), and the act called for "*a tidal reservoir to be provided with automatic inlet and outlet gates.*"¹ In 1890, the scope of the improvements was enlarged to include the replacement of Long Bridge, and the construction of a training dike along the Virginia shore extending downstream from Analostan Island.²

On August 2, 1882, Congress appropriated \$400,000 to begin the massive reclamation effort. The planning for the filling and raising of the flats already had been done. Maj. William J. Twining, first Engineer Commissioner of the District of Columbia to be appointed under the city government reorganization of 1878, submitted a well-developed plan in 1879. Twining's scheme advanced the land area of the city westward into the Potomac, and closed the Washington channel at its upper end, making it a tidal arm of the river. Four inter-connected flushing ponds,

¹ U.S. War Department. *Annual Reports, 1908. Vol. V, Report of the Chief of Engineers.* Washington: Gov't Printing Office, 1908. pp. 240-241.

² This latter action was the origin of the new land which became Columbia Island.

equipped with inlet and outlet gates, worked automatically with the tide. Water was taken in from the Virginia channel on the flood, and discharged into the head of the Washington channel on the ebb. The ponds proposed by Twining were to be landscaped and treated as ornamental features of a large new park area.¹

The clearing action of the flushing ponds was a sanitary and engineering necessity if the Washington channel were to be closed at one end. The plan adopted by Congress in 1882 created one single tidal reservoir of 111.17 acres, however. This basin was excavated to a depth of eight feet to prevent the growth of the offensive eel grass.

Maj. Peter Conover Hains, the head of the Washington Engineer District during the years 1882-1891, designed and directed the greater part of the raising of the flats. A spur from the nearby Baltimore and Potomac railroad line was constructed to haul fill dredged from the channels. Building of the sea wall and the actual deposit and spreading of spoils was done in a manner similar to contemporary levee building (Illustration 1). Hains observed during the course of the work that since the level of the river at the tidal reservoir inlet was generally higher than at the outlet, the inlet gates "might be dispensed with altogether and connection made with the Virginia Channel by means of an open passage or canal. It was accordingly decided to build the outlet first and let the necessity of the inlet gates be determined by experience."²

¹ In Twining's plan, as well as in several other versions of the flats-reclamation scheme, a substantial portion of reclaimed area was to be laid out as building lots.

² Hains, *op. cit.*, pp. 74-75. This article is the best concise, detailed technical and statistical discussion of the Potomac Flats project.

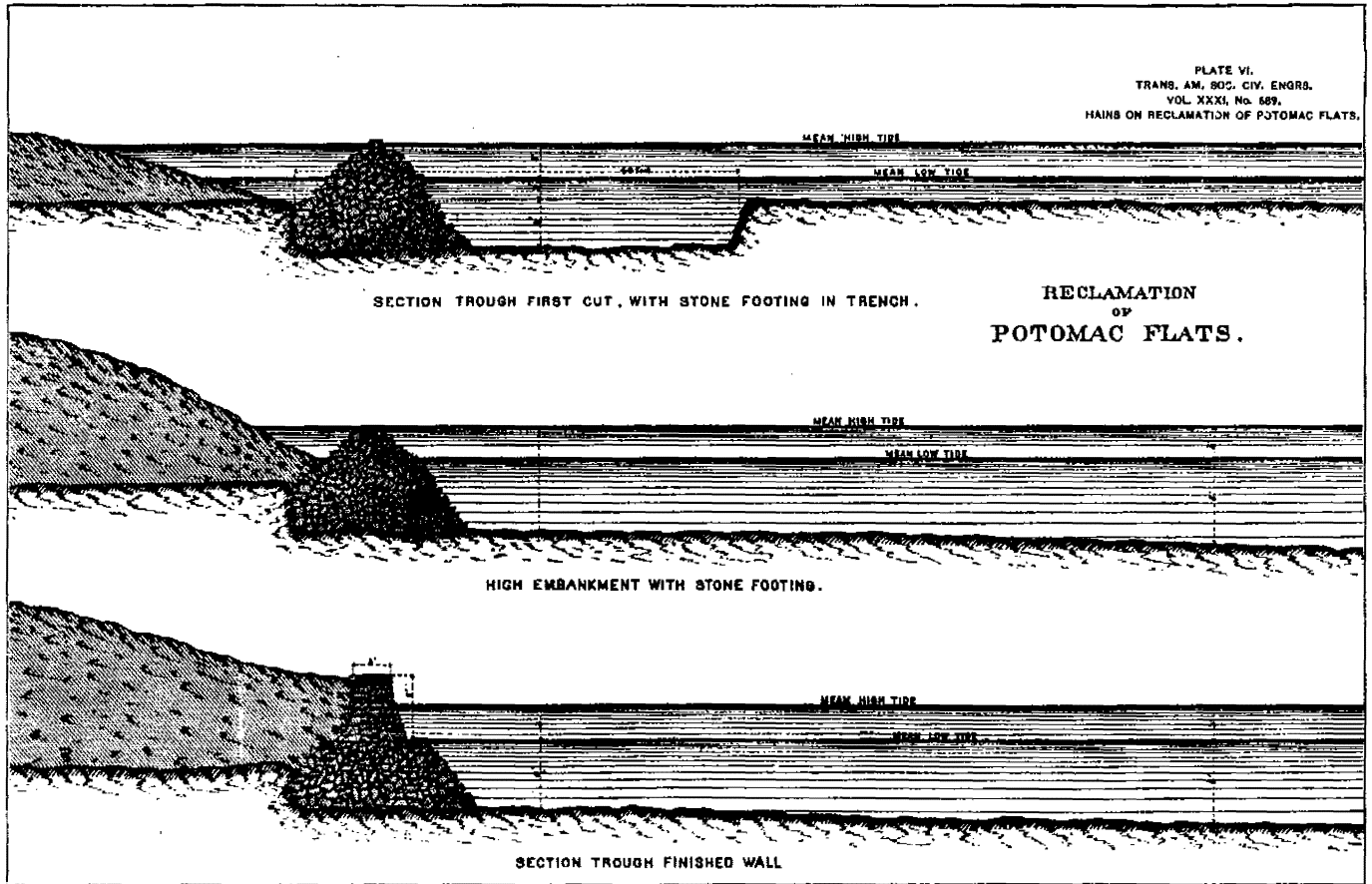


Illustration 1: Diagram of the construction of the seawall and filling of the Potomac Flats at Washington, D.C., ca. 1885.

*American Society of Civil Engineers,
Transactions. Vol. XXXI, January, 1894. Plate VI,
between pp. 77 and 78.*

Early Potomac Park

The lands that are today's East and West Potomac Parks became perceptible features of the Washington landscape by the late 1880's. The long comma-shaped island of East Potomac Park was actually the first area to be reclaimed, yet plans for its development as a recreation area did not take shape until well into the 20th century (see map inside front cover). The improvement of West Potomac Park, on the other hand, was intimately tied to the fate of the McMillan Commission Plan of 1901, and its recommendations for the Lincoln Memorial and reflecting pool, and the Arlington Memorial Bridge.

Much of the credit for the early decision to dedicate the former Potomac flats as public park land is due to Col. Theodore A. Bingham, the Officer in Charge of Public Buildings and Grounds from 1897 to 1903. Keenly in tune with contemporary thought that parks were "breathing spaces" essential to the "promotion of mental growth" and the cultivation of civilized values, Bingham saw the rising flats as an unparalleled opportunity for the extension of the system of Washington's public spaces and the restoration of the Mall.* In response to a directive of Congress in 1898, Bingham made a thorough study of the history of the federal property in the District of Columbia, assembling all the early documentation of the city still extant. It was largely Bingham who generated the intense turn-of-the-century revival of interest in the original plan for Washington, and prompted Michigan Senator James McMillan to a series of measures which ultimately resulted in the establishment of the Senate Park (McMillan) Commission.

* Quoted in Frederick Gutheim, *Worthy of the Nation*. Washington: Smithsonian Institution Press, 1977. p. 97.

Before the Senate Park Commission plan was prepared, however, Congress had been persuaded to pass the law which ended the pressures of real estate interests to allow subdivision and private development of the reclaimed flats, or any portion of them. Chapter 375 of the Laws of 1897, approved March 3, declared

That the entire area formerly known as the Potomac Flats and now being reclaimed, together with the Tidal reservoirs, be, and the same are hereby, made and declared a public park, under the name of the Potomac Park, and to be forever held and used as a park for the recreation and the pleasure of the people.

In the following year, Congress transferred control of all District of Columbia parks to the Office of Public Buildings and Grounds (30 Stat. 570). Army Engineer Bingham, as Officer in Charge, soon turned his attention to the improvement of Potomac Park.

Only gradually, however, did the Office of Public Buildings and Grounds assume administration of the total area of Potomac Park, for significant reclamation work and several associated projects were still ongoing, and thus, were technically river and harbor improvements under the jurisdiction of the Washington Engineer District. In 1901, the Washington District turned over control of the large parcel of land between the Tidal Basin and Washington Monument grounds to Bingham. He soon after cleared and graded the site, raised the Tidal Basin revetment wall, and built a fifty-foot wide macadam drive along the east side of the reservoir.*

* Albert E. Cowdrey, *A City for the Nation: The Army Engineers and the Building of Washington, D.C.* Washington: Gov't Printing Office, 1979. p. 40.

New Potomac Bridges and Park Roads

East Potomac Park, long before its improvement as recreation space, was important as the site of the Washington abutments of the new railroad and highway bridges that replaced the Long Bridge, at approximately the same location as that historic structure. Congress officially authorized the removal of Long Bridge by the Railway Act of February 12, 1901 (31 Stat. 772), although plans for its replacement were made a decade earlier. This law also permitted the Baltimore and Potomac (or Pennsylvania) Railroad to build a new railroad bridge, and directed the Secretary of War to construct a new highway bridge nearby, just south of the Tidal Basin inlet. On the Long Bridge, rail and wagon travel had run side by side, and the extensive yards which developed at the Virginia end of Long Bridge were a major north-south rail transfer and connection point. For this reason, the established route of the railway had to be maintained even if the approaches to the new railroad and highway bridges impinged upon future park land.

A board of Army Engineers led by Lt. Col. Charles J. Allen chose steel-truss designs for both bridges. The railroad bridge was built in 1901. The Pennsylvania Bridge Company began construction of the Highway Bridge in October 1903, and the structure was completed in February 1906. A reinforced-concrete bridge over the Washington Channel, not finished until 1908, provided access from the District of Columbia to the Highway Bridge.

Conditions in most of East and West Potomac Park were deplorable at first. The filled land was irregular, weed-covered, and littered for



Illustration 2: Conditions in Potomac Park just south of the Tidal Basin Inlet, ca. 1902.

National Archives, 42-5PB-29

the most part (Illustration 2). A winding drive along the south side of the Tidal Basin that looped toward the inlet, was constructed in 1905, and the Washington approach road to the Highway Bridge was built in 1907. During construction of the Highway Bridge in 1905, the large oval field lying between the highway approach and the drive along the south side of the Tidal Basin was filled to grade with dredged material and seeded to provide an athletic field (which would later become the site of a bathing beach, and ultimately the location of the Jefferson Memorial).¹ An act of Congress in the same year provided \$65,000 to establish the Public Buildings and Grounds Nursery on the park land along the Potomac between the railway embankment and the Highway Bridge, south of the inlet (Illustration 3).²

The new Highway Bridge and Railroad Bridge embankment acted to cut off the large undeveloped area of East Potomac Park from the sections to the north that were gradually being improved. The lack of a bridge across the Tidal Basin inlet compounded the problem.

The McMillan Commission Plan

The members of the Senate Park Commission were still hopeful in the opening years of the 20th century that their grand scheme for the development of the Nation's Capital would be implemented in all its particulars. The McMillan Plan of 1901 would have re-shaped and filled

¹ U.S. War Department. *Report of the Chief of Engineers, U.S. Army, 1909*. Washington: Gov't Printing Office, 1909. Part III, pp. 2355-2356.

² *U.S. Statutes at Large*. Fifty-eighth Cong., 3d sess., Chapter 1483.

much of the Tidal Basin as part of the elaborate plans for the development of the White House cross-axis. The commission introduced a design to counteract the effect of having built the Washington Monument some three-hundred feet east of the White House-Potomac River axis.

A "Washington Common," with a stadium, ball park, open-air gymnasium, playground, and facilities for water sports was planned for the area south of the Washington Monument grounds. A Pantheon was to be located on the direct line from the center of the White House to the Potomac River--raised on a platform, on filled land, in what was then the Tidal Basin. The remains of the tidal reservoir were to be modified to create a formal basin south of the Pantheon, and an irregular lake with an island to the west. The entire area was sheltered from the Potomac River by the lands of East and West Potomac Parks, and these were to be laid out with a combination of formally-planted axial avenues and more naturalistically-planted lawns and continuous waterside drives. An inlet bridge was to connect the two sections of the park (Illustration 4).

The White House cross-axis development--and the complex series of terraces around the Washington Monument, the Washington Common, and the Pantheon it foresaw--were never realized. Indeed, even the site of the Lincoln Memorial was not settled until January 1913, and as late as 1908-1909 the Army Corps was still busy reclaiming the former area of flats for the memorial and reflecting pool site proposed by the McMillan Commission, and ultimately accepted by Congress. In those years alone, almost a million tons of dredged material were deposited in

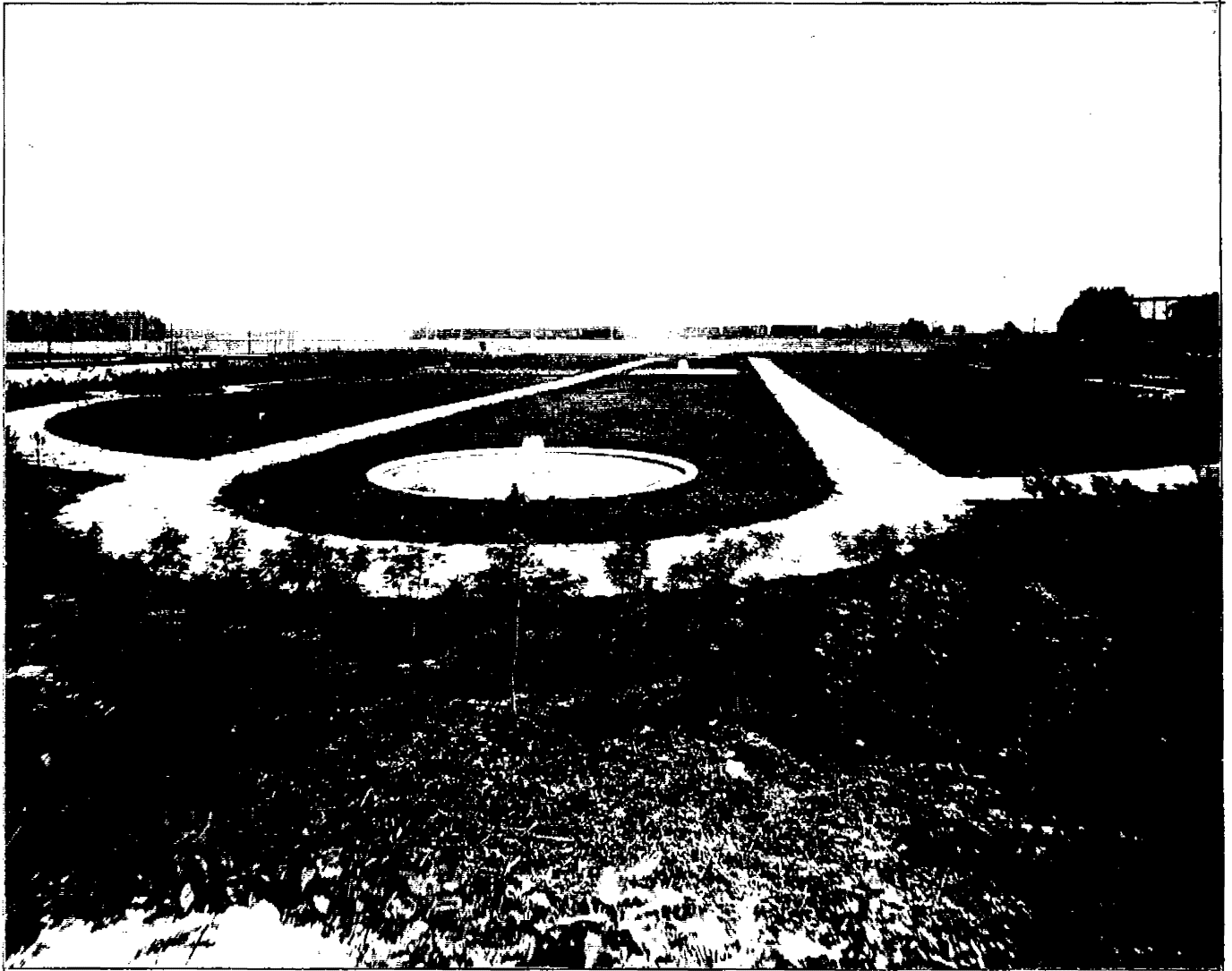


Illustration 3: A view of the Office of Public Buildings and Grounds Nursery, south of the Inlet Bridge, ca. 1910. A train can be seen on the railway bridge in the background.

National Archives, 42-5PB-22

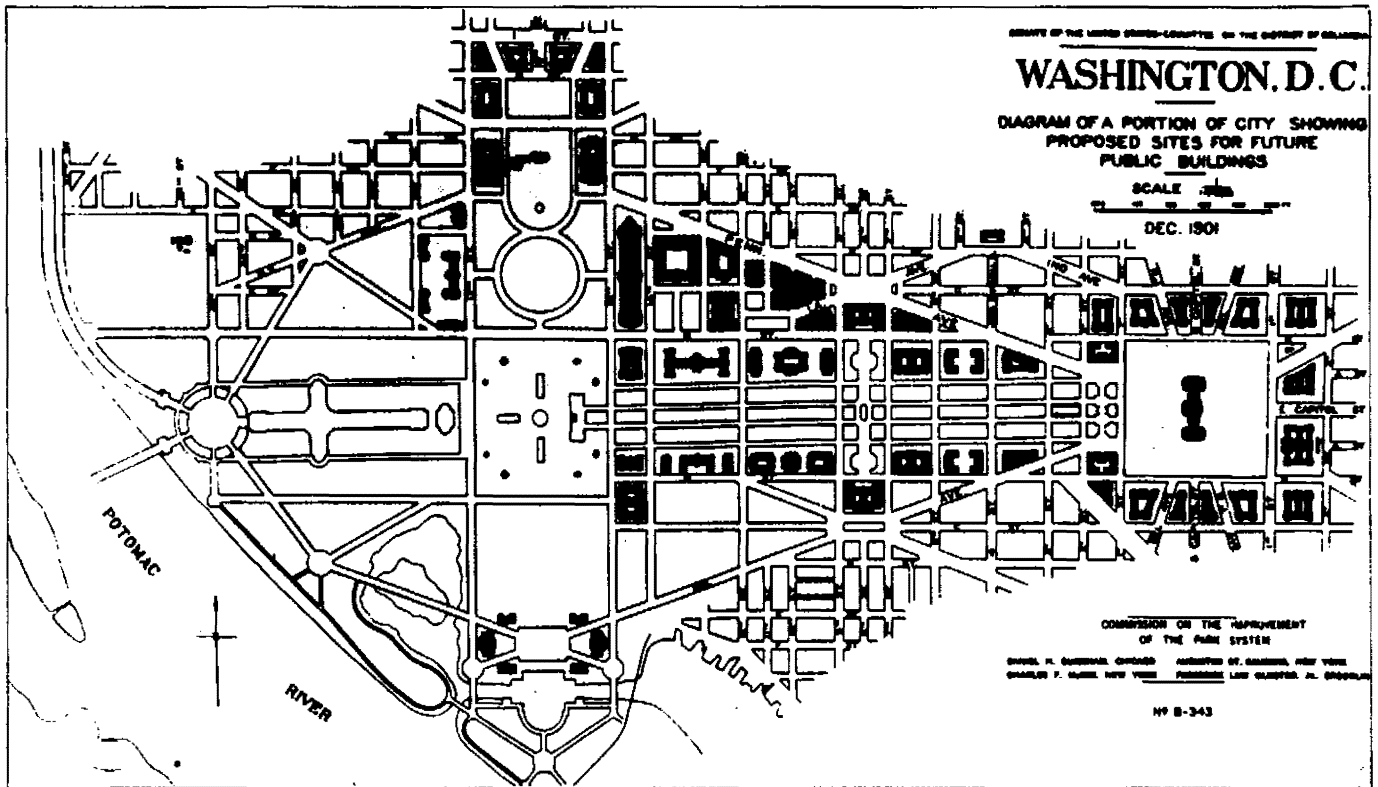


Illustration 4: Detail of the McMillan Commission design for the Mall and Potomac Park areas, 1901, showing the planned changes to the Tidal Basin and a proposed bridge over the inlet.

Senate Report No. 166, 1902.

West Potomac Park, bringing to the established grade all of the park above the railroad embankment.¹

The Improvement of West Potomac Park and the Inlet Bridge

Congress was relatively generous in its appropriations for the development of Potomac Park. In 1902, \$70,000 was made "immediately available" for the improvement of West Potomac Park, provided that the bathing beach and bathhouses that had existed for about ten years south of the Washington Monument grounds be removed.² \$60,000 was appropriated for the improvement of West Potomac Park in the sundry civil act of 1907, and \$84,000 in the sundry civil act of 1908.³

The funds made available by the latter acts were used in part to construct a riverside drive from the foot of Seventeenth Street, N.W. around the Tidal Basin to the inlet and then north along the edge of the Potomac to the foot of Twenty-sixth Street, N.W. The first section of the macadam road-- 4,650 feet along the west side of the Tidal Basin to the inlet--was built in 1906, and the second section of 2,550 feet was begun in March 1907 and finished by the following June. A boat-landing

¹ U.S. War Department. *Report of the Chief of Engineers, 1909*, *op. cit.*, Part I, p. 1212.

² *U.S. Statutes at Large*. Fifty-seventh Cong., 1st sess., Chapter 1301.

³ U.S. War Department. *Report of the Chief of Engineers, U.S. Army, 1907*. Washington: Gov't Printing Office, 1907. Part III, pp. 2327-2328.

basin was erected in the northeast corner of the Tidal Basin (near the old bathing beach), and cinder footpaths and cinder bridle paths were laid out near the roadway. The drive was provided with brick gutters, drains, and catch-basins, and lined with 313 trees. Approximately 1,400 additional trees and shrubs were planted in the lawn areas (Illustration 5).¹

By spring of 1907, Washingtonians and visitors to the capital were able to drive, stroll, or ride horseback around the entire perimeter of the tidal reservoir. A visit to both East and West Potomac Parks meant retracing the same route for part of the trip, however, since there was no traffic route across the inlet. Polo grounds were projected for the peninsula of West Potomac Park, and the Potomac Riders' and Drivers' Association planned a "speedway" for racing horse-drawn vehicles.

Col. Charles S. Bromwell, Officer in Charge of Public Buildings and Grounds from mid-1904 to mid-1909, directed many of the projects that transformed Potomac Park in the vicinity of the Tidal Basin and the inlet. In his report to the Chief of Engineers for the fiscal year ending June 30, 1907, Bromwell expressed his belief that the next steps in the improvement of Potomac Park were the construction of a park roadway along its northern boundary on the line of B Street extended (Constitution Avenue), and the "connection across the inlet into the tidal reservoir between the detached driveways along the river side of the park."²

After some years of experience, the Washington Engineer District--responsible for the continuation of the river and harbor

¹ *ibid.*, pp. 2327-2329.

² *ibid.*, Appendix HHH, pp. 2354-2355.

improvements at Washington--had determined that construction of the inlet gates *was* necessary,¹ and the River and Harbor Act approved March 2, 1907 authorized their construction. Plans were drawn by the Washington Engineer's Office, but before they were made final, Col. Bromwell requested the sum of \$25,000 to "widen the foundations and superstructure of the tidal gates at the inlet in order that the river side drive may be carried across them," and this amount was granted by Congress in the Sundry Civil Appropriations Act approved May 27, 1908.²

The Tidal Basin Inlet Bridge

Prior to approval of Bromwell's request, in the summer and fall of 1907, the Washington Engineer's office carried out preliminary surveys at the site of the inlet gates. A existing construction plant was rehabilitated for the project and temporary job buildings were built in the early spring of 1908. Dredging for the foundation of the bridge (carried to a depth of sixteen feet below mean low water) was begun in May 1908, and was largely completed by the end of June--at which time

¹ The Tidal Basin had silted up to a considerable degree, and by 1907 required complete dredging. This was begun October 8, 1907 and completed by the end of September 1908. At the time dredging began, the average depth of the reservoir was only four-and-one-half feet. The 1907 operation re-established an average eight-foot depth. Most of the dredged material was used to fill the old bathing pool and Seventeenth Street sewer canal. See, *Report of the Chief of Engineers, 1908*, pp. 1205-1206.

² *Report of the Chief of Engineers, 1907, op. cit.*, Appendix HHH, p. 2355; *U.S. Statutes at Large*. Sixtieth Cong., 1st sess., Chapter 200.



Illustration 5: View of the Tidal Basin Drive, looking northeast, ca. 1907, showing the 44-foot wide road, adjacent bridal path, and newly-planted elms.

