

MACOMBS DAM BRIDGE

(Central Bridge)

Spanning the Harlem River between 115th Street Viaduct,
Jerome Avenue, and East 162nd Street

New York City

New York County

New York

HAER No. NY-269

HAER
NY
31-NEYO
175

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service

Northeast Region

U.S. Custom House

200 Chestnut Street

Philadelphia, PA 19106

HISTORIC AMERICAN ENGINEERING RECORD

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MACOMBS DAM BRIDGE (Central Bridge)

HAER No. NY-269

Location: Spanning the Harlem River between 155th Street Viaduct, Jerome Avenue and East 162nd Street, Manhattan and Bronx; New York and Bronx Counties, NY
USGS Central Park Quadrangle, Universal Transverse Mercator (UTM) Coordinates: 18.589850.4520010

Engineer: Alfred P. Boller consulting engineer to the NYC Departments of Public Parks and Public Works

Contractor/Fabricator: Passaic Rolling Mill Company, contractor (bridge); Union Bridge Company, contractor (viaduct); and Herbert Steward (Steward & McDermott) contractor (bridge masonry and viaduct)

Dates of Construction: 1890-1895

Present Owner: New York City Department of Transportation

Present Use: Vehicular traffic

Significance: The bridge was designed by eminent structural engineer Alfred Pancoast Boller and was a considerable municipal endeavor as well as a significant engineering feat. It is the third oldest major bridge in New York City, with the Brooklyn and George Washington bridges being the only ones older. It is the city's oldest intact metal truss swing-type bridge, which style was typically used in New York City along the Harlem River between the 1880's and 1910. The appearance of the bridge and viaduct is highlighted by the outline of the central swing span truss, the various steel latticework, the ornamental steel and iron details, and the large block masonry piers and abutments. It continues to provide a significant historic connection between upper Manhattan and the Bronx.

Project Information: Due to modifications of the deck trusses in span 38, over the proposed Oak Point Link Railroad construction and Ramp from I-87, it was recommended that the entire structure be recorded as per HAER guidelines.

Narrative Report prepared by Jay Shockley, Deputy Dir. of Research; edited by Elisa Urbanelli, Research Department Editor, Landmarks Preservation Commission

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DESCRIPTION AND ANALYSIS

Summary

The Macombs Dam Bridge (originally the Central Bridge) and the 155th Street Viaduct, constructed in 1890-95 to the designs of eminent Structural Engineer Alfred Pancoast Boller, for the New York City Departments of Public Parks and Public Works, was a considerable municipal undertaking, as well as a significant feat of engineering. The Macombs Dam Bridge is the third oldest major bridge in New York City (after the Brooklyn and George Washington Bridges) and is also the City's oldest, intact metal truss, swing-type bridge, a bridge type most often employed in New York City along the Harlem River between the 1880's and 1910. The bridge's steel central Swing Span was considered at the time to be the world's heaviest movable mass. Boller successfully overcame the various difficult challenges involved in the construction of the bridge and Viaduct, particularly in the placing of the foundations, while producing an aesthetically noteworthy design. The Passaic Rolling Mill Company of Paterson, New Jersey, and the Union Bridge Company of Athens, Pennsylvania, Contractors for the critically-acclaimed bridge, were leading steel and iron bridge manufacturers. The long steel 155th Street Viaduct provides a gradual descent toward the bridge from the heights of Harlem to the west, while the long Jerome Avenue approach viaduct of the bridge, consisting primarily of steel deck truss spans carried by masonry piers, with a subsidiary Camelback Truss Span, was built over what was then marshland in the Bronx. The appearance of the bridge and Viaduct is enhanced by the central Swing Span truss outline, the steel latticework, the steel and iron ornamental details (including the Eighth Avenue stairs, sections of original railing and several lampposts) and the masonry piers, abutments and shelterhouses. Following in a succession of bridges at this site since 1815, the Macombs Dam Bridge and the 155th Street Viaduct continue to provide a historically important connection between upper Manhattan and the Bronx.

Macombs Dam¹

In 1813 Robert Macomb² petitioned the New York State Legislature for permission to construct a dam across the Harlem River in the vicinity of present-day 155th Street in order to form a millpond for the use of the business he had obtained from his father. He was granted this right in 1814 with several requirements, including the provision that he operate a lock to allow vessels to pass along the river. A dam was completed in 1815, which also functioned as a toll bridge (see Figure 8). Macombs milling business later failed, and the dam/bridge, consisting of stone piers connected by wooden spans, was sold. By 1838, a dispute arose over this private usurpation of the river and the courts found that "Macombs Dam" was a "public nuisance". The Legislature in 1858 directed New York City and Westchester County to remove the dam and build a new toll-free bridge. The Central Bridge (familarly known as Macombs Dam Bridge, see Figure C) was constructed in

1860-61 by Builders John Ross and D. L. Harris under the direction of Engineer E. H. Tracey;³ initially authorized at \$10,000, it cost over \$90,000. Built of wood, it had a 210-foot central draw span, with a square tower and iron rods supporting the ends, as well as two Howe truss approach spans carried on trestles. This bridge was reconstructed several times: around 1877, the square tower was replaced by A-frames; in 1883, iron trusses by the Central Bridge Works of Buffalo, New York, replaced the approach spans; and in 1890, the wooden draw span was rebuilt.