National Archives, 42-SPB-28

more than one-third of the 55-foot long bearing piles had been driven. The construction of the bridge and gates required that 497 feet of seawall be relocated and reconstructed, and it was further decided that 515 feet of badly-settled older seawall (laid dry, as depicted in Illustration 1) be relaid in mortar and raised to a level matching that of the new walls adjacent to the Inlet Bridge (6 feet above low water).¹

Nathan C. Wyeth, Architect of the Bridge

Col. Bromwell was confident that Congress would vote the additional funds to combine the inlet gates with a bridge, and the Washington District Engineer Office, from the earliest days of 1908, had proceeded with plans for such a structure. On February 1, 1908, Major Spencer Cosby wrote the Chief of Engineers, Brig. Gen. Alexander Mackenzie to secure authority to hire architect Nathan C. Wyeth "to design the architectural features, including the furnishing of all necessary drawings," noting that "the bridge and tidal gate will form one of the most prominent objects in the landscape of Potomac Park" and "no effort should be spared to make the proposed structure as artistic as possible." Cosby had consulted Col. Bromwell about the choice of Wyeth, and had gained his concurrence.²

¹ U.S. War Department. *Report of the Chief of Engineers, 1908. op. cit.*, pp. 241-242; Appendix K, p. 1211.

² Maj. Spencer Cosby to Brig. Gen. A. Mackenzie, February 1, 1908. RG 77, DNA.

Wyeth was a distinguished local architect, 38 years of age. He was born in Chicago, and graduated from New York's Metropolitan Museum School of Arts in 1889, taking first prize in architecture. Graduating first in his class at the École des Beaux-Arts, in 1899, he was immediately offered a position with the prestigious New York architectural firm of Carrere and Hastings (active at the time designing the old Senate and House Office Buildings), and then served in the Office of the Supervising Architect of the Treasury, 1900-1902. This was followed by a year as Chief Designer for the Architect of the Capitol.

Although he entered private practice in 1905, Wyeth continued to enjoy many government commissions as well as a thriving business designing mansions for the wealthy and numerous institutional buildings. The houses he built for Mrs. George Pullman and Franklin MacVeagh (now the Russian Embassy and Mexican Embassy, respectively, both on Sixteenth Street, N.W.) are good examples of Wyeth's early-20th-century domestic architecture and classical tastes. The Corps of Engineers employed Wyeth as consulting architect of the Francis Scott Key Memorial Bridge in 1916. He later became Municipal Architect of the District of Columbia, serving the city from 1934 to 1946. In this capacity Wyeth was responsible for the Georgetown Library, Woodrow Wilson High School, and the Municipal Center on Indiana Avenue, N.W. Nathan Wyeth died on August 30, 1963, at the age of 93.*

* "Nathan C. Wyeth is Selected to Be Municipal Architect," [Washington] *Evening Star*, January 11, 1934; "Nathan C. Wyeth Dies; Architect for District," *Evening Star*, August 31, 1963.

The Architectural Features of the Original Design

Chief of Engineers Mackenzie endorsed the employment of Wyeth as architect of the Inlet Bridge on February 7, 1908, and by April 9, Wyeth had prepared the preliminary designs, although as Spencer Cosby cautioned, many details were yet to be worked out.* The use of reinforced concrete had been decided earlier by the Engineer Office, as had the provision of a lock in the central span. The section of the roadway above the lock was to be removable in order to permit passage of larger vessels into the Tidal Basin. Smaller boats would be able to pass between the river and reservoir under the central span without removal of the bridge floor above.

Wyeth designed an "ornamental concrete" bridge 184 feet long, with a 25-foot wide roadway flanked by two sidewalks, each 7 feet 3 inches in width. The ends of the bridge, and the center span, were marked by concrete piers--four pairs in all. The lock span was 46 feet 8 inches by 26 feet, with the longer dimension running perpendicular to the main bridge axis, producing on the Potomac-River side a section projecting outward from the principal plane of the bridge wall. To each side of the removable center span were two fixed spans.

A concrete balustrade ran between the piers, and turned outward toward the river, at each side of the central span, on the Potomac face of the bridge. The Tidal-Basin wall of the bridge was not broken by a strong projection of the central span. For obvious reasons of weight

* Maj. Spencer Cosby to Brig. Gen. A. Mackenzie, April 9, 1908. RG 77, DNA.

and mobility, however, at the central span of the bridge on both the river and basin faces, an iron railing took the place of the concrete balustrades used over the adjacent spans.

The four fixed spans were articulated on the outward faces of the bridge by round-headed arches. The surrounding concrete was scored to suggest masonry courses and voussoirs. The wall of the bridge visible from the Potomac-River side was actually an architectural fascia masking a machinery platform--divided into two sections, each approximately 9 feet by 52 feet--one section to either side of the removable span. This platform was approximately five feet below the sidewalk level, and it supported the equipment for operating the four curtain gates. A small stairway at each end of the bridge provided access (Illustration 6).*

The gate machinery necessitated that, on the Potomac-River side of the Inlet Bridge, each of the four arches of the fixed spans be subdivided into two smaller arched openings. This was done by the placement in each arch of a cast-concrete panel with two subsidiary arches, which was set back slightly from the surface plane of the main arch (Illustration 7).

On the Tidal-Basin side of the bridge, the arch openings were unobstructed. This wall of the bridge, too, received the major decorative treatment. The sidewalk faces of the two concrete pedestals that flanked the removable span on the reservoir side were provided with

* The structural and mechanical engineering aspects of the bridge and tidal gate design are more fully discussed in Chapter 4 of the report.

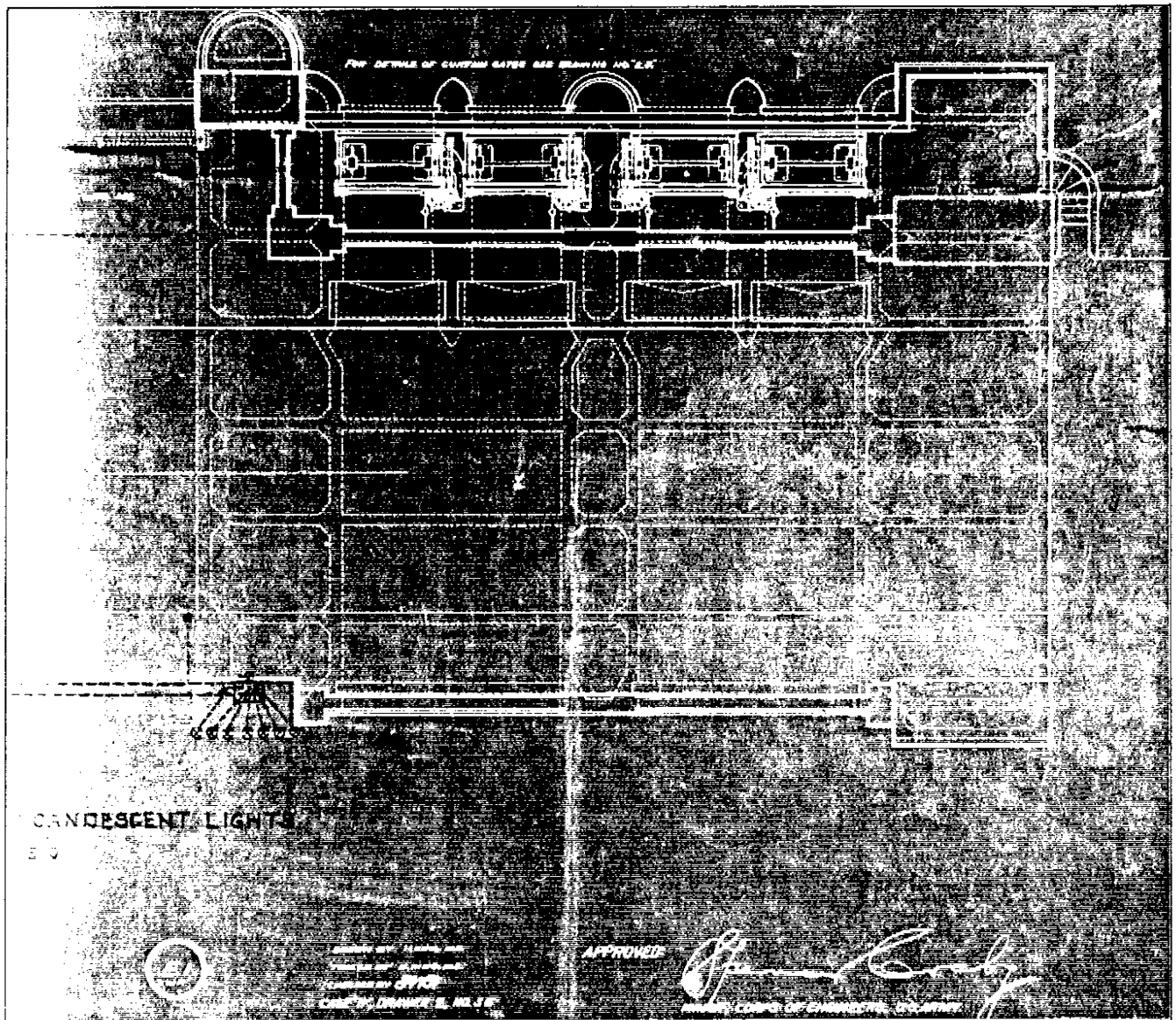


Illustration 6: Horizontal section through upstream half of the Inlet Bridge showing cellular concrete construction and placement of curtain gate machinery.

*National Archives, RG 42, Office of PB&G,
General Correspondence, Potomac Park 52/667*

niches in which bronze fountains were installed. The waste water from the fountains was piped through the piers to the mouths of two ornamental cast-concrete heads of *grotesques* facing the Tidal Basin. These reliefs were positioned above concrete drip, or splash, panels to either side of the central span (Illustration 8).¹

Progress of Construction

The United States Engineer Office performed much of the work of constructing the Inlet Bridge using hired labor. Carter and Clarke of Washington, D.C., furnished and drove the piles under a contract of May 4, 1908 and received final payment for services on September 10, 1908. Another Washington firm, J. B. Kendall supplied the reinforcing steel in late August 1908. Other contracts for such items as mortar, sand, gravel, and building stone for the adjacent revetment construction apparently proceeded smoothly. By June 30, 1909, Washington District Engineer, Maj. Jay J. Morrow, reported that "excepting the installation of the lock, curtain, and automatic gates, the work is now 98 per cent complete," and expenditures on the project (including the seawall) totalled \$106, 382.77 to date.²

¹ No written or graphic information on the source of the design, the manufacturer, or the date of installation of the fountains has been located. No reference to them is made in any records, including the general correspondence and contract files of the Office of Public Buildings and Grounds and Washington Engineer District Office. The fountains are mentioned in passing in the *Report of the Chief of Engineers, 1909*, (Washington, 1909), Appendix K, p. 1211.

² U.S. War Department. *Report of the Chief of Engineers, 1909*, *op. cit.*, Appendix K, p. 1212.

The War Department advertised for proposals for furnishing and installing the set of lock gates and eight curtain gates on March 13, 1909, allowing bidders until April 12 to submit.¹ The G & W Manufacturing Company of New York City was awarded the contract to supply the gates and operating mechanisms on April 22, 1909. The contract price was \$8,997 including installation.

Despite the mechanical-systems installation still to be done, the Engineer Office informed Public Buildings and Grounds in April that the Inlet Bridge was now open to pedestrians and required police supervision.² The *Washington Evening Star* was able to tell its readers in the issue of July 22, 1909, that the new bridge across the inlet was "rapidly approaching completion," and only finishing work and cleaning up were to be done. The *Star* furthermore praised the fact that a continuous circuit drive of the Tidal Basin would soon be a reality.³ Actually, not until the following spring was the bridge ready for vehicular use. In July, plans of the proposed layout of the approaches were drawn, and during the fall of 1909 and in early 1910 the approach

¹ The War Department specifications for the lock and curtain gates are reproduced as Appendix I of this report.

² U. S. Engineer's Office, Washington, D.C. to Office of Public Buildings and Grounds, RG 42, PB&G, Potomac Park, 52/371. This same letter requested that the Office of Public Buildings and Grounds submit plans for grading the areas adjacent to the bridge.

³ "New Bridge Rapidly Approaching Completion." [Washington] *Evening Star*, July 22, 1909.

roads to each end of the bridge were constructed and hundreds of shrubs planted along them.¹ District Engineer, Capt. Warren T. Hannum, made formal transfer of responsibility for the maintenance and control of the Inlet Bridge to the Office of Public Buildings and Grounds on December 15, 1909. In his fiscal year report delivered June 30, 1910, Capt. Hannum advised the Secretary of War that the gates and bridge construction were completed, as well as the ornamental features of the superstructure, with the exception of the incandescent lamps. The work on the bridge and associated features had so far cost \$138,574.54, and lighting posts would have to wait until fiscal year 1911.²

Architect Nathan Wyeth had intended four decorative lighting standards for Inlet Bridge. These were to be cast of bronze and placed on the four pedestals marking the center span of the bridge. The tops of the pedestals at the center of the bridge were built up slightly to act as bases for the four 100-candle-power standards, each with three lights bearing "alabasterine," white-glass globes. In October 1911 suggestions for lighting standards were solicited from the firm of John Williams, Inc., who responded with two designs and estimates the same month. One of the designs submitted by Williams was apparently further refined by architect Wyeth in 1912 as the model for the standards actually manufactured, although the surviving records are unclear in the matter.

¹ U.S. War Department. *Annual Reports, 1910. Volume II, Report of the Chief of Engineers.* Washington: Gov't Printing Office, 1910. pp. 2669-2670.

² *ibid.*, pp. 1335-1336. A blueprint of the bridge's electrical and water-service duct systems, with a wiring diagram for the incandescent lights, is included in Record Group 42, General Correspondence, 1907-1921, File No. 52/622 (Potomac Park).

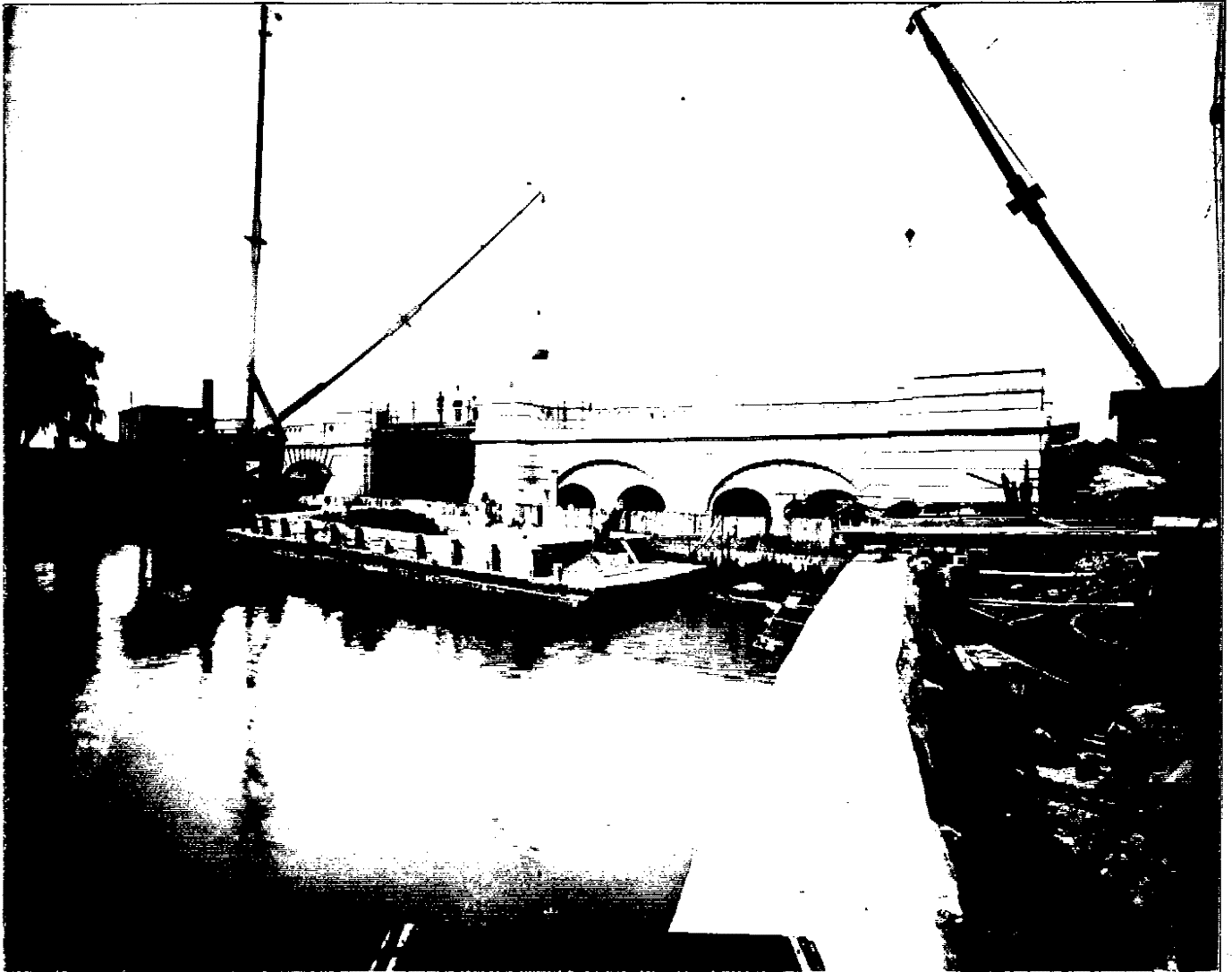


Illustration 7: Tidal Basin Inlet Bridge under construction, 1909.
This view shows the Potomac River side of the bridge and
part of the construction plant.

National Archives, 42-SPB-101

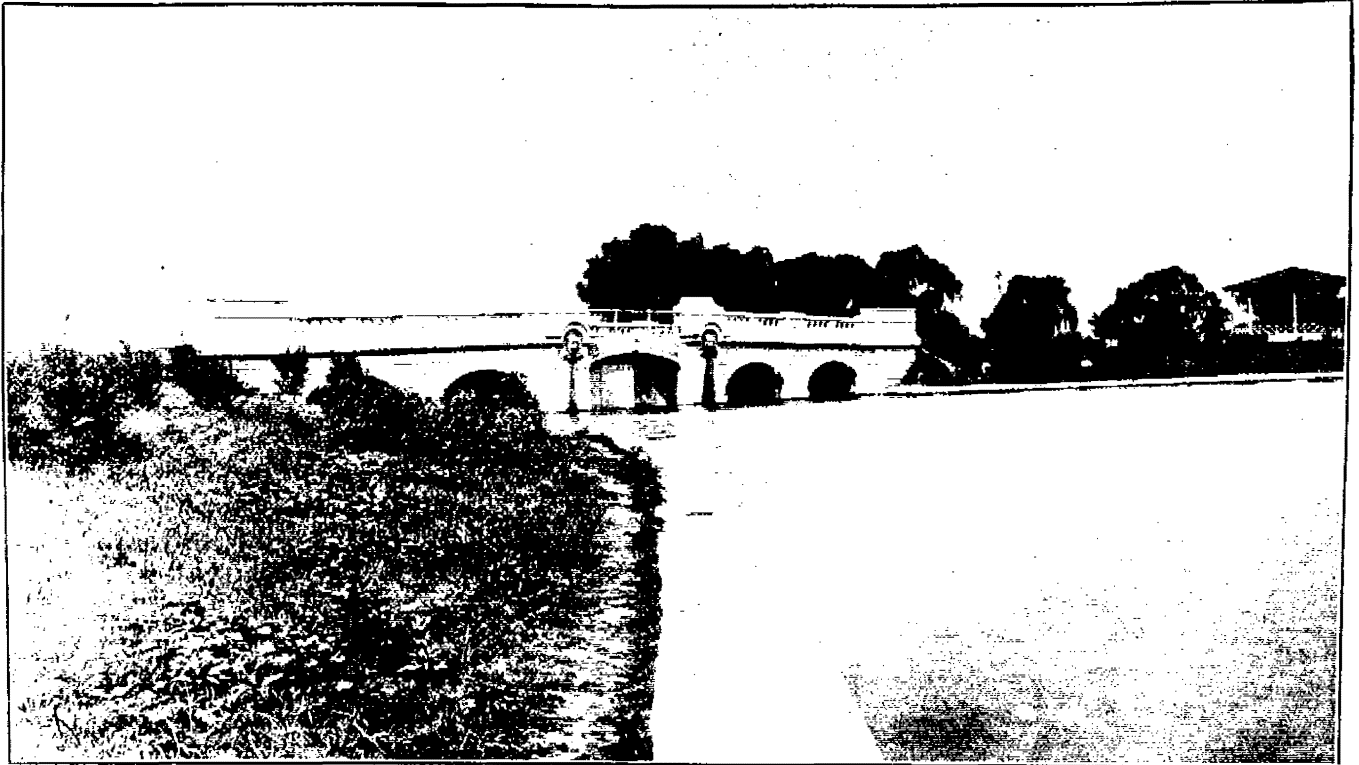


Illustration 8: View of the completed bridge from the Tidal Basin, 1910, showing the band-stand built in April 1909. The lighting standards were not installed on the bridge until late 1912.

U.S. War Department. Annual Report of the Chief of Engineers, Part III. (Washington: Government Printing Office, 1910).

On June 22, 1912, the War Department advertised for bids for furnishing and delivering *two* bronze standards, and price estimates for furnishing two additional standards. Proposals were to be accepted until June 26. In addition to a bid from the New York firm of John Williams, Inc., proposals were received from the Roman Bronze Works in Brooklyn, New York, and the Henry Bonnard Bronze Company, of New York City. The bid of the Roman Bronze Works for two standards at \$1,130 was accepted as well as the price stated for one additional standard at \$500. The fourth standard, at a price of \$500, was ordered the following September, making the total price of the light posts \$2,130.

Under the terms of the contract, Roman Bronze Works was required to submit a model of the standard (or photographs of it) by August 1, 1912, and if that were approved, to deliver the finished items by September 15, 1912. Consulting landscape architect George Burnap and District Engineer Spencer Cosby approved the model supplied by the firm in August (Illustration 9), and production of the standards proceeded according to schedule.¹

With the placement of the lighting standards in late 1912, the Tidal Basin Inlet Bridge was essentially completed. The value of building the bridge with a removable floor in one span seemed to be proved even before the bridge was completed. From mid-1907 to mid-1909, "11 wrecks and 22 logs, snags, etc.," were removed from the Tidal Basin.²

¹ A blueprint of the standard, drawn by Nathan Wyeth, is attached to the contract between the Office of Public Buildings and Grounds and Roman Bronze Works (Record Group 42, General Correspondence, 1907-1921, File 30/487, Public Grounds). It is not clear whether or not this is Wyeth's original design for Inlet Bridge lighting.

² *Report of the Chief of Engineers, 1909, op. cit., p. 1213.*

The bridge immediately became an important feature of Potomac Park. On April 24, 1909, the entire park area above the railway bridge embankment had been transferred to the control of the Office of Public Buildings and Grounds. At just that time laying out of the polo grounds north of the inlet began, and the bandstand immediately above the Inlet Bridge was completed. Near the polo grounds and bandstand was the new so-called Speedway; a fifty-foot wide roadway for the driving and speeding of horses.

On April 17, 1909 a huge society promenade and concert by the Philippine Constabulary Band, organized by Mrs. William Howard Taft, took place in Potomac Park. The New York Daily Tribune recorded how, riding in an "electric landaulette," the President and Mrs. Taft led several hundred "pretentious equipages and swarms of prettily dressed women and their escorts" to the "highly artistic bandstand" just erected by Major Cosby "not far from the new concrete bridge which spans the passage between the tidal reservoir and the Potomac."* The following day the Mayor of Tokyo cabled his offer of 1,000 flowering Japanese cherry trees to be planted along the new Potomac Park drives which bordered the Tidal Basin. 3,800 more trees followed in 1912, when the first shipment of cherry trees was found to have been diseased.

The annual ritual viewing of the cherry blossoms made the Inlet Bridge an even more vital link in the system of park drives. When the Sundry Civil Appropriations Act for the fiscal year ending June 30, 1918 authorized the Chief of Engineers to "establish and maintain at a suitable place upon the shore of the Tidal Basin, in Potomac Park, a public

* "Promenade a Success; Crowd Attends Outdoor Function Arranged by Mrs. Taft." *New-York Daily Tribune*, April 18, 1909.

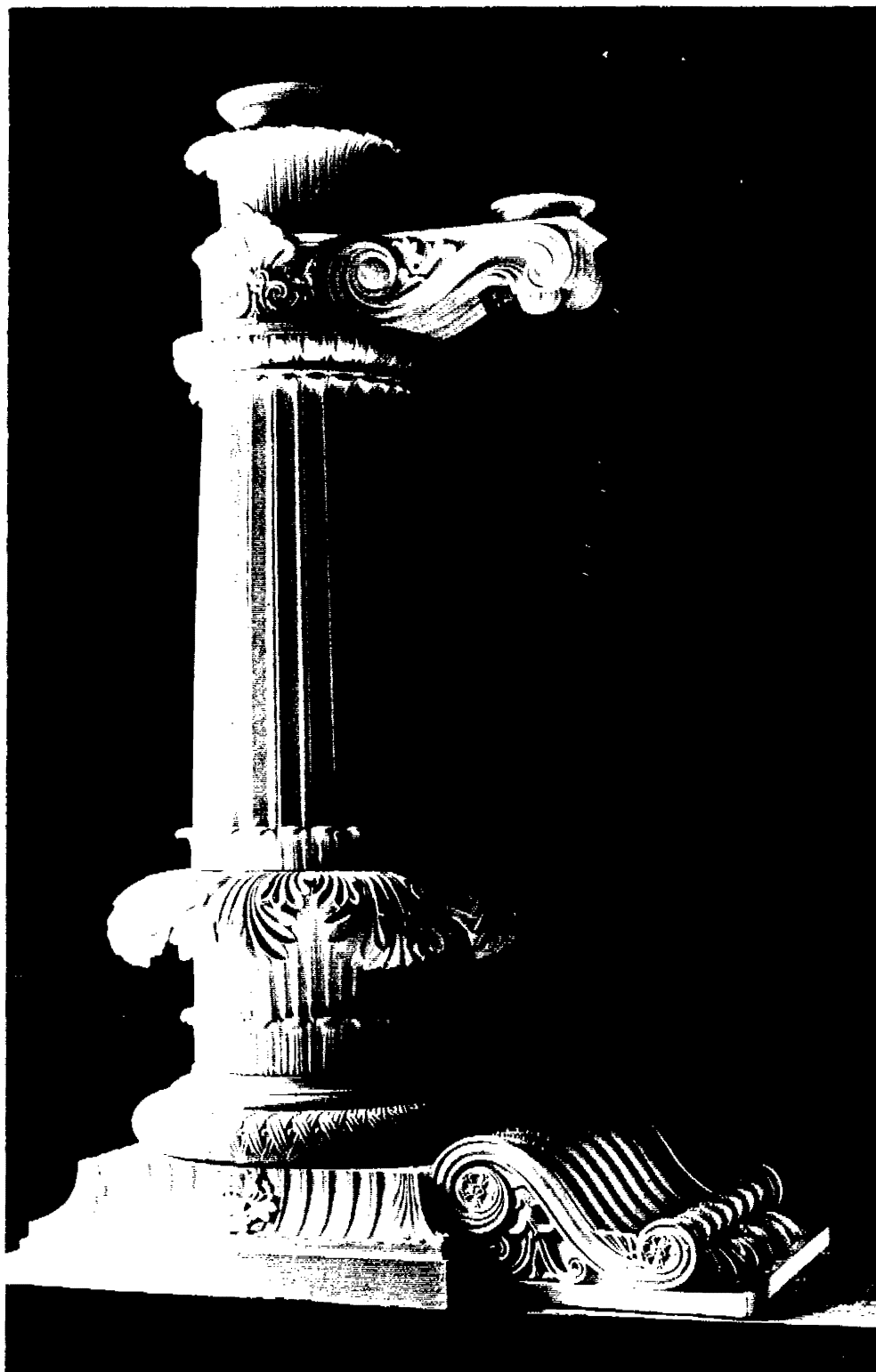


Illustration 9: Photograph of the model for the Inlet Bridge lighting standard, by Roman Bronze Works, 1912.

National Archives, RG 42, Office of Public Buildings and Grounds, Public Grounds 30/520.

bathhouse, with the necessary equipment, with a sloping sandy beach," not only was the traffic burden borne by Inlet Bridge to become much greater, but the structure also was to provide the site for the location of the equipment for chlorinating the waters of the Tidal Basin. Four liquid-chlorine dispensing mechanisms were installed in the arches of the Tidal Basin Inlet Bridge in the spring of 1918.¹ The Tidal Basin Beach, on the site of the future Jefferson Memorial, opened in May 1918 and operated through 1925, when it was permanently closed to avoid the question of racial integration.

Under a contract let in May 1926, the roadway of the bridge over the inlet to the tidal basin was widened in order to accommodate the large number of automobiles using the bridge. The steeply-curving approaches and the high-crowned roadway of the bridge were modified for modern traffic, and steel I-beams inserted under the roadway to strengthen it.² At the same time a new sidewalk was constructed on the Potomac-River side of the bridge--outside the original concrete parapet, and over the gate machinery. By moving the sidewalk, the roadway could be widened to 34 feet and a bridle path constructed. A plain metal railing was installed along the new sidewalk, and for some reason as yet undocumented, the lighting standards were moved from the center piers of the bridge to the piers at the entrances (Illustrations 10 through 13).

¹ See Appendix II, Selected Documents Pertaining to the History of Inlet Bridge, Correspondence Between the Office of Public Buildings and Grounds and the Electro Bleaching Gas Co. of New York.

² The engineering aspects of the 1926 alteration of the Inlet Bridge are discussed in Chapter 3.

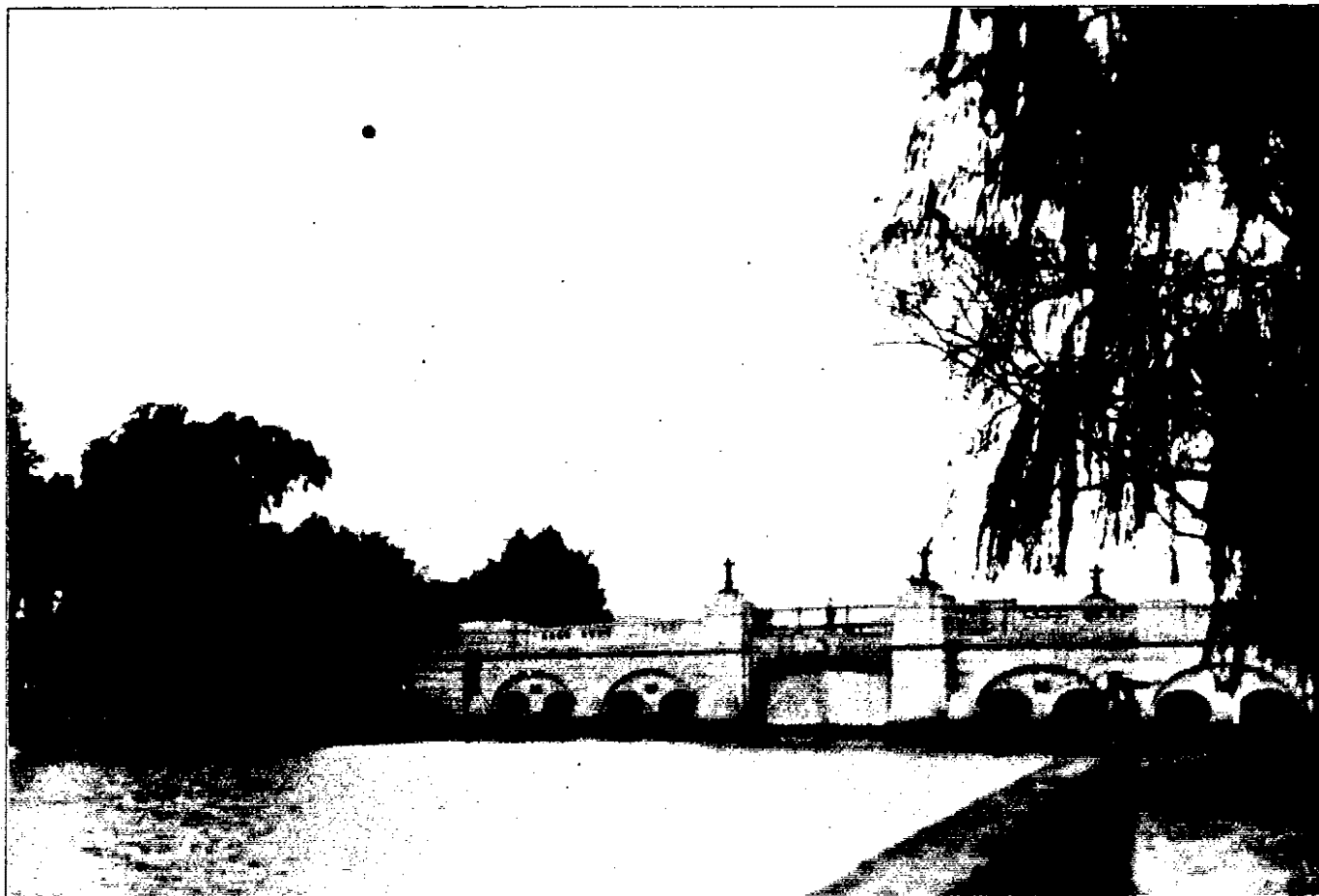


Illustration 10: View of the Potomac-River side of the Inlet Bridge, circa 1920, showing the lamp-posts in their original position and the landscape setting.

Columbia Historical Society, Spratt Collection

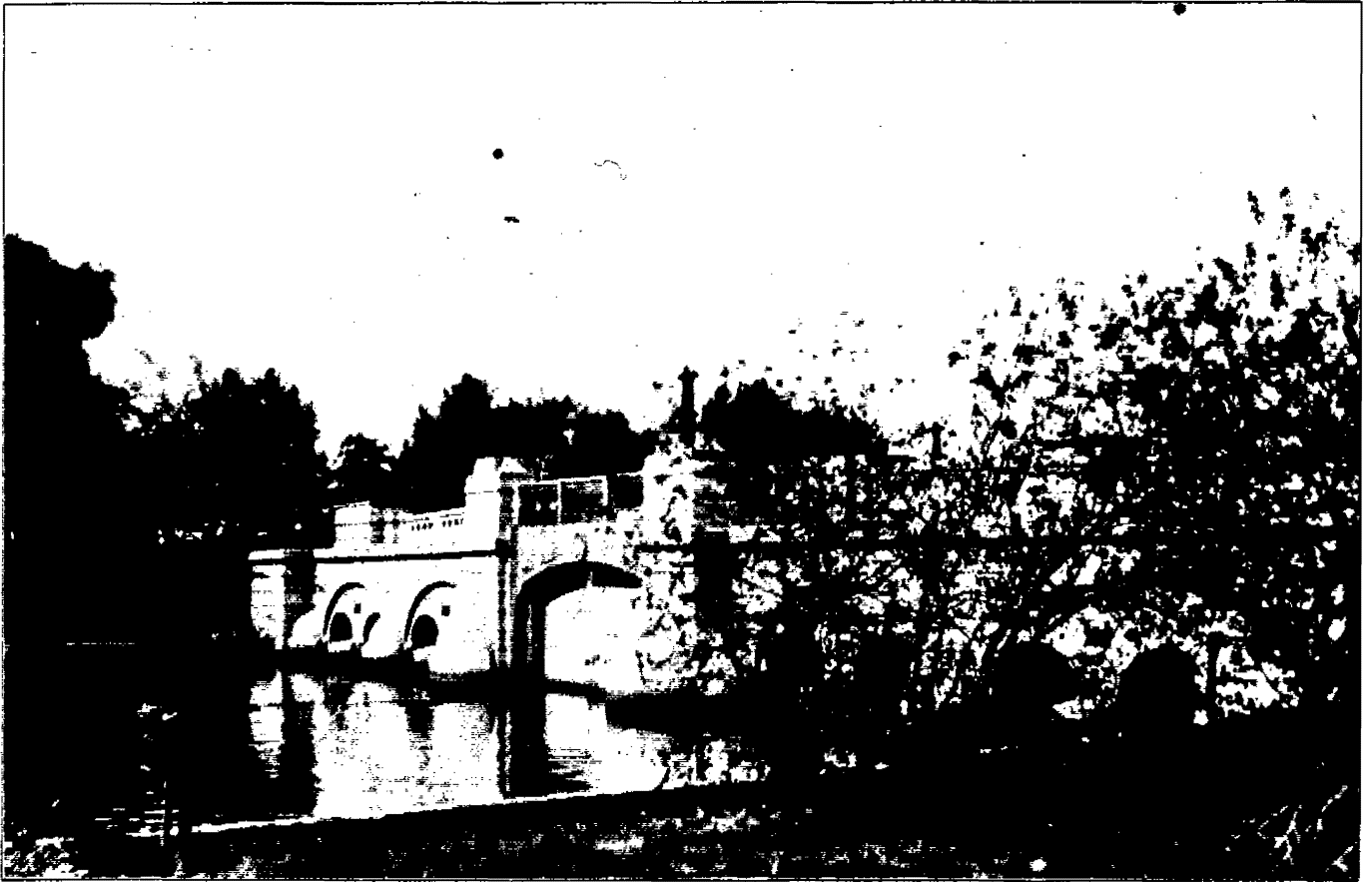


Illustration 11: Photograph of about 1920 of the river side of the Tidal Basin Inlet Bridge.

Columbia Historical Society, Spratt Collection



Illustration 12: The Potomac-River side of Inlet Bridge, circa 1930. The new railing on the outside of the repositioned sidewalk and the relocated lighting standards can be seen clearly.

Columbia Historical Society, Spratt Collection

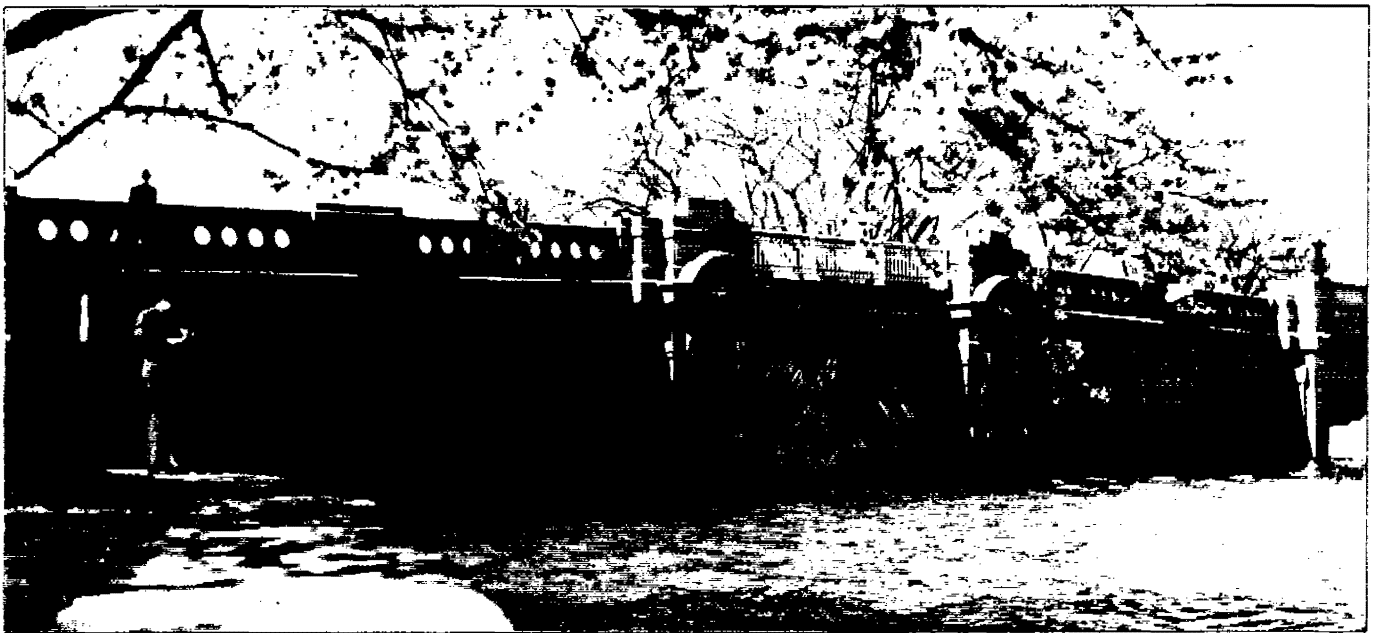
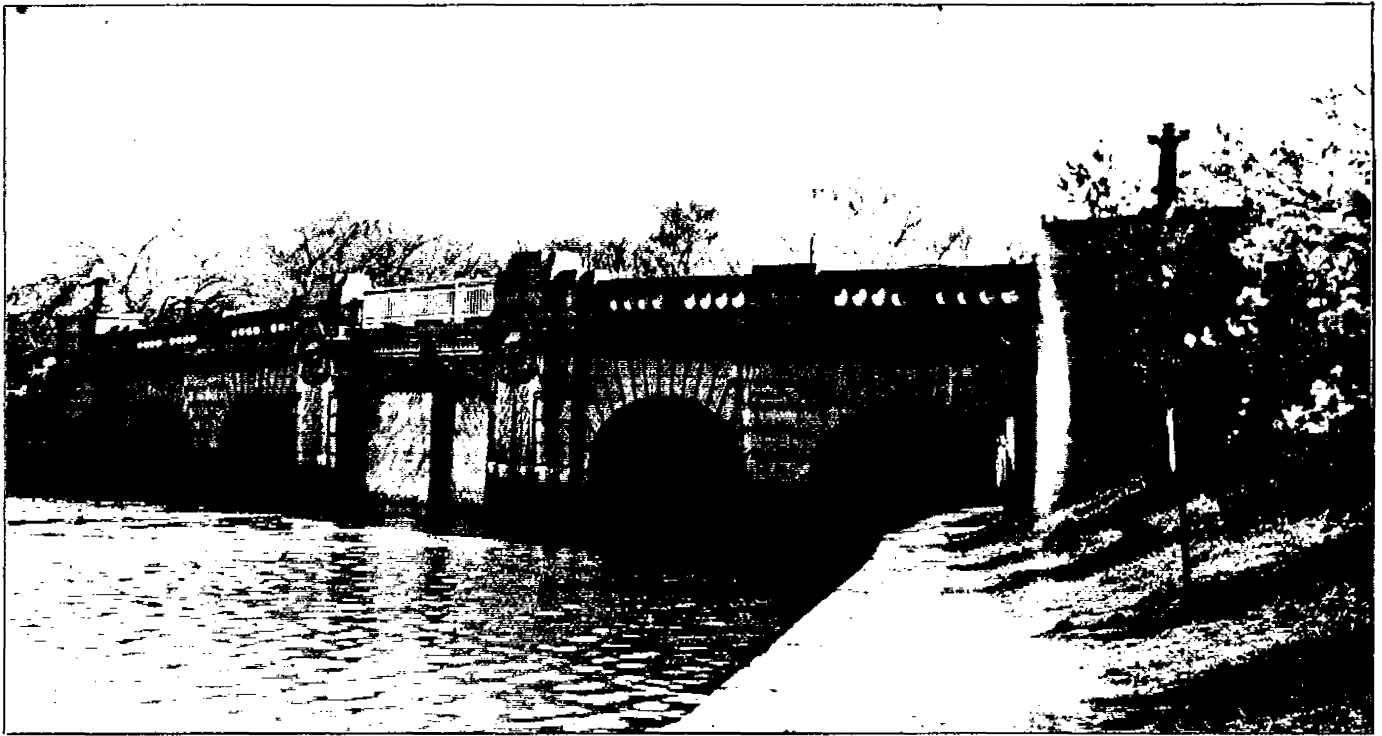


Illustration 13: Two views of the Inlet Bridge from the Tidal Basin side, after 1926 alterations (ca. 1935).

Columbia Historical Society, Bradley Collection

Chapter 2 – Landscape Architectural Elements

Landscape Design Development

The evolution in the landscape features in the vicinity of the Tidal Basin Inlet Bridge was part of the general development and changes in Potomac Park, especially in the period from the turn-of-the-century to the first World War, when many features of the park assumed essentially the forms they exhibit today. The major changes in the treatment of East and West Potomac Parks reflected an early-20th-century shift in American opinion about the role of public parks: from one which viewed parks as civilizing refuges from the city, to one which saw them as logical sites for more vigorous and active recreational pursuits.

From the outset of planning for the Inlet Bridge, the Washington Engineer Office and the Office of Public Buildings and Grounds viewed the linking of East and West Potomac Parks by means of a connection across the Tidal Basin Inlet as essential to the unity and success of the general improvement program for the area. As described earlier in this report, a bridge connection across the inlet was an integral element of the McMillan Commission Plan of 1901. In Potomac Park, the principal departure from the McMillan Commission scheme in the first two decades of the 20th century was the abandonment of any formal avenues defined by carefully-controlled architectural plantings--at least anywhere below the area designated for the Lincoln Memorial and Reflecting Pool composition.

The need for building and repairing more than 1,000 feet of seawall near the site of Inlet Bridge has already been noted. The embankments associated with the Inlet Bridge also necessitated extensive earth-moving, grading and replanting in those areas closest to the structure. A major goal in the reshaping of the areas closest to Inlet Bridge was to provide some transition between, and to help unite, the rather different characters of improvements as they had developed in the East and West sections of the park up to that time.

The Tidal Basin by the time of the inlet-gates-and-bridge construction was an irregularly-shaped, but clearly-defined body of water interrupted by several gentle projections of park land. From the earliest days of Potomac Park, provision for boating, swimming, and other athletics had been made. A large athletic field had been laid out between the southern edge of the Tidal Basin and the railroad embankment in 1905, and the Public Buildings and Grounds Nursery was established at about the same time nearby. Most people using the park arrived by foot or streetcar. And the extensive bridle paths and carriage drives approaching both sides of the inlet were features of Potomac Park that encouraged the generally-slow-moving traffic for which the bridge was intended. The architectural detail of the bridge, the somewhat sharp curves of the original drives leading to it, and the complexity of the early adjacent plantings, lent themselves to closer examination and enjoyment of the setting than modern automobile travel allows. Additional ornamental elements now disappeared--such as the handsome surviving cast-iron gas-lighting standards--helped to give the vicinity of the new Inlet Bridge a distinctive ambience.

Perhaps the most significant and unplanned impact upon the setting occurred early in the history of the bridge. This, of course, was the result of the gift of several thousand cherry trees from Japan in 1912. Not only did the thick planting of the cherry trees along the edge of the Tidal Basin alter the previously-more-naturalistic character of Potomac Park landscaping, but it introduced an unforeseen--however much only a seasonal--traffic demand upon the park and Inlet Bridge. As car ownership increased inexorably, the annual rite of blossom-viewing tended to be done more and more from the inside of automobiles, many of which stopped on Inlet Bridge as they made their circuit around the Tidal Basin. The opening of a public bathing beach and golf course in East Potomac Park just after World War I made the problem of periodic automobile congestion a year-round condition.

Away from the cherry tree planting--to the south and west of Inlet Bridge--the banks of parkland sloping toward the river seawall reflect to this day a less-formal and naturalistic edge treatment. As Illustrations 10 through 12 show, evergreens, willows and other deciduous trees, and irregular flowering shrubs were planted near the bridge abutments soon after completion of construction.

Historical Background

The Office of Public Buildings and Grounds consulted the well-known landscape architect Frederick Law Olmsted, Jr., for his guidance in the general improvement of Potomac Park. Olmsted was a natural choice to oversee the park's development, since he had served on the McMillan Commission and was intimately familiar with Washington.

Col. Charles S. Bromwell, Officer in Charge of Public Buildings and Grounds, asked Olmsted in late 1906 to consider a Potomac Park planting scheme. In a memorandum of January 1907, Olmsted outlined for the Office of Public Buildings and Grounds his concept for the landscape development of the park lands.

In general, Olmsted proposed largely-open lawns planted sparsely with deciduous materials, with particular attention paid to the carriage drives and riverside, which were to be lined with tall deciduous trees. Over the previous several years, fast-growing willows had been established along the Potomac river edge. Olmsted felt they should be supplemented with a variegated planting of water-loving species, including black and yellow birch, white and laurel-leaf willows, sycamores, and--in certain special locations--American elms.¹

Bromwell then formally requested a planting plan from Olmsted, which was ready by late October.² Small-diameter American elms were planted in the same period along the new macadam drive around the west side of the Tidal Basin to the Inlet (See Illustration 5). What is interesting about Olmsted's ideas is that he largely abandoned all of the formal elements of the McMillan Commission plan for Potomac Park--in part, no doubt, because of the economic realities that made installation and adequate maintenance of such features highly unlikely.

¹ Memorandum from Frederick Law Olmsted, Jr., January 4, 1907. RG 42, Office of Public Buildings and Grounds, File 52, Potomac Park, DNA.

² J. H. Poole, First Lieutenant, Corps of Engineers, to F. L. Olmsted, October 23, 1907. RG 42, Office of Public Buildings and Grounds, File 52, Potomac Park, DNA.

The forty-four-foot-wide drive from 17th Street, along the west side of the Tidal Basin to Inlet Bridge was built in 1906, and the extension of the macadam road north from the inlet, along the Potomac River, to the foot of Twenty-sixth Street, N.W., was constructed between March and June, 1907. In conjunction with the establishment of the roadway, 313 trees--primarily elms--were planted along both sides of the drives. They were spaced widely to allow the magnificent crown of the mature American elm to develop. Leading to the new Inlet Bridge from the south, in East Potomac Park, was the river road along the Potomac, which was planted with 16 large willows in 1909. At the time, 325 trees and 290 flowering shrubs were planted in other portions of the park.*

As already noted, in April 1909, as the bridge neared completion, the new bandstand just to the north was also finished, and it immediately became a popular attraction in that section of Potomac Park. Photographs of the Office of Public Buildings and Grounds in Record Group 42 of the National Archives show that by circa 1911, the vicinity of the bandstand was well-cultivated, and consisted of broad, grassy areas; clipped massings of flowering shrubs near the Tidal-Basin water's edge; and growing elms and evergreens.

* Unfortunately, missing from the files of correspondence of the Office of Public Buildings and Grounds is the record of the landscape gardener, George H. Brown, detailing the "making of plantings near approaches to the bridge across inlet to tidal basin," dated October 1909. That such a description was written is known from the record-abstract cards for the correspondence of the office (RG 42, PB&G, DNA).

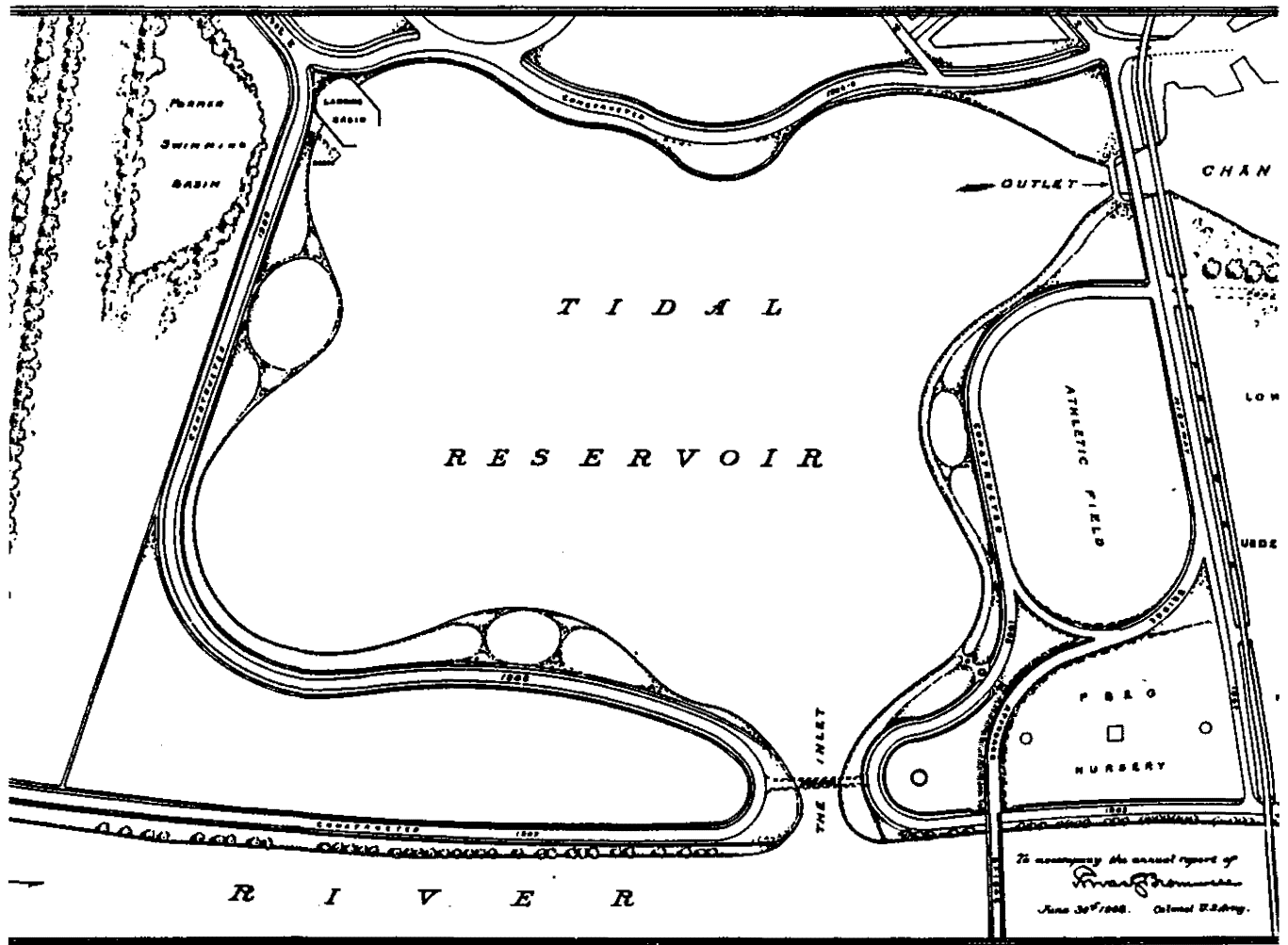


Illustration 14: Plan of Potomac Park near the Tidal Basin, 1908, showing the site of Inlet Bridge, then under construction; the athletic field, Public Buildings & Grounds Nursery, railway embankment, and highway-bridge approach road; and the carriage drives and bridal paths established at that time. The double row of trees on the left indicates the route of the old sewer canal.

U. S. War Department. Annual Reports, 1908. Report of the Chief of Engineers, Appendix K. (Washington: Government Printing Office, 1908).

In 1909, the problem of screening the unsightly railroad embankment and highway bridge approach from the White House and State Department was addressed by planting forty-four poplars near the Inlet Bridge to screen the portion of the highway bridge visible from those buildings, and thirty-one poplars near the railroad bridge.¹ George Brown, landscape gardener for the Office of Public Buildings and Grounds, had given several suggestions for more satisfactory screening plants, in recognition of the fact that preservation of views would become more important as East and West Potomac Parks continued to be developed and used. Among his recommendations were poplars, tulip trees, ash, oriental plane, American elm, sweet gum, American linden and maples.²

Since Inlet Bridge was intended to promote pedestrian activity and horse-back riding, sidewalks and a bridle path were accommodated in the design of the bridge and linked to the system in the adjacent park areas. In 1909, in anticipation of the bridge opening, repairs were made to the existing bridle paths in the park and a series of four horse jumps constructed in 1910.³ Approach roads at each end of the Inlet Bridge were built during early 1910, and the "bridle path across the bridge was

¹ *Report of the Chief of Engineers, 1909. op. cit.* Appendix EEE, pp. 2355-2356.

² George Brown to Col. Chas. S. Bromwell, June 13, 1908. RG 42, Office of Public Buildings and Grounds, File 52, Potomac Park, DNA.

³ *Report of the Chief of Engineers, 1909. op. cit.* Appendix EEE, p. 2356; *Report of the Chief of Engineers, 1910, op. cit.* Part III, p. 2670.

across the bridge was completed and ready for use in May, 1910." As part of the construction of the approaches and bridle path, one-hundred eighty-one flowering shrubs and three trees were planted on the west approach, and three-hundred sixty-five flowering shrubs were planted on the east approach. Fifty-three willow trees were added to those along the Potomac riverfront.¹

State of the Landscape: Historical Intent and Analysis of Major Changes and Maintenance

Existing Conditions

The four areas providing transition between the bridge and the surrounding parks have in recent years integrated new plantings into massings of older specimens. However, little symmetry in the plantings is evident in any two of the four areas and an informality of arrangement characterizes the entire representation of the chronological landscape history of the areas adjacent to the bridge. A limited palette of evergreens (American hollies, white pines), and deciduous plantings (cherry trees, elms) form the principal plant materials along the sloping areas between the bridge and bodies of water. There is a range in heights in all areas, since newer and mature specimens coexist in proximity to one another. Generally, the upper canopy provided by the hollies and pines dominates the dense groupings. However, currently, the height of some of the pines and hollies exceeds

* *Report of the Chief of Engineers, 1910. op. cit., Part III, pp. 2669-2670.*

twenty feet, and in a mass of this height, these trees begin to overwhelm the scale and details of the two-lane Inlet Bridge.

Areas

The plant composition of each of the four bridge landscape-abutment areas differs in plant species, number and maturity, and thus, each must be examined separately. All have in common the fact of a strong massing of evergreen trees, with no understory plantings, and only sparse and irregular lawn areas serving as ground cover.

The quadrant designations below are based upon the assumption of an east-west, rather than a north-south main axis for the bridge.

Northwest Section:

This area borders the Tidal Basin, and connects with the alignment of Japanese cherry trees around the Basin. Among the mature species are one white pine and several American hollies. The hollies are supplemented by younger specimens, for total of ten holly trees. A recently added cherry tree has been incorporated into the plant grouping, and serves as a reference to nearby Basin plantings.

Northeast Section:

Also associated with the Tidal Basin, this group of plantings stands on a slope, terminated by the concrete pathway along the edge of the Tidal Basin. A mature specimen of white pine dominates the massing of plant material closest to the bridge. Approximately

thirteen informally-placed American hollies, ranging in height from six to twenty feet, create a dense evergreen massing. These holly specimens of varying age blend into the cherry-tree plantings in a manner that appears natural. The northeast section also contains the only roadway border planting: a two-foot-high hedge of cottoneaster along the roadway connecting the bridge and Jefferson Memorial, at the crest of the slope.

Southeast Section:

This area provides a transition to the Potomac River edge, and serves as framing planting for the entrance to the Inlet Bridge. Perhaps the most dense and most mature specimens are located in this area. A group of evergreens close to the bridge head consists of four white pines and approximately ten American hollies, the height of which averages twenty feet. Although the pedestrian path across the bridge is joined to the water's edge by a curving set of concrete steps, there is no hard surface path at the riverside, and apparent frequent flooding causes persistent muddy conditions. Four mature cherry trees line a section of the seawall.

Southwest Section:

The southwest landscape area also occupies a portion of land between a bridge approach roadway and the Potomac River. Sparsely planted, this area displays consistently-informal design in the arrangement of plant material. Mature specimens of American elm dominate in scale, although their characteristic shape has been greatly altered by severe pruning of dead branches. A few American holly trees are interspersed within an evergreen mass, and range in size from six

feet, for more recent additions, to twenty-five feet for mature specimens. Two white pines complete the massing and stand closest to the bridge approach.

Conclusion

The groupings of evergreen and deciduous plant materials associated with the Inlet Bridge consist of both mature and recent specimens. Tree forms dominate the scheme and provide a tall canopy for what is a small-scale bridge and a frame for the bridge--especially when it is seen from across the Tidal Basin. At the same time they serve as transitions to the nearby Potomac River edges, and to the special Tidal Basin plantings of Japanese cherry trees.



Illustration 15: Cherry-blossom viewers gathered on the Tidal Basin Inlet Bridge, ca. 1935.

Columbia Historical Society, Bradley Collection

Chapter 3 – Engineering Design, Techniques and Construction

Purpose of the Inlet Bridge

The Inlet Bridge/Tidal Gate had several purposes as originally constructed. The primary purpose was to be an inlet tidal gate to permit ingress of water while the tide is rising but prevent egress at ebb tide. This is accomplished by eight (8) sets of swinging automatic tidal gates. The second purpose was to completely prevent water from entering or leaving the tidal basin when it is so desired, by closing a set of eight (8) "curtain gates" on the river side. It was expected "to keep these closed whenever the river water contain[ed] a large amount of sediment"¹. This would most likely occur during a freshet when the curtain gates would also prevent the Tidal Basin from flooding into the park. The structure's third purpose was to allow passage of vessels, most likely recreational or maintenance crafts, between the River and the Basin.

"The waterway through the central span is to be closed at each end by rolling gates half the width of the span. This will form a lock which can be operated readily to allow the passage of launches and other small boats between the river and the reservoir without necessitating the removal of the bridge floor overhead."²

In case a larger vessel such as a dredge or pile driver was ever required to enter the reservoir, the twenty-six foot wide central span had a removable floor. As noted earlier, after the structure had been designed as a tidal gate, Colonel Bromwell, in charge of the Office of Public Buildings and

¹ Spencer Cosby, Major, Corps of Engineers, to Brig. General A. Mackenzie, Chief of Engineers U.S.A., April 9, 1908, DNA

² *Ibid*

Grounds, requested that the structure be widened enough to carry a roadway bridge to connect the drives in East and West Potomac Park. Figure 15 shows cherry-blossom viewers gathered on the Tidal Basin Inlet Bridge. Figures 16, 17, and 18 are maps of the region in 1881, before improvement was to begin: after the proposed improvement project: and at the present day, respectively. Since the Inlet Bridge was to be a noticeable feature of the Park system, an aesthetically pleasing design was regarded as essential by the Corps of Engineers.

The Design and Construction of the Inlet Bridge

Thomas W. Power Engineering Company, of Washington, provided the design and specifications as well as the inspection of materials, workmanship, and installation of the machinery and other appliances for operating the gates. The G & W Manufacturing Co. of New York furnished and installed the lock and curtain gates.

The substructure of the bridge was built inside a cofferdam. A total of 1,184 piles, averaging 55 feet in length, probably wooden, and spaced for uniform pressure, were driven to ten feet below mean low water (-10 feet) and capped with 5 feet of "sealing concrete" from -12 feet to -7 feet. The bridge was composed of five spans - a removable center span with two fixed spans on each side. Supporting the superstructure and supported by the pile cap in each half of the bridge is an end abutment, a lock pier and a smaller middle pier, all of reinforced concrete built of a cellular construction above mean low water, for a total of 2 abutments and 4 piers.

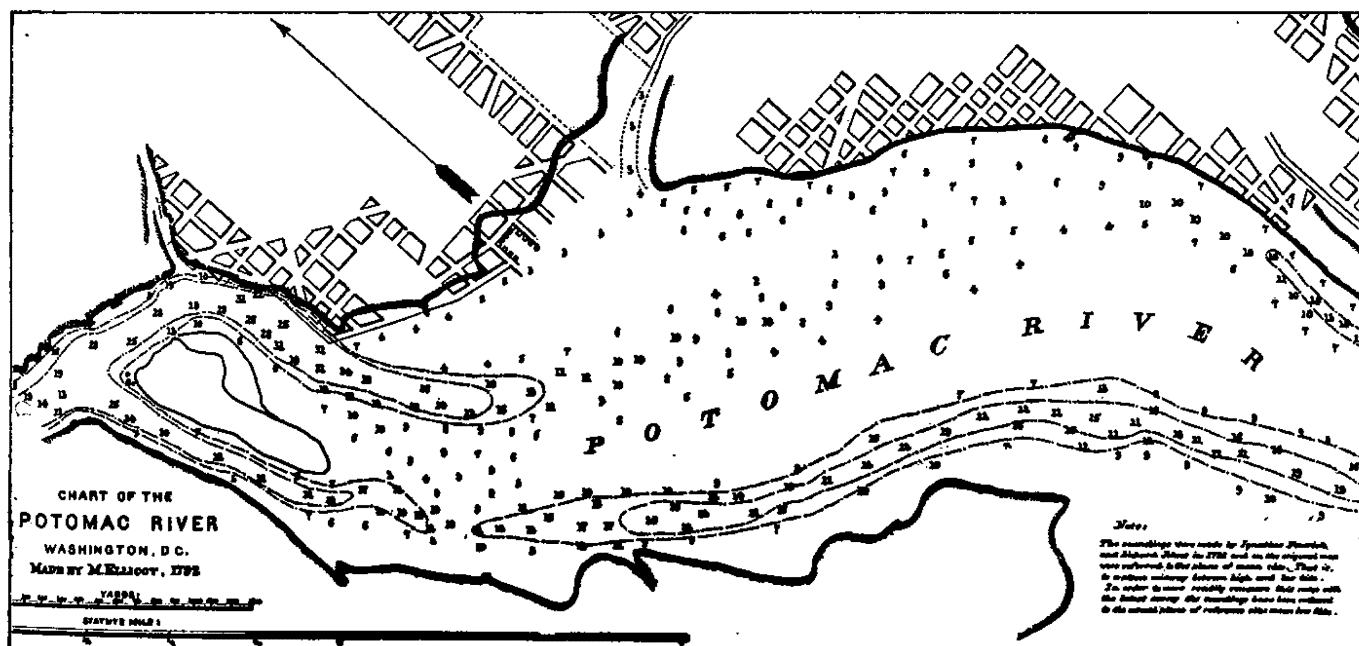


Illustration 16: Before reclamation of flats, showing Long Bridge and locations of Washington and Virginia channels. Note: shaded areas are flats.

*American Society of Civil Engineers, Transactions 689
Vol. XXXI, January 1894.*

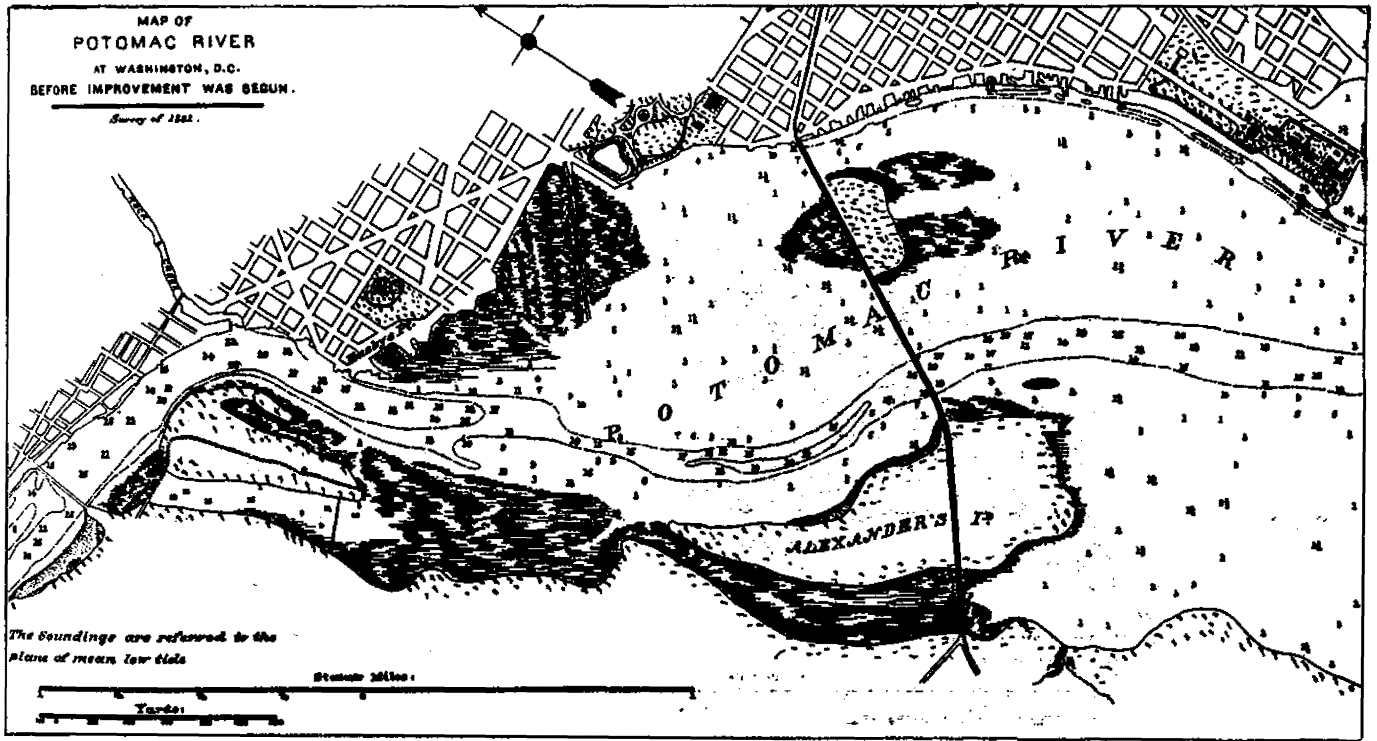


Illustration 17: Configuration of reclaimed land of Potomac Reservoir and Park.

*American Society of Civil Engineers, Transactions 689
Vol. XXXI, January, 1894.*

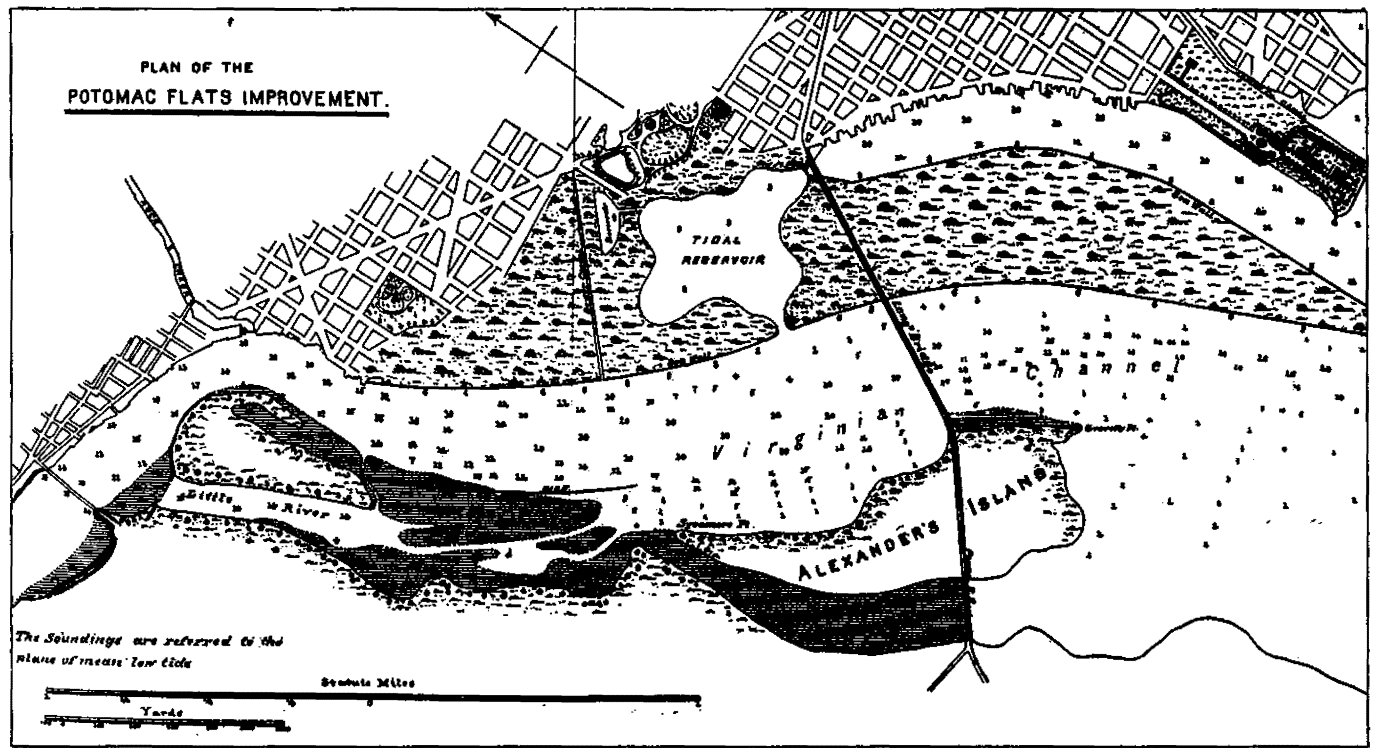


Illustration 18: Plan of Potomac Flats Improvement.

*American Society of Civil Engineers, Transactions 689
Vol. XXXI, January, 1894.*

Resting on the piers and abutments, the decks of the fixed spans were originally of cast-in-place concrete T-beam construction supporting a 25 foot wide macadam roadway and 7'3" wide concrete sidewalks. The removable center span had steel stringers supporting a 25 foot wide macadam roadway on steel buckle plates, with precast concrete sidewalks on either side. The sidewalk on the river side was extended toward the river over the lock gate forming a promontory.

The railing on the fixed spans, originally enclosing the sidewalks, is an ornamental concrete balustrade between large concrete pedestals at the ends and over the center of the bridge. On the riverside beyond the balustrade and 5 feet below sidewalk level on each fixed half of the bridge, was originally located two platforms each approximately 9 feet wide by 52 feet long on which the machinery was mounted for opening the curtain gates. In each half of the bridge, four (4) curtain gates could be lowered into place in inlet openings 8 feet wide. Behind each curtain gate were a set of swinging wooden gates, set to work automatically with the tides.¹ The machinery platform was open from above but hidden from the river side by a fascia wall. Care was apparently taken to allow the concrete balustrade above to be viewed from the river.

¹ *Report of the Chief of Engineering*, U.S. Army. Annual Reports, War Department. Part I. 1909. p.1211.

The lock span is 26 feet wide and 46 feet 8 inches from the Tidal Basin end to the River end. At each end is a set of metal gates, one gate stationary and the other constructed to toll behind the stationary gate, permitting an opening of 12 feet.*

Exposed Aggregate Concrete

The original concrete used in the bridge, now found in the ornamental concrete balustrades and exterior faces, has an unusual dark color and a slightly sparkling appearance. Although records of the mix design have not been found, the composition of the concrete has been analyzed using sampled thin sections viewed under a petrographic microscope in order to determine the concrete's mineral content by volume. In addition, a chemical analysis was performed which identified the concrete's constituents by weight. (These analyses do not reveal the proportion of water used in the original mix.)

The concrete has an average density of 165 pounds per cubic foot, which is denser than the average normal weight concrete, which weighs about 150 pounds per cubic foot. By weight, 92 to 93% of the concrete is aggregate (course and fine) and 7 to 8% is cement. By volume, the concrete is composed of 40% coarse aggregate, 30% fine aggregate, and 30% cement matrix.

* *ibid.* p. 1211

The coarse aggregate, diabase, is a fairly common, dark-colored, intrusive igneous rock associated with the Eastern Triassic Basins. Two Possible sources near Washington, D.C. are the Gettysburg Basin in Southcentral Pennsylvania and Northern Maryland and the Culpepper Basin in Virginia, but diabase intrusions also occur outside of these basins. The diabase contains the minerals plagioclase-labradorite (60%), augite (35%) and Olivine (about 5%) with traces of magnetite and minor traces of quartz and hornblende.

The fine aggregate is a dark brown glass with very fine particles of uniform size and irregular shape. Most probably, this glass is crushed and sieved slag from the steel or iron mills of the Eastern United States, a plentiful source of aggregate at the time of construction. Slag from the production of ferrous metals is often a dark brown opaque glass which becomes translucent when crushed fine. However, crushed and sieved brown bottles may have been used, or the glass may have been a volcanic ash from the Western United States. This glass probably causes the concrete's sparkle since no mica is present. Structurally, glass is a logical fine aggregate, while mica is not because of its planes of weakness.

The exact composition of the cement matrix could not be determined by the analyses performed, but a high-lime mix is indicated.

Chapter 4 – Assessment and Impact of Structural Repairs and Rehabilitation

Maintenance and Alteration History Pre-1985

May 1925 - Fish screens with top sections of cypress and bottom sections of steel were installed on the fixed spans.

1926 - A major reconstructing was carried out. The existing sidewalks were removed and the roadway widened to 32 feet. A concrete curb was added adjacent to the river-side concrete balustrade and a cinder bridle path next to the Tidal Basin balustrade. A 3" sheet asphalt surface covered the new roadway. Steel I-beam stringers were added under the existing concrete deck slab on the fixed spans presumably to reinforce the T-beams. Steel stringers and cross pieces were placed under the former river-sidewalk to support the new width of roadway. A new concrete sidewalk was placed over the machinery deck. Over the abutments and lock piers the sidewalk was cast-in-place and nonremovable while over the machinery deck and lock span 3" thick precast removable slabs were used. The ornamental balustrade on the river side, now between the sidewalk and the road, was obscured by a utilitarian iron or steel handrail.

1927 - The bridge approach and surrounding area were regraded.

1945 - Two small rubble masonry retaining walls were added and the area at the north end of the bridge, Tidal Basin side, was regraded.

At some unknown year, the cinder bridle path along the Tidal Basin side was replaced by a concrete sidewalk.

1969 - 1970 - The 3-inch precast removable concrete sidewalk panels on the lock span and the tidal gate spans were removed and replaced.

Repairs and Restoration 1985 - 1986

A major repair and reconstruction of the Inlet Bridge is now being completed. The major repair items are as follows:

- A. Removal of the existing roadway deck (full and partial depth) and placement of a new concrete roadway deck including waterproofing membrane and bituminous wearing surfaces.
- B. Removal and replacement of existing sidewalks and curbs.
- C. Repairs to existing concrete railings.
- D. Cleaning and repainting of structural steel and steel railings, plus replacement of some structural steel.
- E. Repairs to lock span fascia plates.

More specifically, the following repairs have been carried out on the tidal gate spans, center lock span, and the concrete railings.

Tidal Gate Spans:

- A. Removal of existing bituminous and macadam pavement.
- B. Removal of deteriorated portions of existing concrete deck; entire removal of some portions; milling of top 1/2" of remaining portions.

- C. Cleaning and painting of existing steel stringers (I-beams).
- D. Placement of a new reinforced concrete deck approximately 12" thick, topped with a waterproofing membrane and 2" bituminous wearing surface.
- E. Removal and replacement of concrete sidewalks on both sides; the new sidewalks are cast-in-place and non-removable.

Lock Spans:

- A. Removal of existing roadway and sidewalk decks to full depth, including metal buckle plates.
- B. Removal and replacement of some existing steel I-beam stringers; cleaning and painting of others.
- C. Placement of a new 7" thick reinforced concrete deck topped with a waterproofing membrane and 2" bituminous wearing surface.
- D. Placement of new cast-in-place, non-removable sidewalks.

The existing lock span roadway and sidewalks were removable. The new roadway and sidewalks are not removable since they are cast continuously with the tidal gate spans.

Concrete Railing:

Repair of spalls, deteriorated areas, and cracks. Repair of cracks by epoxy injection; repair of spalls and deteriorated areas with concrete to match adjacent concrete in color, texture, aggregate exposure and workmanship, plus an epoxy bonding agent.

Other items included in the current repair contract are:

- A. Removal and resetting some of the steel handrail and cleaning and painting all of it;
- B. Cleaning and painting the machinery hatches;
- C. Removal, cleaning and painting the fascia plates on the lock span;
- D. Cleaning and resetting the existing medallion and casting and setting a new one on the lock span fascia;
- E. Steam cleaning all exposed exterior concrete surfaces including railings; and
- F. Various other small repairs.

Assessment of the Historical Impact of Alterations, Repairs, and Maintenance

Alterations made to an historic structure may be judged as to whether they preserve or destroy the structure's purpose. In addition, structures protected under the National Historic Preservation Act may be judged as to whether they maintain or destroy the structure's integrity of location, design, setting, materials, workmanship, feeling, and association, as described in "Historic Bridges - Criteria for Decision Making".¹

Briefly, integrity of location refers to whether the structure is at its original site or has been moved. Integrity of design refers to whether essential design elements of the structure are maintained or altered. Integrity of setting addresses changes in the surroundings and how these affect the relationship of a property to its surrounding. Integrity of materials has to do with whether original, historically important materials have been replaced by new materials equivalent to or compatible with the original. Integrity of workmanship deals with the way particular materials or elements are combined and the technology used in making them, and whether replacement duplicates this authentic workmanship. "Integrity of feeling and association is considered to be present if the property communicates to an informed observer a sense of what it was like in its historic period."²

¹ William P. Chamberlain, "Historic Bridges - Criteria for Decision Making", National Cooperative Highway Research Program Synthesis of Highway Practice 101, Transportation Research Board, Washington, DC, October 1983.

² *Ibid*, p.16.

Pre-1985 Repairs and Alterations

In 1926, the bridge was not yet an historic structure. The widening of the roadway enhanced the structure's purpose as a highway bridge without detracting from its other purposes. The steel stringers added apparently were required structurally, although the structure was originally built as a reinforced concrete structure. The addition of the removable sidewalk panels shielded the operating machinery from the weather thereby preserving the bridge's purpose as a tidal gate. Visibility of the machinery was historically subordinate to aesthetics since the ornamental fascia shielded the machinery from view from the river. The only element of the 1926 reconstruction that detracted from the structure's integrity of design was the addition of the pipe-handrail. An ornamental reinforced concrete handrail matching the existing ones would have been in keeping with the structure's original aesthetic intent.

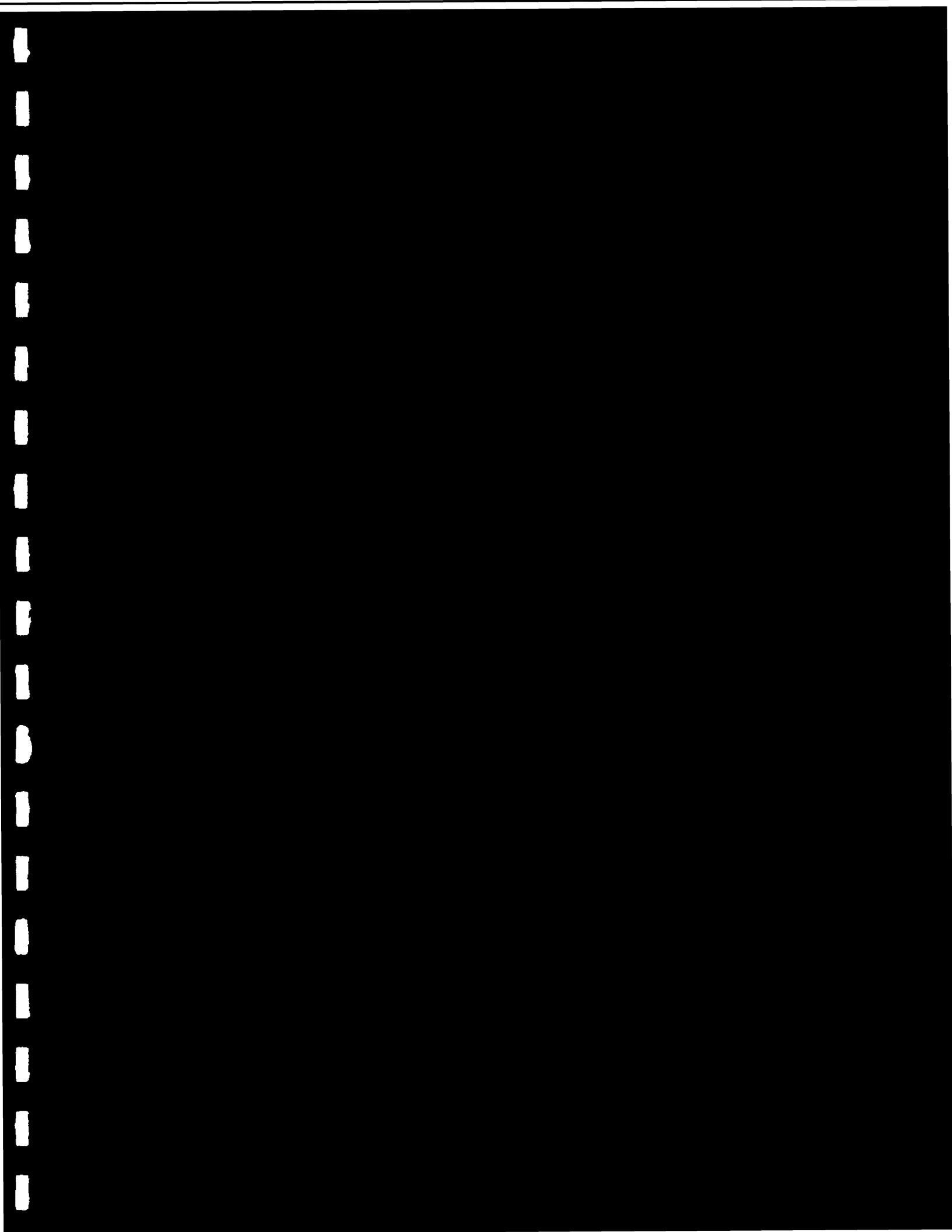
Alteration, Repair, and Reconstruction, 1985 - 1986

The reconstruction of the roadway deck on the fixed spans, including replacement and repair of steel stringers, concrete deck, and pavement, preserves the historic purpose of the structure as a roadway without any historical detriment. The replacement of the precast removable sidewalks over the machinery decks with non-removable cast-in-place sidewalks does not at present hinder the operation of the curtain gates or tidal gates and should not interfere with these purposes in the future as long as the

machinery hatches are large enough to allow future replacement of the machinery. Since the bridge is intended to be preserved as an historical structure, however, the new non-removable sidewalks may be considered by some to slightly damage integrity or authenticity of design and materials. If desired in the future, new precast sidewalk panels could easily and inexpensively be used in reconstruction. To an observer, however, this change is not noticeable.

The replacement of the removable lock span with a fixed reinforced concrete span interferes only in a small way with the structure's historical purpose but damages its historical authenticity to some extent. The center span was intended to be removed in case maintenance boats such as dredges, or possibly large presidential boats, were desired in the Tidal Basin, but as far as is known the occasion to remove the span has never arisen. Nowadays, finding the appropriate metal buckle-plates for reconstruction may be difficult or impossible. In any case, the replacement materials are not visible except inside the bridge. The repairs do not interfere with operation of the lock for small boats, nor do they interfere with the use of the tidal gates or curtain gates, which are still in operation as originally intended. Still, replacing a removable steel buckle-plate span with a fixed concrete span can be considered somewhat damaging to the integrity of design, materials, and workmanship.

The repairs of the concrete railings have been designed in such a way as to maintain integrity of materials (Special attention needs to be given to the new concrete to assure the careful matching of the old with the new). Likewise, the cleaning and restoration of ornamental and functional metalwork and exterior concrete maintains the structure's authenticity.



IMPROVING POTOMAC RIVER. LOCK AND CURTAIN GATES.

WAR DEPARTMENT.

ADVERTISEMENT.

U. S. ENGINEER OFFICE,
920 17th St. N. W.,
WASHINGTON, D. C., March 13, 1909.

Sealed proposals for furnishing and installing one set lock gates with operating mechanism and 8 curtain gates with operating mechanism, in bridge at inlet to Tidal Basin, Potomac Park, Washington, D. C., will be received at this office until 12 M., April 12, 1909, and then publicly opened. Information furnished on application.

JAY J. MORROW,
Major, Engrs.

GENERAL SPECIFICATIONS.

1. No proposal will be considered unless accompanied by a guaranty, which should be in manner and form as directed. At the option of bidders certified checks for the amount of the guaranty required may be furnished in place of the guaranty.

2. All bids and guaranties must be made in duplicate upon printed forms to be obtained at this office.

3. Each guarantor will justify in the sum of fourteen hundred dollars (\$1,400). The liability of the guarantors and bidder is determined by the act of March 3, 1883, 22 Statutes, 487, Chap. 120, and is expressed in the guaranty attached to the bid.

4. The bidder to whom award is made will be required to enter into written contract with the United States, with good and approved security, in an amount of three thousand five hundred dollars (\$3,500) within ten (10) days after being notified of the acceptance of his proposal. The contract which the bidder and guarantors promise to enter into shall be, in its general provisions, in the form adopted and in general use by the Engineer Department of the Army, blank forms of which can be inspected at this office, and will be furnished, if desired, to parties proposing to put in bids. Parties making bids are to be understood as accepting the terms and conditions contained in such form of contract.

5. The proposals and guaranties must be placed in a sealed envelope marked "Proposals for lock and curtain gates, to be opened April 12, 1909," and inclosed in another sealed envelope addressed to Major Jay J. Morrow, Corps of Engineers, U. S. A., 920 17th St. N. W., Washington, D. C., but otherwise unmarked. It is suggested that the inner envelope be sealed with sealing wax.

6. Whenever the term "Engineer" is used in the specifications it is understood to refer to the officer of the Corps of Engineers, U. S. Army, in charge of the work. He will be represented on the work by as many assistants as may be necessary. Whenever the term "contractor" is used it is understood to refer to the second party to the contract. Subcontractors, as such, will not be recognized.

7. It is understood and agreed that the quantities given in these specifications are approximate only, and that no claim shall be made against the United States on account of any excess or deficiency, absolute or relative, in the same. No allowance will be made for the failure of a bidder or of the contractor to estimate correctly the difficulties attending the execution of the work.

8. The contractor will not be allowed to take advantage of any error or omission in these specifications, as full instructions will always be given should such error or omission be discovered.

9. It is understood and agreed that the contractor assumes full responsibility for the safety of his employees, plant, and materials, and for any damage or injury done by or to them from any source or cause.

10. In the prosecution of the work herein specified, the employment of persons undergoing sentences of imprisonment at hard labor which have been imposed by courts of the several States, Territories, or municipalities having criminal jurisdiction is prohibited.

11. The contractor will be required to discharge any employee who, in the opinion of the Engineer, is objectionable or incompetent. Such discharge shall not be made the basis of any claim for compensation or damages against the United States or any of its officers or agents.

12. The contractor must at all times either be personally present upon the work or be represented thereon by a responsible agent, who shall be clothed with full authority to act for him in all cases and to carry out any instructions relative to the work which may be given by the Engineer, either personally or through an authorized representative.

13. No work shall be done on Sundays or legal national holidays except in cases of emergency, and then only with the consent of the Engineer; nor shall any work be done at night unless authorized in writing by the Engineer.

14. The attention of bidders is called to the following act of Congress:

An act relating to the limitation of the hours of daily service of laborers and mechanics employed upon the public works of the United States and of the District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the service and employment of all laborers and mechanics who are now or may hereafter be employed by the Government of the United States, by the District of Columbia, or by any contractor or subcontractor upon any of the public works of the United States or of the said District of Columbia, is hereby limited and restricted to eight hours in any one calendar day, and it shall be unlawful for any officer of the United States Government or of the District of Columbia or any such contractor or subcontractor whose duty it shall be to employ, direct, or control the services of such laborers or mechanics to require or permit any such laborer or mechanic to work more than eight hours in any calendar day except in case of extraordinary emergency.

SEC. 2. That any officer or agent of the Government of the United States or of the District of Columbia, or any contractor or subcontractor whose duty it shall be to employ, direct, or control any laborer or mechanic employed upon any of the public works of the United States or of the District of Columbia who shall intentionally violate any provision of this act, shall be deemed guilty of a misdemeanor, and for each and every such offense shall upon conviction be punished by a fine not to exceed one thousand dollars, or by imprisonment for not more than six months, or by both such fine and imprisonment, in the discretion of the court having jurisdiction thereof. * * *

(Act approved August 1, 1892, 27 Stats. L., 340.)

All bidders are advised that, should the contractors for the work fail to comply with this law, they will be reported by the officers of the War Department for such action as the Department of Justice may deem it proper to take.

It is understood that this law applies only to the work of delivery and installation.

15. The contractor will be required to commence work under the contract within twenty (20) days after the date of notification of approval of the contract, by the Chief of Engineers, U. S. Army, to prosecute the said work with faithfulness and energy, and to complete it within four (4) months after said date of notification.

16. The time allowed in these specifications for the completion of the contract to be entered into is considered sufficient for such completion by a contractor having the necessary plant, capital, and experience, unless extraordinary and unforeseeable conditions supervene.

17. *Payments.*—Payments will be made not oftener than once in each calendar month for such materials as shall have been delivered on the ground and for such work as has been done on the ground. As soon after the first of each month as practicable the Engineer will cause an estimate to be made of the material so delivered and the work so done. The contractor will then be paid 60 per cent of the value of the material and work, based upon the above estimate. The monthly payments may be suspended in whole or in part if the progress of the work is not satisfactory to the Engineer. All parts paid for under the system of partial payments above specified shall become thereby the sole property of the United States, but this provision shall not be interpreted as relieving the contractor from the sole responsibility for the proper care and protection of said parts prior to their erection, trial and final acceptance by the United States. The remaining 40 per cent shall be paid upon the final completion and acceptance of the work under the contract. (See par. 28.)

18. It is expected that the progress of the construction of the bridge in which the gates to be provided under these specifications shall be installed, will permit the beginning of the installation on or before June 1st, 1909, but it is agreed that no damages shall accrue to the contractor against the United States for any loss that may occur on account of any delay in commencement of installation beyond June 1st, 1909, on account of incomplete construction of the bridge.

19. *Extra work.*—Any extra work not called for in the specifications and found to be necessary in the execution of the work may be ordered in writing by the Engineer and the contractor will be paid therefor at actual cost, plus 15 per cent.

20. *Risks, Damages, etc.*—The contractor will assume all risks for loss or damage which may be incurred by floods, fire or other causes during the progress of the work. The contractor shall at all times take every reasonable precaution to guard against any mishap, and take all precautions to secure the safety of employees. On his attention being called to any such precautions necessary, in the judgment of the Engineer, he shall make arrangements to that end immediately. The contractor will be required to repair to the satisfaction of the Engineer any damage that his operations may cause to the bridge or lock, or other structure, the property of the United States.

21. *Storage Yards, etc.*—Yards in the vicinity of the work used by the contractor must be kept at all times in a clean, sanitary condition. Ample space will be available for use of the contractor but he will be required to vacate promptly and clean up any space needed at any time by the United States.

SPECIAL CONDITIONS.

22. *Work to be done.*—The work to be done consists in the furnishing and installing of two movable and two stationary lock gates with mechanism complete, and of eight curtain gates with mechanism complete, at the inlet to the Tidal Basin, Washington, D. C., as detailed in specifications following and as shown on drawings numbered E-1, E-2, E-3 and E-5.

23. *Location.*—The structure is located at the Inlet to the Tidal Basin, Potomac Park, Washington, D. C. It is readily accessible by road. The average tidal range at this point is 3 feet.

24. *Cofferdam.*—The entire structure is now inclosed by a cofferdam. The United States will keep this cofferdam pumped out reasonably dry for a period of 30 consecutive calendar days to permit the installation of the gates and machinery. Should it be necessary to keep the cofferdam dry for a longer period than 30 consecutive calendar days, the actual cost during the additional term will be charged against the contractor. The United States will not be liable in damages for any delays to the contractor caused by failure to keep the cofferdam unwatered.

25. *Drawings and Specifications.*—The drawings and these specifications are intended to explain one another and provide complete information necessary for construction and erection. It is the intent thereof to specify a first-class job complete in every particular, and any minor item not specifically called for which may prove necessary to secure this result will be required of the contractor without additional expense to the United States. Should any conflict between the drawings and specifications be found the decision of the Engineer as to the true intent shall be final. Any discrepancies between scaled and written dimensions should be called by intending bidders to the attention of the Engineer, who will decide which shall be adhered to or adjust the difference; or, should such discrepancy be discovered after contract is executed, the Engineer shall similarly decide or adjust, and such action shall be final. Blueprint copies of drawings will be furnished to prospective bidders on deposit of certified check for \$5.00 with the Engineer, which check will be returned upon return of blueprints.

26. *Bench Marks, etc.*—The United States will establish bench marks and points in the immediate vicinity of each piece of mechanism, it being the intention in this respect to relieve the contractor from all necessity of providing surveyors or surveying instruments. The datum plane used by this office, to which all elevations shown on drawings or mentioned in specifications are referred, is mean low water in the Potomac River at Washington.

27. *Concrete Work in Place.*—The concrete work shown in the drawings has been or will be placed by the United States, except that under the bridge the concrete will be leveled off by the United States as shown in the drawings after the contractor shall have set the necessary baseplates and sills. The United States guarantees that the openings left for the reception of the mechanism shall be substantially as shown on the drawings. The contractor will be required to set all castings. Materials for the mortar required for this work will be furnished at the site of the work by the United States without charge to the contractor.

28. *Trial.*—Before final acceptance each piece of mechanism will be tested as nearly as practicable under working conditions, and final payment will not be made until the satisfactory completion of such trial.

29. *Shop Drawings.*—The contractor will be required to furnish without cost to the United States shop drawings, in duplicate, for any part or parts of the mechanism for which shop drawings are required. Such drawings must meet the approval of the Engineer before the work is executed.

MATERIALS.

30. *Castings.*—All iron castings to be furnished shall be of tough gray iron, free from cold shuts, blow-holes and other defects; and shall be true to size and of workmanlike finish. Any parts of the castings forming bearing or guiding surfaces shall present a smooth, true surface.

31. *Steel.*—Steel used shall be medium steel and the finished material shall present smooth clean surfaces, free from flaws, cracks, buckles, ragged edges and other defects.¹

32. *Expansion Bolts and Lag Screws.*—In all cases where expansion bolts are used they shall be of the type known as Diamond expansion bolt, or an equal type to be submitted to the Engineer for approval. Where lag screws are used the holes bored into the wood for the reception of these screws shall not be larger than the smallest diameter of the screw used, including the thread.

33. *Paints and Preservatives.*—All metal surfaces inaccessible after riveting or after erection, shall, before assembling or installation be painted with two coats of red lead paint, made up in the proportion of 30 lbs. of pure red lead to one gallon of boiled linseed oil. All other metal surfaces shall have one shop coat of red lead paint as above and after installation shall be painted with one coat of red lead paint as above and two coats of the best graphite paint, of a brand and color to be approved by the Engineer. All surfaces shall be clean and dry when painted. No painting shall be done in wet weather.

All wooden surfaces inaccessible after assembling or installation, shall, before assembling or installing, be painted with two coats of a carbolineum wood preservative, of a brand to be approved by the Engineer; and, after installation, all exposed wooden surfaces shall be painted with two coats of the same kind of preservative, unless otherwise specified.

34. *Lumber.*—All lumber used under these specifications shall be sound, well manufactured, full to size and saw-butted, and shall be free from the following defects: unsound, loose and hollow knots, worm holes and knot holes, through shakes or round shakes that show on the surface; and shall be square edge unless otherwise specified. Unless otherwise specified all lumber shall be commercial long leaf yellow pine.

DETAILED SPECIFICATIONS.

{ LOCK GATES.

35. *Work to be done.*—Two movable and two stationary lock gates and all material connected therewith, will be installed, as shown in detail on sheet E-2. The position of the work to be done under this class is shown on sheet E-1, being in the lock in the center of the structure. The following described parts are included under this class.

36. *Movable Lock Gates.*—There are two movable lock gates, one to be installed in each end of the lock, as shown in the drawing. The *frame* of each gate shall consist of twelve (12) horizontal dressed timbers having the dimensions shown on the drawing. These timbers shall be mortised into end posts which shall have bevels shown, in order to make water-tight joints with the surfaces against which they bear. The horizontal timbers and end posts shall be fastened together by two long vertical bolts. The gate on the basin side of the lock shall be faced with diagonal *sheathing* two (2) inches thick and six (6) inches wide on its lock face, and one (1) inch thick on its basin face. The gate on the river side of the lock shall be faced with sheathing three (3) inches thick and six (6) inches wide on its river face, there being no sheathing on its lock face. The gates shall be well braced with *cast iron knee plates* at each of the four (4) corners and shall be made up in secure and workmanlike manner. The diagonal sheathing shall be made of tongued and grooved lumber dressed on one side, the pieces being placed so that they shall be inclined downward from the center of the lock at an angle of forty-five (45) degrees and secured with galvanized iron spikes. These spikes shall be driven square through the sheathing to a countersunk position and all holes over the heads of the spikes shall be filled with red lead putty mixed with linseed oil.

37. Each lock gate shall be suspended by means of *wrought steel hangers* provided with cast-iron rollers for bearing surfaces. Each hanger shall be braced with angle irons secured to the top beam of the gate. Each gate shall be suspended from its hangers by means of two (2) one-inch screw bolts, securely welded to or made a part of the hanger. These bolts shall be provided with proper nuts and washers and be of sufficient length to permit the gate to be moved vertically at least one inch above or below the mean working position of the gate; and to provide for this movement, the hangers shall be slotted to permit the maximum necessary vertical movement of the bolts securing the hangers to the angle irons; and the top beam of the gate shall be mortised sufficiently to receive the hangers when the gate is raised to a position one inch above its mean working position. The two (2) large rollers carrying each gate shall be provided with brass compression grease cups for lubricating the bearings. All other bearings shall be provided with proper holes for oiling with a squirt can. All rollers shall be provided with brass bushings. The steel shafts passing through the rollers shall be provided with proper washers to fit against the shoulders of the shafts and with cotter pins to secure the shafts in place. To the top beam of each lock gate shall be securely fastened the cast-iron rack shown on the drawing. To the bottom of each gate shall be secured a heavy cast-iron *guide groove plate* which shall be provided with an inclined lug at the proper end to make a watertight joint over the base plate receiving the vertical posts in the center of the lock.

38. Two (2) fifteen-inch 55-lb. I-beams, one in each end of the lock, located as shown on blueprint, support the movable gates. These I-beams shall be securely fixed in the recesses in the lock walls to prevent overturning.

¹All steel shall conform to the requirements of the manufacturer's standard specifications, as given on pages 219-228 of the Carnegie Handbook for 1903, unless otherwise mentioned herein.

39. *Horizontal guide rails* for movable lock gates, located under the gates, shall be made of cast iron, secured by expansion bolts to the concrete in the bottom of the lock, and shall have the form and dimensions as shown on blueprint, sheet E-2. Each guide rail shall be cast in two (2) pieces and shall be keyed, as shown on blueprint, sheet E-2, to the base plate receiving the vertical built up posts in the center of the lock in order to keep the rails of the two parts aligned with the part of the guide rail on the base plate.

40. *The base plates* receiving the vertical built up posts in the center of the ends of the lock shall be provided with two sockets, into which shall be fitted the steel I-beams forming the vertical posts, so that there shall be no motion of the posts in the sockets, but in a manner to permit the posts to be easily removed and reset. The base plates shall be provided with an inclined seat to fit the lug mentioned above on the end of the cast iron guide groove at the bottom of the movable gate. The base plates shall be secured to the concrete bottom of the lock by expansion bolts.

41. *The vertical wooden guide or bearing posts* secured by expansion bolts to the concrete, shall be installed in the recesses in the face of the lock wall, and shall have the dimensions as shown on blueprint, sheet E-2, bevels being provided to fit the bevel on the end posts of the movable gates, and *cast iron base plates*, secured by expansion bolts to the concrete, shall be provided to receive the bottom of each guide or bearing post.

42. *Four (4) vertical bearing posts* shall be furnished and installed on the center line of the lock, two (2) at each end of the lock as shown. Each post shall be built up of two (2) 15-inch 55-lb. I-beams, with a wooden guide post between the I-beams. The I-beams and wooden guide shall be held together by bolts as indicated on blueprint, sheet E-2. Iron separators shall be placed between the wooden guide and the I-beams at every place where there are connecting bolts, which shall pass through the separators.

43. The vertical built up posts in the center of the lock, the cast iron base plates and guide rails, and the vertical wooden guide or bearing posts in the recesses in the face of the lock wall, shall be carefully set and accurately fitted to form water tight joints, with corresponding adjacent parts of the movable lock gate when the latter is closed.

44. The top of each set of two vertical built up bearing posts in each end of the lock shall be joined to a 24-inch 80-lb. *horizontal I-beam*, in the manner indicated in detail on blueprint, sheet E-2. The ends of these two (2) horizontal I-beams fit into *cast iron boxes*, secured by expansion bolts to the concrete in recesses in the faces of the lock walls. Details of these boxes, including cast iron cover plates for the same, are shown on blueprint, sheet E-2. The *liners* or gibs, used to secure the horizontal I-beams in place in the boxes, shall be provided with small I-bolts for easy removal.

45. *The platform for operating* the movable gates shall be made of 2-inch select ash, dressed on the upper surface, and shall have the dimensions shown, and be supported by seven (7) brackets, to which it shall be secured by carriage bolts, spaced 6 inches center to center over each bracket, except that the bolts securing the base plate of the winches, described later, mounted on this platform, shall pass through the wooden platform and the flanges on the brackets under the winches. The brackets shall be built up of 3-inch x 3-inch x $\frac{3}{8}$ -inch steel angles and fastened to the wall by $\frac{1}{2}$ -inch expansion bolts, two brackets being located under each winch, the remaining three (3) spaced with equal intervals between the sets under the winches.

46. The mechanism for operating the movable gates shall be as shown on blueprint, sheet E-2, as follows:

Two winches mounted on platform, as shown, shall have all parts of cast iron, except the shafts, pins and bolts, which shall be of steel. The movement of either movable gate shall be accomplished by hand power applied to the hand wheel of the corresponding winches. The power applied at the hand wheel shall be transmitted through a set of gearing to a sprocket wheel mounted on the winches, thence by an extra heavy sprocket chain to another sprocket wheel mounted on a counter-shaft supported by brackets secured to I-beams of the vertical bearing posts in the middle of the lock, thence through a cog wheel mounted on the same counter-shaft to the rack on the top of the gate, as shown on blueprint, sheet E-2. The frames of the winches, the brackets supporting the counter-shafts, and all wheels and gearing shall be of cast iron; all pins and shafts shall be of steel; all bearings shall have brass bushings. The cog wheels on the counter-shafts shall have teeth of sufficient length to permit operation of the gates when they are lowered $\frac{1}{4}$ of an inch from their mean working position. The main journals on winches and counter-shafts shall have the maximum permissible lengths and be provided with grease cups for lubricating bearings. All other bearings shall be provided with holes for oiling with a squirt can. The mechanical construction of the operating mechanism for each movable gate shall permit the operation of the gate by applying a load of not more than twenty (20) pounds on the handle of the operating wheel at the corresponding winch when the water is four (4) feet below mean low water on both sides of the gate, and shall permit the operation of the gate through the full width of the opening between the vertical I-beam posts and the face of the lock wall. The operating mechanism shall be rigid and well made throughout, and shall have sufficient strength to withstand any or all of the conditions named. The teeth of all gearing shall mesh mechanically well.

47. *Stationary Lock Gates.*—Two (2) stationary lock gates shall be provided and installed, one at each end of the lock, located as shown on blueprint, sheet E-2. The numbers and sizes of the timbers forming the frame of each gate are shown, and they will be secured by bolts and braced at the corners with knee plates, as provided for the movable lock gates. *The sheathing* on each gate shall be placed and shall have thicknesses as provided for the sheathing of the corresponding movable gate. These stationary gates fit into concrete recesses at the bottom of the lock and in the face of the lock wall. At the center of the lock they fit between the flanges of vertical I-beams, parts of the vertical bearing posts in the center of the lock. All joints shall be water tight, the joints between the concrete and the gates being caulked with oakum. The inside faces of the gates at the lock wall ends bear against *wooden bearing posts* 15 inches x 20 inches, secured to the lock wall by expansion bolts.

48. *Two butterfly valves* shall be provided in each stationary gate, together with the necessary operating mechanism, as shown on blueprint, sheet E-2. The wearing parts of each valve and the box casing to contain the valve shall be of cast iron, except the necessary pins and bolts, which shall be of steel. The rods, pins and bolts of the operating device shall be of steel. The brackets at the top of the gates, providing bearing for the hand levers, shall be of cast iron. The valves shall be accurately fitted in their boxes in a manner to make the joints reasonably water tight. Each vertical operating rod shall be provided with a right and left turn-buckle nut for adjustment purposes, and each operating hand lever shall operate along a quadrant, at any point of which it may be firmly secured by a thumb screw. The operating device must

be of strength sufficient to operate against a head of water equal to the distance of the valve from the top of the gate. The construction shall be such as to permit operation of any valve with one hand.

49. All material between the faces of the lock walls shall be removable, and nothing shall be done during installation which would prevent the removal and resetting of all the parts already fitted. Bolt holes in the steel work shall be field reamed. The dimensions of angles, bolts and rivets are shown on blueprint, sheet E-2.

CURTAIN GATES.

50. Eight (8) curtain gates complete, similar in all respects, except as noted in paragraph below, describing hand winches, to the curtain gate shown in detail on blueprints, sheets E-3 and E-5, will be furnished and installed. The location of the gates in the bridge is shown on sheet E-1. The following described parts are included in the work to be furnished and installed:

51. Eight (8) hand winches shall be furnished and installed, similar in all respects, except that in each set of four (4) curtain gates on each side of the lock, two (2) hand winches shall be equipped with operating wheels on the right side of the curtain gates and two (2) with operating wheels on the left side, as indicated on sheet E-1.

52. *Each winch* shall be built up as follows: Two heavy cast iron pedestals, secured to the concrete by expansion bolts, support a steel shaft, on one end of which is mounted a cast iron sprocket wheel and at the other end, a cast iron sprocket wheel and a cast iron worm wheel, the worm wheel being at the extremity of the shaft outside of the sprocket wheel. The sprocket wheels support two (2) counter-weights and the curtain gate. The bearings on the shaft shall be babbitted with at least $\frac{3}{8}$ inch of the best babbitt metal, to be approved by the Engineer; and shall be provided with sheet metal liners $\frac{1}{2}$ inch thick, sufficient in number to provide for $\frac{1}{4}$ inch adjustment. The sprocket wheels shall be securely keyed to the shaft.

53. Heavily ribbed cast iron base plate and stand, containing the operating device, shall be secured by expansion bolts to the concrete so that the worm on the worm shaft of the operating device shall accurately fit the worm wheel. The worm and worm shaft shall be cut from one piece of forged steel. The thrust of this shaft shall be received at the bottom of the shaft by a washer or thrust-button of brass and at the upper bearing by a thrust-ring of brass. To the upper end of the worm shaft shall be fitted a cast iron spur gear wheel and at the extremity of the shaft a removable cast iron operating hand wheel. On a short independent steel shaft, parallel to the worm shaft, shall be mounted a small pinion, gearing into the spur gear on the worm shaft, and the upper extremity of this pinion shall also be fitted to receive the detachable operating hand wheel.

54. All bearings shall be properly machined so that the gate may operate with the least friction. The worm gear ratio shall be 120 : 1. The gear ratio of the spur gear and pinion shall be 4 : 1.

55. *Cast iron idler pulleys*, mounted on steel shafts and supported on brackets cast as part of the pedestal, and provided with proper journal boxes, as shown on sheet E-3, shall be provided for the curtain gate.

56. Sheet E-3 shows the dimensions and spacings to scale of the various parts of the winch. The winch shall be so installed that when the gate is nearly closed each sprocket wheel will support approximately one counter-weight and one-half the weight of the gate. The size and weight of each of the *two counter-weights* to be provided with the gate are shown on sheet E-5, and the hinged connecting links between the counter-weights and gate are shown on sheet E-3. The links shall be of wrought steel, the hinges being fitted with 1-inch bronze bolts, provided with cotter pins to prevent the bolts falling out of the hinge holes, which shall be reamed to receive the bolts.

57. *The curtain gate* is made up of hinged box sections built up of steel channels and sheet steel, and an extra large section built up of steel channels, I-beams and sheet steel. The hinges shall be of wrought steel, the holes to be reamed to receive 1-inch bronze bolts fitted with cotter pins. Sheet E-5 shows in detail the method of constructing the sections of the gate.

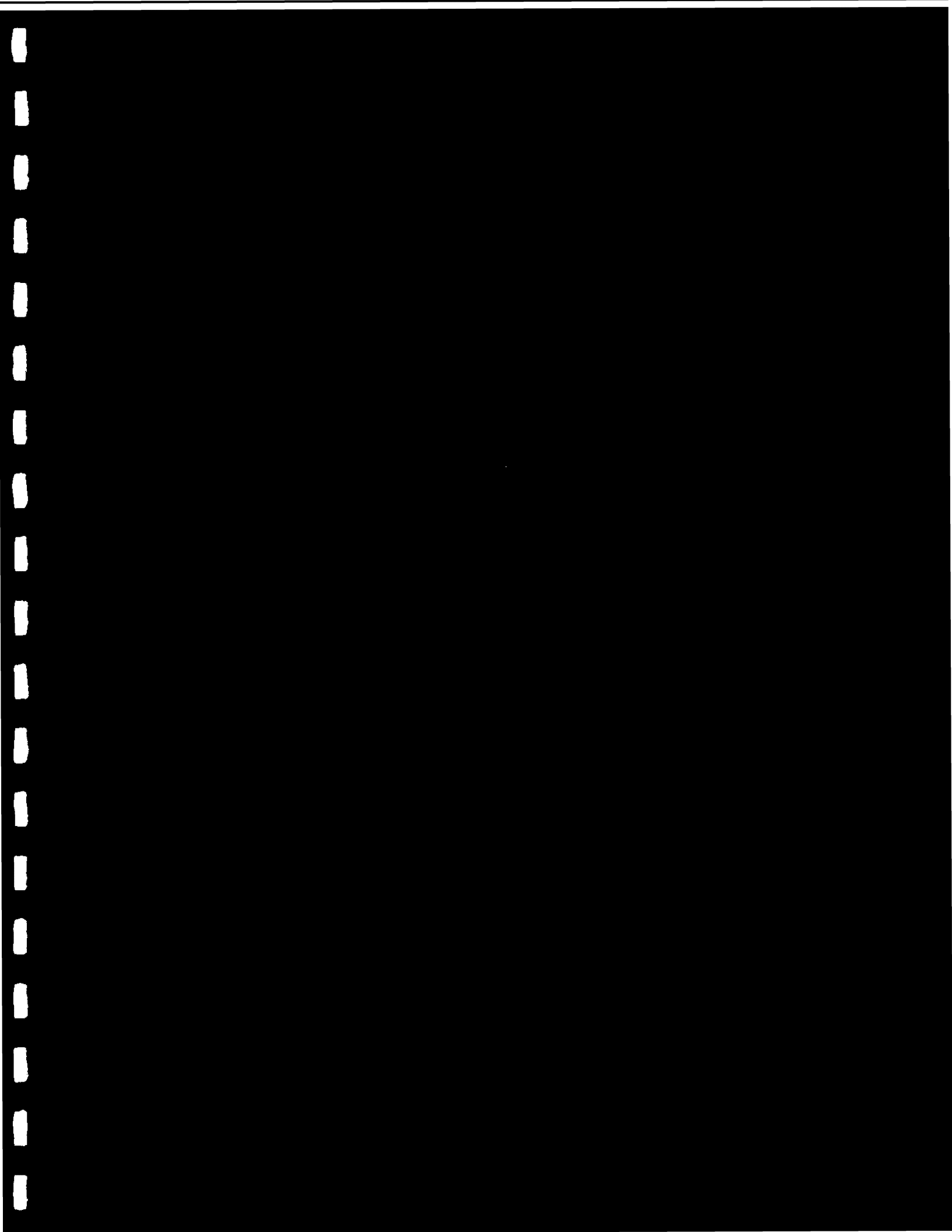
58. In raising and lowering the gate it will move up and down in the guide grooves provided in the faces of the concrete piers, shown on sheets E-3 and E-5. Along these guide grooves shall be secured by expansion bolts *wooden guides* of the size and dimensions shown on sheets E-3 and E-5. In the movement of the gate the counter-weights move up and down in guide grooves provided for the purpose, the openings of which in the faces of the piers shall be covered by a $\frac{3}{8}$ -inch steel plate, as indicated on sheet E-3, secured by expansion bolts, to the concrete. At the bottom of each of the counter-weight grooves there shall be installed *cast iron sills* imbedded in the concrete on which the counter-weights shall rest when the gate is wide open.

59. *Sheet steel groove flaps* shall be provided and installed as shown on sheet E-3, for covering the groove openings when the gate is raised to its full height. These flaps are designed to be opened and closed by means of vertical steel shafts secured to the flap and passing through cast iron brackets, secured through the wooden guides to the concrete, as shown on sheet E-3. These shafts rest in recesses provided in the cast iron base plate on which the gate rests when closed, which shafts shall be operated by a *hand lever*, whose motion is transmitted through a horizontal steel shaft, to which it is attached, and the cast iron bevel gears as indicated on sheet E-3. The hand lever shall be provided with a detachable weight. The operating mechanism shall be installed so that when the lever is in a vertical position the flaps will be closed over the groove openings and when in the horizontal position the flaps will be open. The hand lever shall be provided with a chain so that when in the vertical position the chain may be passed through the operating wheel and an I-bolt and lock, to prevent movement when flaps are closed. The I-bolt shall be secured to the proper section of the curtain gate in a manner not to interfere with opening or closing the gate. The lock to be provided shall be a brass padlock, water and dust proof, of a type to be approved by the Engineer. Two keys shall be provided for the lock.

60. *The cast iron base plate* or sill on which the gate shall rest when closed shall be secured by expansion bolts to the concrete in the bottom of the bridge opening under the curtain gate, as shown on sheet E-3.

61. The curtain gates shall be so constructed and so installed that when the gate is closed and the pressure of water is on the side indicated on sheets E-3 and E-5, all joints in the curtain gate, between curtain gate and guide, and curtain gate and sill, shall be reasonably water tight.

62. *Immersion of wooden parts.*—After being fitted in place, the stationary and movable lock gates, wooden guides, sills, and all other wooden parts to be provided under these specifications, which will be wholly or partially under water when in service, shall be removed, immersed in water for one hundred hours, and then refitted in place.



REPORT ON THE ANALYSES OF THE
EXPOSED-AGGREGATE CONCRETE
FROM THE INLET BRIDGE

Samples of the exposed aggregate concrete provided to Nassaux-Hemsley, Incorporated by the National Park Service were analyzed using thin sections viewed under a petrographic microscope in order, to determine the mineral content and composition by volume of the concrete. A chemical analysis was also performed in which the concrete's density and composition by weight were determined. The results of the analyses follow.

The average density of the concrete was 165 pounds per cubic foot. (An average normal weight concrete weighs about 150 pounds per cubic foot.)

1. COMPOSITION BY WEIGHT

<u>COMPONENT</u>	<u>PERCENT BY WEIGHT</u>
Aggregate (Coarse and Fine)	92%-93%
Cement	7%-8%

2. COMPOSITION BY VOLUME

<u>COMPONENT</u>	<u>PERCENT BY VOLUME</u>
Coarse Aggregate (Diabase)	40%
Fine Aggregate (Glass)	30%
Cement Matrix	30%

The coarse aggregate was identified as diabase, a fairly common dark-colored intrusive igneous rock associated with the Eastern Triassic Basins. Two possible sources of diabase are the Gettysburg Basin located in Southcentral Pennsylvania and Northern Maryland, and the Culpepper Basin in Virginia, but diabase intrusions also occur outside these basins. The diabase is composed of the minerals plagioclase-labradorite (60%), augite (35%), and olivine (5%) with traces of magnetite, hornblende, and quartz.

The fine aggregate is a dark brown glass. The glass particles are irregularly shaped and uniform in size. This glass is most probably a crushed and sieved slag from the steel or iron mills of the Eastern United States. (Slag is often a dark brown opaque glass which becomes translucent when crushed into small particles.) Very finely crushed and sieved brown bottles are also a possible source. A third, less likely possibility is that the glass is a volcanic ash from the Western United States. The glass particles are the most likely cause of the concrete's sparkle since no mica is present.

No positive identification of the type of cement used could be made. A fine-grained material, possibly calcium carbonate was identified in the matrix. The cracks contained calcite, a normal product of deterioration.

Copies of the chemical and petrographic analyses reports are attached. The material listed as "sand" on the chemical analysis report is actually glass.

FRANKLIN ANALYTICAL LABORATORIES

A DIVISION OF NASSAUX-HEMSLEY INCORPORATED

N.H.I. Building • 56 N. Second Street • Chambersburg, Pennsylvania 17201 • Tele. (717) 263-5941

LABORATORY REPORT

DATE IN: February 12, 1986

DATE REPORTED: February 18, 1986

LAB NO.: 3387.1 - 3387.2

JOB NO.: 85ST18.01

CLIENT: Structural Department

PROJECT MGR.: Ralph P. Matter

ATTN: Mr. W. Walsh

INLET BRIDGE RANDOM CONCRETE SAMPLES

SAMPLE NO. 1	
AGGREGATE AND SAND	93%
CEMENT	7%
WT. PER FT. ³	168 lbs.

SAMPLE NO. 2	
AGGREGATE AND SAND	92%
CEMENT	8%
WT. PER FT. ³	162 lbs.

ANALYST


RALPH P. MATTER, LABORATORY DIRECTOR

Coarse Aggregate - (Triassic) diabase

Minerals

- | | |
|-------------------------------|----------------|
| 1. Plagioclase - Labradorite | 60% |
| 2. Augite | 35% |
| 3. Olivine approximately | 5% |
| 4. Trace (accessory) minerals | |
| Magnetite | Quartz (minor) |
| Hornblende (minor) | |

Fine Grains - glass

- Irregularly shaped
- Uniform size
- No cleavage
- Various shades of brown (no pleochroism)
- Extinct under crossed polars

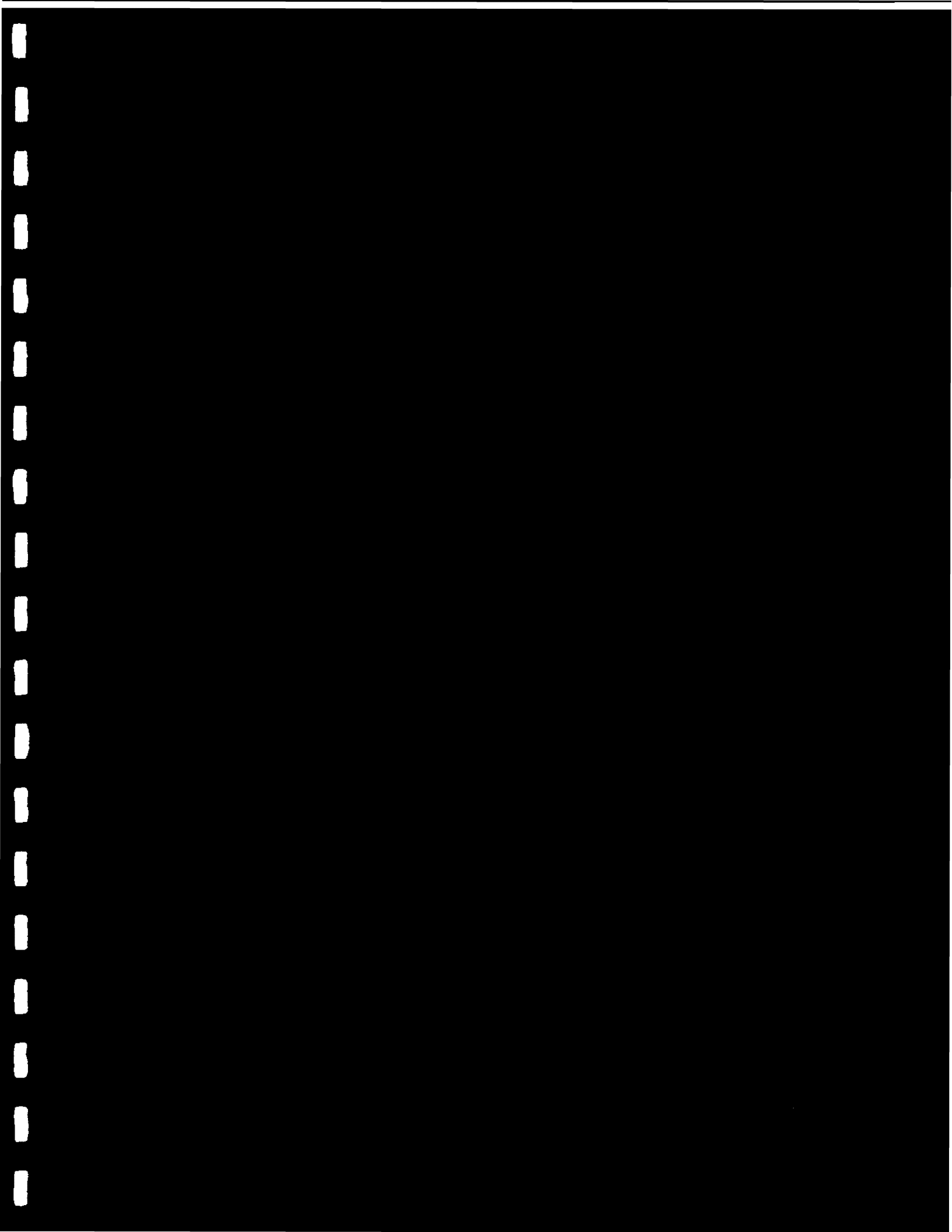
Matrix:

- Micrite (carbonate)
- Fibrous calcite present in cracks of matrix

Overall breakdown:

Diabase:	40%
Glass:	30%
Matrix	30%

Note: Both thin-sections showed the same characteristics



Appendix III - Selected Documents

Pertaining to the History of the Tidal Basin Inlet Bridge

1. Cosby to Mackenzie, February 1, 1908. RG 77, DNA.
2. Cosby to Mackenzie, April 9, 1908, RG 77. DNA.
3. E. J. Dent to the Chief of Engineers, June 25, 1908. RG 77, DNA.
4. E. J. Dent to the Chief of Engineers, June 26, 1908. RG 77, DNA.
5. Jay J. Morrow to the Chief of Engineers, November 17, 1909.
RG 77, DNA.
6. Warren T. Hannum to Spencer Cosby, June 9, 1910. RG 42, DNA.
7. Warren T. Hannum to Spencer Cosby, June 20, 1910. RG 42,
DNA.
8. John A. Kienle to William W. Harts, March 23, 1917. RG 42,
DNA.
9. John A. Kienle to William W. Harts, September 7, 1917. RG 42,
DNA.
10. William W. Harts to Electro Bleaching Gas Co., September 22,
1917. RG 42, DNA.

Pot. 10/27.

777, Feb 3, 1908 *Potomac R*
1 13

SECRET.

United States Engineer Office,
22nd and K Streets, N. W.,

Washington, D. C. February 1, 1908,

Brig. Gen. A. Mackenzie,
Chief of Engineers, U.S.A.,
Washington, D.C.

Through the Division Engineer, Eastern Division.

General:

1. I have the honor to request authority to employ the services of Mr. Nathan C. Wyeth to design the architectural features, including the furnishing of all necessary drawings, of the proposed combined bridge and tidal gate over the inlet to the tidal reservoir in Potomac Park, and to pay him therefor the regular architect's fee of 3-1/2 per cent of the cost of the architectural features of the work, the total sum in any event not to exceed one thousand dollars.

2. The construction of the reservoir inlet gates was provided for in the River and Harbor Act approved March 2, 1907, and a project for doing the work by hired labor was approved by the Chief of Engineers March 27, 1907 (E.D.7590-68). The gates are to be built of concrete and designs for them have been in course of preparation in this office for several months. At the request of Colonel Bromwell, in Charge of the Office of Public Buildings and Grounds, the designs provide for making the gates wide enough to carry a roadway, and a lock is also to be placed in them for the passage of small craft.

3. A roadway bridge across the inlet at this point is a part of the plans for the improvement of Potomac Park, and to pay for the

additional cost involved in widening the gates so that they can be used as a bridge Colonel Bromwell has included in his estimates for the next fiscal year an item of \$25,000, to be expended under the direction of the Chief of Engineers. He states that he believes Congress will make the necessary appropriation.

4. The bridge and tidal gate will form one of the most prominent objects in the landscape of Potomac Park, as it will be visible from all portions of the road, ^{which runs} around the edges of the reservoir, and which has already become a much frequented driveway. It is considered most important that no effort should be spared to make the proposed structure as artistic as possible, and for this purpose it is essential that the services of a competent and experienced architect be employed. Mr. Wyeth has been selected not only because of his experience but because he is, I understand, the only architect in Washington who is a graduate of the Ecole des Beaux Arts of Paris, which school probably gives a better training in work of this kind than any other in the world. It is proposed to pay him only the usual regular architect's fee.

5. Colonel Bromwell has been consulted in this matter and concurs in the necessity of employing an architect, and the selection of Mr. Wyeth.

Very respectfully,



Major, Corps of Engineers.

SC/WNT.
SUBJECT:

Pot. 10/37	
U. S. ENGINEER	Potomac R
EASTERN DIVISION	
Received <i>Hy. Apr 10, 1908</i>	1 15

United States Engineer Office,

22nd and K Streets, N. W.,

Washington, D. C. April 9, 1908.

Brig. Gen. A. Mackenzie,
Chief of Engineers, U.S.A.,
Washington, D.C.

Through the Division Engineer, Eastern Division.

General:

1. I have the honor to forward, herewith, under separate cover, for approval by the Chief of Engineers, a set of four (4) blueprints showing the general layout, elevations, plans, sections and part of the operating mechanism of the proposed combined bridge and tidal gate over the inlet to the Tidal Reservoir in Potomac Park, to be built from the appropriation for Improving Potomac River, contained in the River and Harbor Act approved March 2, 1907.

2. The construction of the reservoir inlet gates is specifically provided for in the Act and a project for doing the work by hired labor was approved by the Chief of Engineers March 27, 1907, (E.D. 7590-68). By indorsement of the Chief of Engineers of February 7, 1908 (E.D. 66337), the employment of Mr. N. C. Wyeth to design the architectural features was approved. Number 2 of the blueprints forwarded herewith, is his preliminary sketch showing generally the design proposed; the details, however, have not yet been definitely worked out and it is expected that many of them as shown on the preliminary design will ultimately be changed. As construction progresses it will doubtless be found desirable to make changes of a

more or less important character in other portions of the structure.

3. The combined gate and bridge is to be built of concrete supported on piles. After driving the latter, sealing concrete is to be deposited over the tops of the piles, and a cofferdam is to be erected around the area to be occupied by the structure so as to allow the rest of the concrete to be placed in the dry. The concrete walls above low water are to be reinforced with steel bars.

4. There are to be, as shown on the plans, eight (8) sets of automatic swinging tidal gates, which will prevent the egress of water when the tide is falling.

5. On the river side of the tidal gates are to be eight (8) curtain gates intended to be used whenever it is desired to prevent either the ingress or egress of water from the reservoir; it is expected to keep these closed whenever the river water contains a large amount of sediment.

6. The central span of the structure is twenty-six (26) feet wide and is to be covered with a movable floor, which can be taken off in case it is ever desired to have a dredge, piledriver, or similar large vessel enter the reservoir.

7. The waterway through the central span is to be closed at each end by rolling gates of half the width of the span. This will form a lock which can be operated readily to allow the passage of launches and other small boats between the river and the reservoir without necessitating the removal of the bridge floor overhead.

8. The estimated cost of the combined bridge and tidal gate is

as follows:

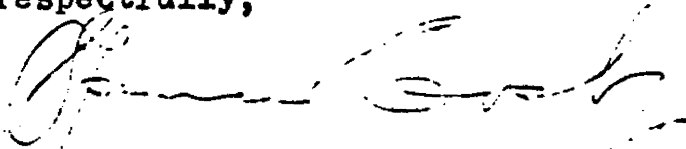
Dredging, 3,000 cu.yds. at \$0.10,-----	\$	300.
Piles, 1,300 piles, 55-ft. length, at \$5.50,-----		7,150.
Driving same to elevation -10, at \$3.00,-----		3,900.
Concrete, Sealing 2,500 cu.yds. at \$7.00,-----		17,500.
" Pier, spread footing, including forming, 1,600 cu.yds. at \$10.00,-----		16,000.
" Interior wall, including forming, 730 cu.yds. at \$11.00,-----		8,030.
" Exterior wall, including forming, 100 cu.yds. at \$12.00,-----		1,200.
" Floor and beams, including forming, 380 cu.yds. at \$12.00,-----		4,560.
" Ornamental, including forming, 80 cu.yds. at \$20.00,-----		1,600.
Steel, Reinforcement, 40 tons at \$80.00,-----		3,200.
Automatic Gates, 16 at \$100.00,-----		1,600.
Curtain Gates and machinery, 8 at \$700.00,-----		5,600.
Lock gates and moving gear, including operating platform,		3,000.
Movable floor,-----		2,000.
Macadam road and gutter,-----		1,000.
Cement sidewalks,-----		360.
Gratings over automatic gates,-----		200.
Alterations in sea wall and grading,-----		5,000.
Temporary structures,-----		2,000.
Repairs to, and addition to plant,-----		3,000.
Cofferdam,-----		7,000.
Pumping,-----		1,600.
Superintendence and office expenses,-----		5,000.
Contingencies,-----		4,200.

	\$	105,000.

9. The making of the tidal gate wide enough to carry a roadway across the inlet was done at the request of Colonel Bromwell, in Charge of the Office of Public Buildings and Grounds, who has included in his estimates for the next fiscal year an item of \$25,000. to pay the additional cost, to be expended under the direction of the Chief of Engineers. Colonel Bromwell states that he believes Congress will appropriate the above amount this year, in which case the net cost of the structure, to be paid from the River and Harbor appropriation will be \$80,000; in case, however, the \$25,000. is not

appropriated it will be possible to reduce the cost of the structure, if deemed advisable, by narrowing greatly the roadway.

Very respectfully,

A handwritten signature in dark ink, appearing to be a cursive name, possibly "R. L. ...".

Major, Corps of Engineers.

4 inclosures.

EJD/HEJ
SUBJECT:

Pot. 7/25

U. S. ENGINEER OFFICE, EASTERN DIVISION.	Wash. Misc.
Received June 26, 1908.	2 133

United States Engineer Office,
22nd and K Streets, N. W.,

Washington, D. C., June 25, 1908.

The Chief of Engineers, U.S.A.,
Washington, D. C.

Through the Division Engineer, Eastern Division.

Sir:

1. I have the honor to request authority to employ the Thos. W. Power Engineering Company, of this city, to prepare the working drawings and specifications for, and to inspect all materials purchased in Washington, all workmanship and all installation of, the machinery and other appliances for operating the gates of the combined tidal gate and bridge at the entrance to the Tidal Reservoir, Potomac Park.

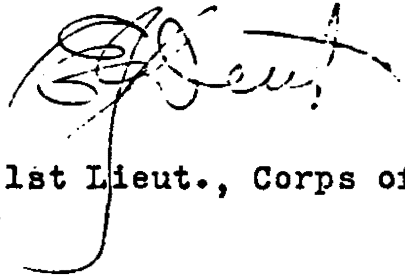
2. For doing the above work, the United States is to pay to the Thos. W. Power Engineering Company 5 per cent of the final cost of that part of the work designed by them, 2 1/2 per cent of the estimated cost to be paid upon completion and approval of the working drawings, and the balance upon completion of the installation of the work. Under no circumstances shall the amount paid for this service exceed the sum of \$850.

3. The work which it is proposed that the Thos. W. Power Engineering Company shall do requires the employment of a mechanical engineer of some ability. Informal inquiries indicated that there would be considerable difficulty in finding a man competent to do the work

under this office if employed by the month. The Thos. W. Power Engineering Company have done a large amount of mechanical work in this vicinity and it is believed that they are entirely competent to do the work, ^{They} and are willing to guarantee that the drawings shall meet the approval of this office in every respect before any payments are made.

4. Payments will be made from the appropriation for Improving potomac River.

Very respectfully,

A handwritten signature in cursive script, appearing to read "S. J. [unclear]", written in dark ink. The signature is positioned above the typed name and title.

1st Lieut., Corps of Engineers.

EJD/WNT.
SUBJECT:

U. S. ENGINEER OFFICE, EASTERN DIVISION.		Potomac R	
Received	June 27, 1908.	1	22

United States Engineer Office,
22nd and K Streets, N. W.,

Washington, D. C., June 26, 1908.

The Chief of Engineers, U.S.A.,
Washington, D.C.

Through the Division Engineer, Eastern Division.

Sir:

1. I have the honor to inclose, herewith, abstract of proposals received for furnishing and delivering materials for the combined tidal gate and bridge at the entrance to the Tidal Reservoir, Washington, D.C. A copy of the specifications and of each bid received is also inclosed.

2. Authority is requested to enter into contracts for the different classes as follows:

Class A. ✓ With the National Mortar Company, Washington, D.C., for 7,000 barrels, more or less, of Old Dominion Portland cement, at \$1.475 per barrel. The rebate for return of sacks to be - for serviceable sacks, \$0.075 each; for repairable sacks, \$0.055 each.

Class B. With L. E. Smoot, for 3,800 cubic yards, more or less, of 2-inch gravel. The demurrage charge for scows detained more than 48 hours to be at a rate of \$5.00 for each 24 hours or fraction thereof. .65

Class C. ✓ With the Potomac Granite Company, for 1,200 cubic yards, more or less, of 1-inch broken stone, at \$1.34 per cubic yard. The demurrage charge for scows detained more than 48 hours to be at a rate of \$5.00 for each 24 hours or fraction thereof.

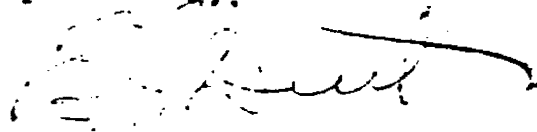
Class D. ✓ With L. E. Smoot, for 3,000 cubic yards, more or less, of sand, at \$0.40 per cubic yard. Demurrage charge for scows detained more than 48 hours to be at a rate of \$5.00 for each 24 hours or fraction thereof.

Class E. With J. B. Kendall, for 60,000^{pounds,} more or less, of reinforcing steel in accordance with the revised schedule hereto attached.

3. A letter from the National Mortar Company, stating the brand or cement that they propose to furnish, is inclosed herewith.

4. The variation between the quantity of steel called for in the specifications and the quantity called for by the revised schedule attached, has been called to the attention of J. B. Kendall and they state verbally that the original unit price will hold for the lesser quantity.

Very respectfully,



1st Lieut., Corps of Engineers.

19 inclosures.

67654

SCHEDULE OF REINFORCING STEEL FOR COMBINED TIDAL GATE
AND BRIDGE AT INLET TO TIDAL RESERVOIR, WASHINGTON, D.C.

1-in. sq. bars	55 pieces	16-ft. long	=	880 linear ft.
"	20 "	20-ft.	"	400 " "
"	85 "	22-ft.	"	1,870 " "
"	50 "	24-ft.	"	1,200 " "
"	160 "	26-ft.	"	4,160 " "
"	60 "	28-ft.	"	1,680 " "
"	50 "	30-ft.	"	<u>1,500</u> " "
1-in. sq. bars, total linear feet, =				11,690 at 3.4 lbs. ft.
				= 39,746 lbs.

1/2-in. round bars	650 pieces	16-ft. long	=	10,400 linear ft.
"	115 "	17-ft.	"	1,955 " "
"	120 "	18-ft.	"	2,160 " "
"	50 "	20-ft.	"	1,000 " "
"	220 "	22-ft.	"	4,840 " "
"	155 "	24-ft.	"	3,720 " "
"	58 "	26-ft.	"	1,508 " "
"	30 "	28-ft.	"	840 " "
"	130 "	30-ft.	"	<u>3,900</u> " "
1/2-in. round bars, total linear feet, =				30,323 at 0.667 lbs. ft.
				= 20,216 lbs.

1-in. sq. bars,	39,746 lbs.
1/2-in. round bars,	<u>20,216</u> "
Total weights,	59,962 lbs.

WTH/HEJ
SUBJECT:

Pot.10/106

Office
Public Buildings
and Grounds.
No. 52/533

United States Engineer Office, 22, 1909

920 Seventeenth Street, N. W.,

Washington, D. C., November 17, 1909.

The Chief of Engineers, U.S.A.,

Washington, D. C.

Sir:

1. I have the honor to report that it is expected that before December 1, 1909, the G. & W. Mfg. Co., of New York City, will have completed their contract for furnishing and installing lock and curtain gates in the new bridge at the inlet to the Tidal Reservoir, Potomac Park, this city; and that when the contract is completed, it will be possible to begin the operation of the gates for the purpose for which they were designed.

2. To do this economically, and also to place the control and supervision where it is believed they properly belong, the following transfer to the Office of Public Buildings and Grounds, which now has charge of the section of Potomac Park north of the railroad embankment, is recommended:

a. Control of Tidal Reservoir, except the control of inflow and outflow of water.

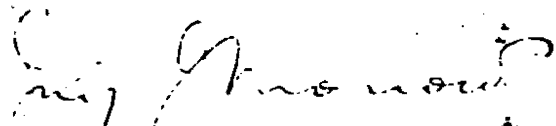
b. Control and maintenance of the roadway of the inlet bridge, including lighting and water service, roadway surface, sidewalks, concrete and steel balustrades above sidewalk level, and structural steel supports of the roadway in the center of the bridge.

c. Operation of lock gates permitting the passage of boats to and from the Tidal Reservoir, provided that both sets of

lock gates shall not be opened and remain open simultaneously without the consent of the United States Engineer Office.

The operation and maintenance of the curtain and automatic gates in the inlet bridge and the maintenance of lock gates and sea-walls should remain under the United States Engineer Office, as the operation of the gates mentioned, controls the inflow of water to the Tidal Reservoir, and the maintenance charges mentioned, are proper charges against the appropriations for Maintenance, Improvement of Potomac River.

Very respectfully,


Major, Corps of Engineers.

GFP/PD
SUBJECT:

Rec'd JUN 10 1910

Office
Public Building
and Grounds

United States Engineer Office, 52/666'

920 Seventeenth Street, N. W. June 10 1910

Washington, D. C. June 9, 1910. Anad/669

See 30/225

See 52/65889

Colonel Spencer Cosby, U.S.A.,
Major, Corps of Engineers,
In charge Public Buildings & Grounds,
Washington, D. C.

Colonel:

Replying to your letter of June 1, 1910, I have the honor to inform you that the matter of providing current for incandescent lights on the new inlet bridge has again been taken up informally with the Potomac Electric Power Company by this office. The inclosed blueprint, showing the extensions of the underground conduit which will be necessary to reach the bridge, has been seen by Mr. L. E. Sinclair, of the Potomac Electric Power Co., and is believed to be in accordance with his ideas.

As the extension of these conduits will be done under the contract for lighting to be made by your office, it is suggested that you send this drawing to Mr. Sinclair for confirmation, authorizing the extensions indicated. It is understood that the circuit will be tapped into the present 550-volt circuit under the sidewalk of the Highway Bridge, at the north abutment, running thence down the abutment to a hand hole to be built between the abutment and the driveway under the bridge, thence across the driveway in a new conduit to a new hand hole on the duct line carrying the park arc lighting circuit, thence through the existing arc light duct to a point opposite the inlet bridge where it will leave the existing duct line either by the hand hole opposite the existing arc light pole or a new one near it, thence in a new con-

duit to the opening in the abutment under the sidewalk on the Basin side of the bridge, thence under the sidewalk to the interior of the pedestal at the east side of the lock, where it will connect with the wiring to be installed by this office.

A drawing showing the general arrangement proposed for this is also inclosed for your information, with request for any suggestions you may desire to make.

It is understood that the Potomac Electric Power Company will install everything shown, from their present mains to and including the meter, except the switch, which must be furnished by this office.

Very respectfully,

[Handwritten Signature]
Captain, Corps of Engineers.

2 inclosures.

Recd. 10.11.1911

GFP/ED

Rec'd 21 1910

SUBJECT:

United States Engineer Office,

920 Seventeenth Street, N. W.,

Washington, D. C. June 20, 1910.

See 52/669

Office Public Buildings and Grounds. No. 52/675 ✓ June 21, 1910 <i>See 52/679</i>
--

Colonel Spencer Cosby, U.S. Army,
In Charge Public Buildings & Grounds,
Washington, D. C.

Colonel:

In accordance with suggestions contained in your letter of June 11, 1910, the plans for installation of incandescent lights on the new inlet bridge have been revised to provide for placing the main switch and meter on the river side of the bridge, near the steps leading down from the machine deck to the platform along the automatic gates.

The main switch will be inclosed in a case provided with a lock and key. Separate switches will be provided also at each of the four series of five lights. The five central lights over each concrete head will be in one series, the two outside lights being in series with the three remaining lights on each half of the bridge.

It is proposed to use lead and rubber insulated wire in armored conduit or lead armored cable, either of which it is believed will make a satisfactory installation.

Very respectfully,

Warren T. Hannum

Captain, Corps of Engineers.

R.C.

[Handwritten signature]

ELECTRO BLEACHING GAS CO.

MANUFACTURERS OF

*Liquid Chlorine*18 EAST 41ST STREET

NEW YORK

March 23, 1917.

SANITARY DEPARTMENT
JOHN A. KIENLE
SANITARY ENGINEERCOMPLETE INSTALLATIONS
FOR STERILIZATION OF
WATER AND SEWAGECol. Wm. W. Harts,
1729 New York Avenue, N. W.,
Washington, D. C.Office
Public Buildings
and Grounds.
No. 52/2637
Mar. 24. 1917.

Dear Sir:-

In the following we wish to give you a description of the chlorine plant which we will install if awarded contract upon the basis of the attached proposal.

We have indicated in red ink on blue print attached hereto the method which we propose to follow in installing the liquid chlorine apparatus for treatment of the waters of the Tidal Basin. We have indicated the apparatus in one archway section of the bridge, and would advise that it would be our intention to furnish four equipments located in each of the four arches similar in general arrangement with that indicated on the blue print. In order that these equipments may be installed in the archways, as indicated, it will be necessary for the Department of Public Buildings & Grounds to construct in said archways necessary platform upon which these equipments can be erected, also the necessary housing for enclosing the apparatus.

The type of equipment upon which we are bidding is known as our Model C-F Gravity Feed type apparatus, blue print of which we are also herewith enclosing. The size of each of these equipments will be sufficient to apply chlorine at the rate of 12-1/2 pounds of chlorine per hour, which is more than ample to take care of the complete sterilization of the waters of the Tidal Basin. You will note that the apparatus is of the Manually Controlled type - that is to say, adjustment of the flow of chlorine will have to be made by hand. The equipment is automatic in the sense that once the rate of flow is adjusted, it will continue at this rate until re-adjusted. Attention is called to the fact that each equipment is to be provided with three solution lines conveying the chlorine into the channel beneath the arches.

While it would be possible to obtain the

See 52/2644

desired discharge of chlorine for the treatment of the Tidal waters through one or possibly two apparatus, we feel that the installation as above recommended - namely, four equipments - one for each of the individual archways, would give you a plant that would result in a much greater satisfaction from operation than could possibly be obtained from a single or double units.

DESCRIPTION OF APPARATUS.

Each of the four apparatus to be furnished under the attached proposal shall consists of three main parts: First - a substantial cast and angle iron pedestal on which shall be mounted, Second - vulcanite absorption tower provided with the necessary material to insure complete and thorough absorption of the chlorine in a minor supply of water prior to the application to the water to be treated; also, Third - a panel board on which shall be mounted two chlorine gauges, two pressure regulating valves, a manifold providing connection for eight cylinders, meter control valve, eight cylinder coils with connecting coil valves, and one sight feed chlorine meter.

ABSORPTION TOWER AND SOLUTION PIPING: Vulcanite absorption tower shall consist of one vulcanite pipe 8" in diameter by 7 feet high, including necessary caps. It will be filled with fragmentary porous material so that complete absorption of the gas will be obtained with the minimum amount of water without escape of the gas to the atmosphere. There shall also be provided all the necessary protecting solution piping for enclosing same and preventing damage.

PANEL BOARD shall consist of steel plate and chlorine gauges shall indicate the chlorine cylinder pressure, also the reduced pressure under which the apparatus is working. Pressure regulating valves shall maintain a constant pressure regardless of the change in pressure in the chlorine cylinders due to atmosphere or other conditions. Panel Board shall be provided with the necessary manifold system for connecting eight cylinders in series, so that either one or more cylinders can be in service at any time. Chlorine meter shall be of the sight-feed type, which will indicate the flow of chlorine in pounds or fractions thereof per hour, and the weight of the chlorine shall be within 5% of the indicated feed at any point of delivery on the meter scale.

The materials used for said apparatus shall be of the best of their several kinds and qualities and particularly adapted for use in connection with chlorine gas, and there shall be furnished for repair, throughout a period of one year, any portion of the apparatus which shall become defective during that period, such repairs, extending to making good any inherent defects in the design, materials and workmanship that become manifest under ordinary working conditions, and shall not cover ordinary wear and tear or any breakage or damage caused by the improper use, or by contingencies over which the manufacturer has no control.

WORK TO BE DONE BY THE DEPARTMENT OF BUILDINGS AND GROUNDS.

In order to facilitate the installation of the equipment above specified, the Department of Buildings and Grounds shall construct in each of the four arches of the main bridge, as indicated on blue print accompanying the proposal, a substantial floor, together with the necessary housing for the apparatus; also furnish one inch water supply piping to a point immediately adjacent to the location of the equipment and supply the necessary water for absorption of chlorine prior to application.

// Stole
ESTIMATED COST OF MATERIAL NECESSARY FOR SUCCESSFUL OPERATION OF PLANT.

While the specifications furnished by the Department state the number of bacteria in the water to be treated, the absence of information on the organic content of the water does not make it possible for us to give an accurate estimate of the cost of operating the plant. Assuming that the water is not unusual in its characteristics, we would estimate that it could be properly sterilized for the purpose intended by the use of not more than four pounds of chlorine per million gallons, or 400 pounds daily. Assuming that the period of service for the equipment will average 100 days per annum, the annual cost for the chlorine, exclusive of labor required in attendance, would be approximately \$6,000.00. There is of course the probability that this estimate may be considerably higher than the actual requirements will show to be necessary when the plant has been in service and bacteriological tests made of the treated water.

Col. Wm. W. HartsNo. 4

Any additional information required on the construction or operation of the equipment will be very gladly furnished.

Very truly yours,


SANITARY ENGINEER

ELECTRO BLEACHING GAS COMPANY.

JAK-S.
Enc.

P.S. Should the Dept favor or prefer the application of the chlorine in its dry state we shall be pleased to submit an alternative estimate for such plant as may be required

ELECTRO BLEACHING GAS CO.

MANUFACTURERS OF

Liquid Chlorine

18 EAST 41ST STREET

NEW YORK September 7, 1917.

SANITARY DEPARTMENT
JOHN A. KIENLE
SANITARY ENGINEER

COMPLETE INSTALLATIONS
FOR STERILIZATION OF
WATER AND SEWAGE

See 52/26/46

Col. Wm. W. Harts,
Office of Public Buildings and Grounds,
1729 New York Avenue NW.,
Washington, D. C.

Office
Public Buildings
and Grounds,
No. 52/2647
Sept. 10 1917.

Dear Sir:-

We are in receipt of your letter of September 5th in which you acknowledge receipt of our previous communication of July 23rd with reference to proposed contract for the installation of chlorine sterilizing equipment at the Tidal Basin, and note that it will be acceptable to the Government to purchase these equipments from us at once with the understanding that the labor of installation is to be provided in the Spring of 1918, and the work of erecting the equipment is to be done at that time.

In order to draft contract acceptable to the Department you desire that we submit supplemental proposition describing the parts of the equipment to be furnished under the above arrangement and the price to be paid for each item and delivery at your Storehouse. We therefore wish to submit the following:

Each of the four equipments as outlined in our letter accompanying proposal of March 23rd, will consist of four main parts, as follows:

- Pedestals
- Front Plates
- Absorption Towers
- Solution Piping

the prices on these items being as indicated in the following tabulation:

4 - Pedestals	\$300.00
4 - Front Plates complete, including coils, gauges, etc.....	2000.00
4 - Absorption towers including absorption material	500.00
4 - Sets of solution piping	200.00
	<u>\$3000.00</u>
Labor cost for installation	150.00
Total	<u>\$3150.00</u>

Hertgen

See 52/2648

Col. Wm. W. Harts No. 2

Shipment of the entire four equipments will be made at one time, and it is now estimated that this shipment can go forward the latter part of September provided we are authorized to proceed with the work of manufacture and assembly within the course of the next few days. At least three weeks should be allowed for shipment from date of order to proceed.

Trusting this is the information which you desire, and awaiting your authority to go on with the work, we are,

Very truly yours,


SANITARY ENGINEER.

J-E-S

OFFICE OF PUBLIC BUILDINGS AND GROUNDS.

Office
Public Building
and Grounds.
No. 52/2648.
Sept. 27. 1917

See 52/2647

September 22, 1917.

*See 52/2649
2667*

Electro Bleaching Gas Co.,
18 East 41st Street,
New York City, N. Y.

Dear Sirs:

In reply to your letter of September 7th, you are authorized to commence the manufacture of the pedestals, front plates, absorption towers and solution piping required for the chlorine sterilizing equipment at the Tidal Basin for which your proposal in the sum of \$3,150. has already been accepted.

In accordance with my letter of September 5th, a contract for this work will be drawn by me so that the equipment can be paid for within 10 days after its delivery in this city less 10 per cent of its value, which will be retained by the contracting officer until the entire equipment has been installed in the spring of 1918 and accepted by this office. The prices to be paid for the equipment will be as follows, as stated in your letter:

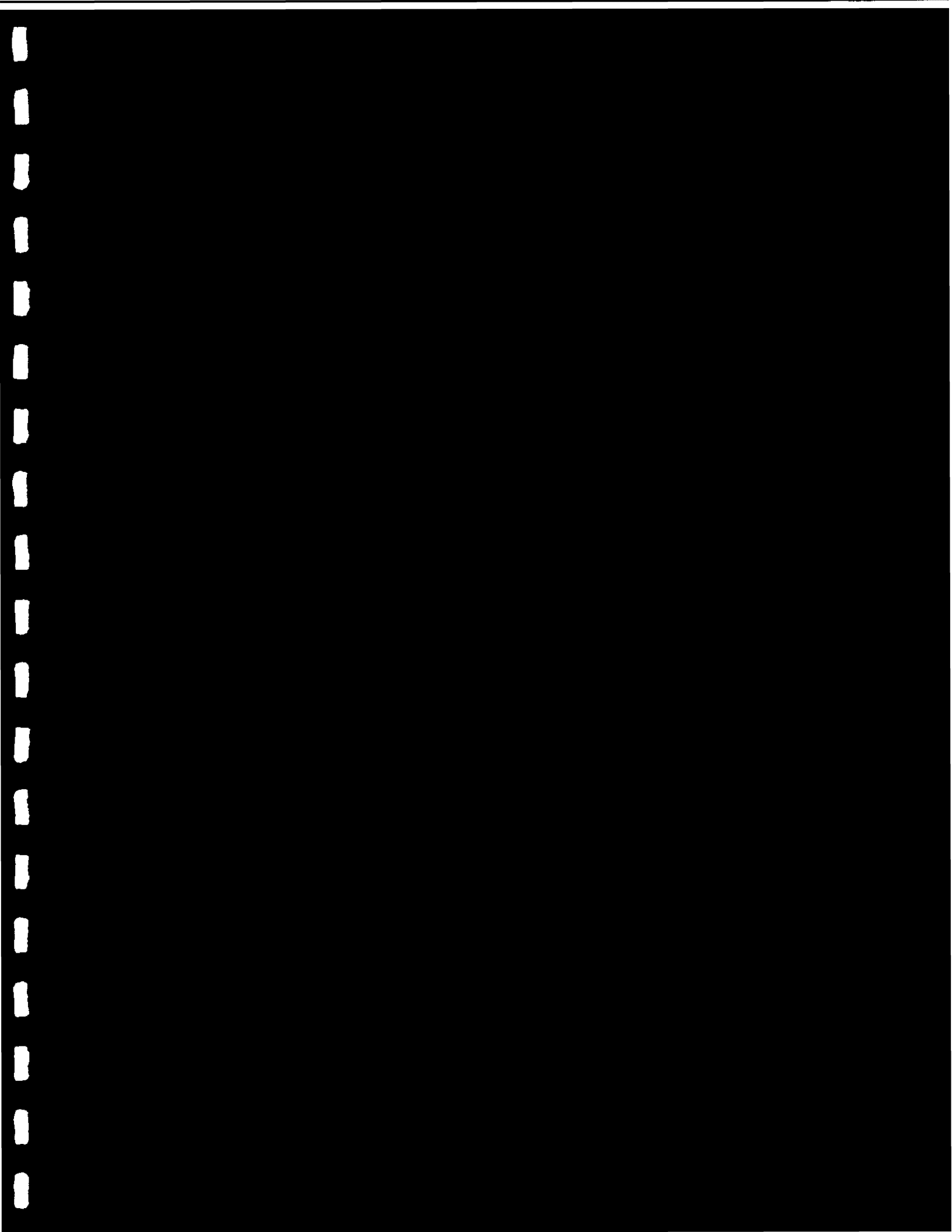
4 - Pedestals	\$ 500.00
4 - Front plates complete, including coils, gauges, etc.	2,000.00
4 - Absorption towers including absorption material	500.00
4 - Sets of solution piping	200.00
	<u>\$3,000.00</u>
Less 10%	300.00
Leaving the sum of	<u>\$2,700.00</u>

to be paid your company upon the delivery of the materials. The contract will also provide that the cost of installation amounting to \$150.00 will be paid for upon the entire completion of the work.

A contract drawn in accordance with the foregoing and the bond which you are to give to insure the performance of the contract will be prepared at once in this office and sent you for signature.

Respectfully,

/s/ WM. W. HARTS,
Colonel, U. S. Army.



Appendix IV - Selected Annotated Bibliography

Introduction

The investigation of sources pertinent to the study of the Tidal Basin Inlet Bridge in Washington, D.C. has been restricted to repositories in the National Capital region. The concentration of primary written documentation of the bridge is in the Pennsylvania Avenue headquarters of the National Archives, especially in the records of the Office of Public Buildings and Grounds of the National Capital (RG 42) and the records of the Office of the Chief of Engineers of the United States Army (RG 77). Extant graphic materials are divided between the Cartographic and Architectural Branch of the National Archives in Alexandria, Virginia, and the Federal Records Center in Suitland, Maryland, although a number of valuable drawings, blueprints, and photographs of the bridge and its related features are scattered among the General Correspondence Files (1907-1921) of Record Group 42, especially Files Nos. 52 (Potomac Park) and 30 (Public Grounds). However, the National Archives record groups likely to contain additional, if less significant, sources for the history of the Inlet Bridge have not been thoroughly exhausted.

The decision was made to focus data-gathering efforts in the records of the agencies and offices most centrally, regularly, and continuously involved in the overall improvement and modification of the Washington waterfront since 1882, and in the design, construction, and maintenance of the Inlet Bridge. In addition to the records of the Office of the Chief of [the Army Corps of] Engineers (RG 77), and the records of the Office of Public Buildings and Grounds and its successor the Office of Public Buildings and Parks of the National Capital (RG 42), the records of the Commission of Fine Arts (RG 66); and the National Park Service (RG 79) were thoroughly examined for Inlet-Bridge-related documents. Within each of these record groups are instances of materials duplicated in others. However, there were also in these materials many references to letters, photographs,

plans, drawings, etc. that have not yet been located. In the case of the Office of Public Buildings and Grounds, for example, certain Acts of Congress permitted the disposal of numerous records considered not to be essential.

Basic Sources for Background and Context

The Inlet Bridge and associated Potomac Park improvements must be seen as a chapter in the larger history of public works in Washington, D.C., and as a reflection of the complex administrative history of planning, building, and managing the National Capital. In particular they are legacies of an entire century in which the Army Corps of Engineers shaped and determined the physical expression of the federal interest District of Columbia, and built much of the underlying structure of the modern city of Washington, D.C.

In 1867 Congress decided to remove the public buildings and grounds from the control of a civilian commissioner and established the Office of Public Buildings and Grounds under the Corps of Army Engineers, and the Washington Engineer District was created in 1875 to undertake the improvement of the Potomac River. The honesty and competence of the Corps' work in Washington contrasted vividly with the excesses and corruption of the Territorial Government (1871-1874) of the District of Columbia. In 1878, following several years of experimentation with a three-man commission government, the Congress made that form of government permanent, and specified that one of the commissioners was thereafter always to be an officer of the Corps of Engineers. Thus, in less than a decade, virtually all public works, including government buildings, the city's parks, river and harbor improvements, and the water supply, came to be the jurisdiction of the Army Corps of Engineers.

Growth in the amount and complexity of the work of the Office of Public Buildings and Grounds led to its separation from the Corps in 1925, when the Congress created the Office of Public Buildings and Parks of the National Capital (which for eight years still functioned

under an Engineer officer specifically assigned to the agency). The Department of the Interior took over the National Capital's parks in 1933.

The following works are significant for their contributions to an understanding of general Washington, D.C. planning, construction, and administrative history:

Glenn Brown, comp. PAPERS RELATING TO THE IMPROVEMENT OF THE CITY OF WASHINGTON, DISTRICT OF COLUMBIA. (56th Cong., 2nd sess., Senate Doc. No. 94). Washington: Government Printing Office, 1901.

Brings together important sources of information on the historical development of the District of Columbia, with special attention to the L'Enfant Plan, Potomac River tidal-flats projects, and the entire range of matters leading to the creation of the Senate Park Commission. Brown was an architect, historian, and Secretary of the American Institute of Architects who organized the important 1900 Convention of the A.I.A., which focussed on the future of the National Capital. His MEMORIES, 1860-1930 (published 1931) provide a highly personal view of most of the figures instrumental in the great physical development projects of the turn-of-the-century, including Potomac Park and the Arlington Memorial Bridge.

Albert E. Cowdrey. A CITY FOR THE NATION: THE ARMY ENGINEERS AND THE BUILDING OF WASHINGTON, D.C. Washington, D.C.: Government Printing Office, 1979.

Several attempts have been made to present the story of the Corps of Engineers and the growth of Washington. This is a good general summary; identifies most of the important works of civil engineering carried out by the Corps; and relates projects chronologically in a lucid and smooth fashion.

District of Columbia. Department of Highways. WASHINGTON'S BRIDGES: A PICTORIAL REPORT ON HIGHWAY BRIDGES AND STRUCTURES IN THE DISTRICT OF COLUMBIA. Washington: District of Columbia Department of Highways, 1956.

First published in 1948, this compendium was prepared in cooperation with the Bureau of Public Roads to serve as an inventory and conditions report. Valuable for its illustrations.

William Stull Holt. THE OFFICE OF THE CHIEF OF ENGINEERS OF THE ARMY: ITS NON MILITARY HISTORY, ACTIVITIES, AND ORGANIZATION. The Brookings Institution for Government Research, Publication No. 27. Baltimore: The Johns Hopkins Press, 1923.

An overview of the civil engineering work of the Corps of Engineers and a worthy analysis of the chain-of-command in Corps operations. Holt's study contains intriguing biographical data, and while it is not concerned exclusively with the Corps' Washington work, adds a certain perspective to our knowledge of local projects.

Sue A. Kohler. **THE COMMISSION OF FINE ARTS: A BRIEF HISTORY, 1910-1976. With Additions, 1977-1984.** Washington: Government Printing Office, [1985].

An examination of the genesis and role of the Commission of Fine Arts. Commission historian Sue Kohler has probed the minutes of Commission meetings to extrapolate the central issues, aesthetic debates, and personality influences in the important matters concerning the Commission of Fine Arts since 1910. These include the continuing development of the Mall, and the design and location of the Arlington Memorial Bridge.

Charles Moore, ed. **THE IMPROVEMENT OF THE PARK SYSTEM OF THE DISTRICT OF COLUMBIA.** (57th Cong., 1st sess., Senate Report No. 166). Washington, D.C.: Government Printing Office, 1902.

Remains the basic document on the formation of the Senate Park Commission, its ideas for the restitution and embellishment of the L'Enfant plan for Washington, and the development of the extensive linked system of parks and bridges that was eventually completed in all its essentials. An important source of drawings, maps, and contemporary photographic illustrations.

Donald Beekman Myer. **BRIDGES AND THE CITY OF WASHINGTON.** Washington: Government Printing Office, 1974

An historical survey of the principal Potomac and Anacostia River bridges; bridges of Rock Creek Park; and special Washington bridges, such as those crossing the C&O Canal. Donald Myer is concerned with the effects of changing technology on bridge design in Washington as well as changing ideas about the appropriateness of bridge form. Excellent illustrations--including those for the Arlington Memorial Bridge schemes not executed, and valuable footnotes.

John W. Reps. **MONUMENTAL WASHINGTON: THE PLANNING AND DEVELOPMENT OF THE CAPITAL CENTER.** Princeton: Princeton University Press, 1967.

Fundamentally a study of the 1901-1902 plan of the McMillan Commission, although also a broad, informed sketching of the evolution of the monumental core of Washington. Dominated not only by Reps' profound admiration for the work of L'Enfant, but also by his understanding of and sympathy for the generation of 1900. Very good information on the pre-McMillan Commission plans for the Mall and Potomac waterfront.

Paul D. Spreiregen, ed. **ON THE ART OF DESIGNING CITIES: SELECTED ESSAYS OF ELBERT PEETS.** Cambridge: M.I.T. Press, 1968.

Contains selections from Peets' writings on Washington over a period of thirty-two years. Section III is an important critique of the history of the planning and design of the entire Potomac River treatment, including the Lincoln and Jefferson Memorials, and the Arlington Memorial Bridge and Rock Creek and Potomac Parkway system, and their associated sculptural groupings.

[U.S. National Capital Planning Commission] Frederick Gutheim, Consultant. **WORTHY OF THE NATION: THE HISTORY OF PLANNING FOR THE NATIONAL CAPITAL.** Washington: Smithsonian Institution Press, 1977.

An effort to compile and analyze the overall planning history of the National Capital and its region. Despite serious weaknesses--including too many researchers and writers, and abundant evidence of unfortunate editorial

decisions--the book is eminently useful as an encyclopedia of detail and facts numerous local projects. It admirably strives to make constant reference to larger national historical issues affecting local decision-making. Illustrations are plentiful, and the bibliographical essay very helpful.

Major Government Documents, Articles and Pamphlets Concerned with the History of the Memorial Bridge Project and the Tidal Basin Development

The following references constitute the *principal* sources. Even a selected list of late-19th and early-20th century documents, books, articles, and pamphlets with some general applicability to the study of concrete bridges (such as the Arlington Memorial and Inlet Bridges in Washington) and their urban context, would be very lengthy and beyond the scope this project. Most of the titles below are self-explanatory and require no annotation.

"Architectural Effects in the Construction of Metallic Bridges." The Engineering Record, 44. November 2, 1901.

Interesting discussion of the use of metal as an ornamental and architectural material in modern bridges.

"Arlington Memorial Bridge." American City, 37. October 1927.

Summarizes the project and its major construction problems; illustrated.

Albert W. Buel. "The Merits and Permanency of the Masonry Arch Bridge." The Engineering Magazine and Industrial Review, 17. April-September 1899.

Review of the concrete-arch method of bridge construction, the record of existing examples, and the current state of concrete technology.

"Concrete-Steel Construction in the Proposed Memorial Bridge." The Engineering Record, 41. May 26, 1900.

Waldon Fawcett. "The Longest Concrete Bridge in the World." American Exporter, 62. 1908.

Peter C. Hains. "Reclamation of the Potomac Flats at Washington, D.C." Transactions of the American Society of Civil Engineers, 31. 1894.

Col. Peter C. Hains, as head of the Washington Engineer District, beginning in 1883 directed the project to improve the navigation and raise the flats of the Potomac River, thus creating the land on which Potomac Park and the Washington end of the Arlington Bridge are located. A first-hand account of the process.

"Improvement of the Potomac Flats." Scientific American, 65. September 19, 1891.
A contemporary view of the massive river, harbor, and parks-development engineering projects underway in Washington.

Montgomery Schuyler. "Bridges and the Art Commission." The Architectural Record, 22. December 1907.

_____. "'Monumental' Engineering." The Architectural Record, 11. October 1901.

_____. "The New Washington." Scribner's Magazine, February 1912.

Three of numerous articles by the famous architectural critic and apostle of modernism and functional expression in buildings and other structures. These pieces review developments in Washington, including public buildings, parks, and bridges. Schuyler is generally negative about the self-conscious historicism in Washington bridge and park-structures design, and about government building in general. Illustrated.

U.S. House. Bridges Across the Potomac. Letter from the Secretary of the Interior, Transmitting Reports, Plans, and Estimates for Permanent Bridges Across the Potomac, and for the Improvement of the River. 34th Cong., 3rd sess., Executive Doc. No. 58. February 9, 1857.

U.S. Senate. Letter from the Secretary of War to the President Pro Tempore of the Senate, Transmitting to the Senate Mr. S. T. Albert, U.S. Civil Engineer, Report on Survey Made in Compliance with Requirements in River and Harbor Act of March 3, 1881, on Potomac River in Vicinity of Washington. 47th Cong., 1st sess., Executive Doc. No. 126. January 17, 1882.

Published Annual Reports and Periodicals Useful Over Long Periods of Publication

There are several series of published annual reports and professional periodicals which are helpful to the investigation of the history Inlet Bridge. They are:

American Society of Civil Engineers. Transactions of the American Society of Civil Engineers. 31-117 (1894-1952).

In addition to following the work of the Corps of Engineers in Washington the Transactions provide much information about developments in American civil engineering generally, and biographical data on figures important in the history of Washington's physical development. Indexed.

Chief of Engineers, U.S. Army Corps of Engineers. ANNUAL REPORT. Washington: [usually] Government Printing Office, 1866- .

A year by year accounting of Engineer activities under the authority of the Chief of Engineers. These reports reproduce important documents and graphics and often contain extremely useful appendices and compendia of information about Washington public works.

Commission of Fine Arts. REPORT. Washington: Government Printing Office, 1911- .

Irregularly published-- in the early years of the Commission usually biennially and after 1932 infrequently--these summarize the deliberations of the Commission of Fine Arts on all matters in its purview, and are richly-illustrated with proposal drawings, alternative designs for public works; photographs; and maps. The Potomac River park system was a principal concern of the Commission for the entire period in which the biennial REPORT was published.

Commissioners of the District of Columbia. ANNUAL REPORT. Washington: [usually] Government Printing Office, 1879-1935 (after 1935, Government of the District of Columbia. ANNUAL REPORT).

Includes the Annual Report of the Engineer Commissioner and develops the role of the District of Columbia Government in the city's physical growth and change. An excellent source of maps and other graphics.

Congressional Record. Washington: Government Printing Office, 1879- .

The day-by-day, bill-by-bill, hearing-by-hearing record of the activities of the Congress of the United States and its numerous committees. Indexed annually and very thoroughly. The Potomac River and Tidal Basin bridges generally are indexed under the entries "Potomac Park" and "Potomac River." Every word of each bill and hearing related to these improvements can easily be located. The Library of Congress has filmed the Congressional Record and indexes up until 1920.

[Washington] Evening Star.

The Evening Star was the principal local newspaper after the Civil War and indeed up until the late 1960's. Editorial policy was often shaped with the input of the Washington Board of Trade. Both the Star and the Board of Trade vigorously followed and promoted the massive federal works and public improvements occurring in late-19th and early-20th century Washington. The Saturday issues in particular followed Potomac River and Tidal Basin improvements.

The Washingtoniana Division of the Martin Luther King Memorial Library houses a card index to the Star.

The Military Engineer, 1-28 (1909-1936).

A regular outlet for articles discussing the role of military engineering. Many are concerned with Washington, D.C. projects. Army Engineers important in the Arlington Memorial Bridge and associated Mall and waterfront developments, such as U. S. Grant, III, were frequent contributors.

The United States National Archives: Pertinent Holdings

This bibliography separates pictorial from written material where possible. Most plans, drawings, and maps--which are often on a large scale and pose different conservation problems than letters and printed reports--have been removed to the Cartographic and Architectural Branch of the National Archives in Alexandria, Virginia. The Construction Files of the Army Corps of Engineers are part of Record Group 77 and are housed at the Federal Records Center at Suitland. Since the National Park Service in 1933 assumed responsibility for the public grounds and parks formerly under the control of the Office of Public Buildings and Parks of the National Capital (and before 1925 under the control of the Office of Public Buildings and Grounds), much pertinent graphic documentation for the Inlet Bridge, including the drawings for the 1926 widening of the bridge, is now part of Record Group 79 (Records of the National Park Service) and housed at the Cartographical and Architectural Branch in Alexandria.

Inlet Bridge Records, National Archives

Record Group 42, Written Documentation

- Entry 92 - Card Index to Letters Received, Office of Public Buildings and Grounds, 1899-1906. Index entries trace beginnings of the Inlet Bridge, and discussions of its design and possible materials of construction.
- Entry 97 - General Correspondence, 1907-1921, consists of about 12 feet of records, including many letters dealing with Potomac Park and the Inlet Bridge. Among them are copies of reports and some smaller blueprints, photographs, and drawings.
- Entry 99 - Record Abstract Cards for the General Correspondence of the Office of Public Buildings and Grounds, 1907-1921, described above. An extremely valuable index arranged numerically by correspondence file category, and consisting of business-envelope-sized cards showing subject; date; the letter number; sender; whether the letter was received or sent; an abstract of the contents, and a file-category number.

Pertinent file categories for Inlet Bridge are "Potomac Park" and "Bridges," and the pertinent file numbers are 52 (Potomac Park) and 30 (Public Grounds). Other files, however, such as No. 8 "Potomac Speedway," contain documents useful in studying the context of the Inlet Bridge project. There are approximately 50 items dealing specifically with the Inlet Bridge in the primary files. These serve as clues to other records, as well. Some items appearing in the index and record abstract cards are missing.

Samples of significant items of correspondence concerning Inlet Bridge are:

Pot. Pk. 52/158, Maj. S. Cosby sends blueprints showing architects' plans and elevations of proposed bridge and tidal gate across inlet to tidal basin; March 1908.

Pot. Pk. 52/164, L. E. Kielhorn asks when bridge will be built, April 1908; and in Pot. Pk. 52/165, receives reply to above, April 1908.

Pot. Pk. 52/371, U.S. Engineer's Office informs PB&G regarding the opening of Inlet Bridge to pedestrians and equestrians, and requests police supervision; also discusses the submission of plans for grading, April 1909.

Pot. Pk. 52/383, PB&G requests set of revised drawings of bridge and tidal gate across inlet to Tidal Basin, and of adjacent seawalls, May 1909; and in Pot. Pk. 52/391, the U.S. Engineer's Office sends the required drawings, May 1909.

Pot. Pk. 52/427, U.S. Engineer's Office transmits plans showing proposed layout for approaches to the Inlet Bridge, July 1909.

Pot. Pk. 52/509, includes a record of the discussion with George H. Brown, landscape gardener, regarding the plantings to be made near the approaches to the Inlet Bridge, October 1909.

Pot. Pk. 52/658, first of a number of letters in file 52 regarding the installation of electric lights by Potomac Electric Power Company on Inlet Bridge, March 1910.

Pot. Pk. 52/677, U.S. Engineer's Office reports damage to operating machinery of lockgates at Inlet Bridge, June 1910.

Pot. Pk. 52/682, U.S. Engineer's Office reports that electrical system for lighting complete, "with exception noted," July 1910.

Pub. Grounds 30/380-381, to John Williams, Inc., requests suggestions for lighting standards, October 1911; and in Pub. Grds. 30/388 John Williams, Inc. submits two designs with prices, October 1911.

Pub. Gds. 30/484, abstract of bids, and full bids for bronze lighting standards for Inlet Bridge, June 1912.

Pub. Gds. 30/513-514, Roman Bronze Works sends photos of model for lamp posts, August 1912.

Pub. Gds. 30/578, C. A. Muddiman will furnish Doric Moonstone globes at same price as Alba globes for Inlet Bridge light standards, April 1913.

- Entry 110 - Scrapbook of Newspaper Clippings Relating to the Career of Spencer Cosby as District Engineer, Washington District (1905-1908), and as Officer in charge of Public Buildings and Grounds (1909-1913).

- Entry 114 - Appropriation Ledger, Fiscal Years 1907-1922, arranged by fiscal year and thereunder by name or appropriation title.

Record Group 77 - Written Documentation

- General Records, Letters Received and Sent (Entry 103). Correspondence for the period 1890-1923 relating to civil affairs, including all of the Army Corps' Washington public works. These files provide substantial data on the progress of the Inlet Bridge. There are registers of, and indexes to, the correspondence (Entry 99). Inlet Bridge appears under a number of index categories, including "Tidal Basin," "Potomac Park," "Bridges," and "Inlet." The correspondence records for the period 1923-1942 are at the Washington National Records Center in Suitland.

- Contract Index (Entry 235) and Contract Files, 1906-1932. An excellent source of detail on the Engineer's Office's negotiations with private construction firms and suppliers. Indexed by the name of the Contracting Officer of the Corps of Engineers and by the name of the firm.

- Correspondence and Reports Relating to River and Harbor Improvements (Entry 1044). These records are housed at the Suitland Federal Records Center. A list of contents is provided at the beginning of the entry.

Record Group 66 - Written Documentation

- Unpublished papers of Charles Moore, Secretary of the McMillan Commission, 1901-1910, and Chairman of the Commission of Fine Arts, 1915-1937. Valuable for understanding Moore's conception of Washington as a "world standard," and for specific, intimate details about most of the principal figures in the transformation of Washington, D.C. at the turn-of-the-century, and the continued process of realization of the McMillan Commission plan of 1901-1902.

Record Group 42 - Graphic Documentation

- Entry 178 - Negatives of Statues, Memorials, Monuments, Parks, and Buildings (in the Still Pictures Branch, Deck 18N, National Archives Main Building, Pennsylvania Avenue, Washington, D.C.). Approximately 400 negatives dating from the years 1897-1916, arranged alphabetically. There are numerous pictures of Potomac Park and the area about the Inlet Bridge.

Record Group 79 - Graphic Documentation

- Cartographic and Architectural Branch, Alexandria, Virginia. There are approximately 40 original plans, drawings, and specifications for the Inlet Bridge and its accessories that belong among the National Park Service cartographic records (RG 79). These are currently (1986) in the custody of Norbert Erickson, at the National Park Service building at 1100 Ohio Drive, S.W., Washington, D.C.

Inlet Bridge Records, Other Collections

Columbia Historical Society Library

1307 New Hampshire Avenue, N.W., Washington, D.C. 20036

- A thorough check of all current finding aids revealed no primary written sources for the Inlet Bridge. The Society has a newly-organized and extensive aerial-photograph collection, which documents the Washington area chiefly in the period of the Second World War and early post-War years. This holding contains a number of views pertinent to a study of the Inlet Bridge and surroundings. Of special importance at the Society (1986) is the Zack Spratt Collection of approximately 300 Washington-area bridge photographs, 1920-1950, including views of the Inlet Bridge before and after widening. There are negatives for most of the Spratt photographs. Also of note is the Bradley Collection of Washington scenes, with several shots of the bridge and its surroundings in the 1930's and 1940's.

District of Columbia Public Library, Washingtoniana Division

Martin Luther King, Jr. Memorial Library, 901 G Street, N.W., Washington, D.C. 20001

- Washington Star Collection, 2 modern photographs dated March 1, 1971 and January 12, 1974, showing accumulation of debris in inlet gates; clear view of the bridge in both. The Inlet Bridge appears in the background of a number of photographs filed under "Potomac Park," "Tidal Basin", and "Cherry Blossoms," as well as in aerial views from

Library of Congress, Prints and Photographs Division

- No photographs or other illustrations of the Inlet Bridge have been found in this collection.

Federal Highway Administration, Eastern District Federal District

1000 North Glebe Road, Arlington, Virginia 22201

- The FHA maintains copies of some inspection reports and copies of the most recent repair contracts and specifications for the Inlet Bridge.