As early as 1826, proposals had been made to dredge a navigable channel, incorporating part of Spuyten Duyvil Creek, to connect the Harlem and Hudson Rivers. This project did not come to fruition; however, until the late nineteenth century; work was begun on the Harlem Ship Canal in 1888, and the Canal was opened, uncompleted, to traffic in May 1895. In the meantime, the U. S. River and Harbor Act of 1890⁴ required that the low bridges along the Harlem River be replaced by ones with a clearance of 24 feet above spring tide, to be located at right angles to the bulkhead lines of a regularized channel; it was determined that revolving Swing Spans would best accommodate both masted and mastless vessels. In 1890, planning commenced on a replacement for the Central Bridge. At this same time, construction also began on a long Viaduct at 155th Street in Manhattan, which would eventually connect with the bridge (see 1892 map, Figure D).

155th Street Viaduct⁶

By the 1880's, property owners and City officials had expressed concern about the slow rate of development of certain sections of northern Manhattan, as well as the inadequacy of bridges linking northern Manhattan with the western Bronx, recently annexed to the City; development of the area adjacent to Macombs Dam, in particular, was considered to be impeded by a significant difference in height between the ridge (later called Coogan's Bluff)⁶ to the west and the river level and by limited transportation connections to the rest of the City. This area was; however, becoming increasingly popular as a destination for day excursions out of downtown, especially for bicyclists, drivers of trotting horses and patrons of Manhattan Field and the adjacent Polo Grounds (which opened in the early 1880's) north of the bridge. *King's Handbook* observed in 1892 that:

Seventh Avenue, south of the river, and Jerome Avenue, its continuation north of the river, have for a generation constituted the favorite drive for New-Yorkers outside of Central Park. North of the river the avenue extends to the Jerome-Park racing-Track, and thence on to Yonkers; and it is lined with many well-known road-houses.⁷

For these reasons, there was pressure to improve the system of roads in the vicinity of the Central Bridge.

Around 1886, a decision was reached to construct a substantial Viaduct along 155th Street to connect the ridge at St. Nicholas Place with the Central Bridge (at one time there had been a wooden footbridge between the ridge and the elevated railway station at Eighth Avenue). The Legislature authorized the Commissioner of Public Works to proceed with the construction of an "elevated iron roadway, viaduct or bridge" which would provide a gradual means of descent from St. Nicholas Place to Seventh Avenue and the bridge.⁹ Alfred P. Boller, an eminent Structural Engineer, was hired as a Consulting Engineer to the New York City Department of Public Works for the design and supervision of the construction of the Viaduct; jurisdiction over the Viaduct was placed within the Department, under the Chief Engineer of the Croton Aqueduct, George W. Birdsall. Martin Gay, Engineer-in-Charge of the Harlem and Manhattan Bridges, acted in the capacity of Resident (Assistant) Engineer. Boller's plans were officially adopted in May 1890; the cost of the Viaduct was then estimated to be \$514,000, half of which was to be paid by the City, while half was to be assessed to those property owners who would benefit from the improvement. In July 1890, Herbert Steward of Trenton, New Jersey, was retained as the Contractor. The Union Bridge Company of Athens, Pennsylvania, supplied the structural steel and iron for the Viaduct, and the Hecla Iron Works of Brooklyn, New York, was Subcontractor for the ornamental iron railings and stairways.⁹

By the end of 1891, work had been completed on the masonry west abutment of the Viaduct, as well as the foundations (concrete piers on piles) for nearly all of the steel columns, the depth of which varied according to the ground conditions; the foundations of the three columns nearest to the anticipated location of the pier of the proposed new bridge (near the intersection of Macombs Dam Road) could not be safely placed until the bridge foundations were laid. The Viaduct was nearly completed from St. Nicholas Place to Eighth Avenue by the end of the following year, while work on the eastern portion continued to be delayed, due to the intricacies of coordinating the construction of the Viaduct and bridge; a further complication arose from the Viaduct and bridge meeting at an angle. In addition, a debate ensued about the adequacy of the proposed approach to the bridge and Viaduct from the south at Seventh Avenue and Macombs Dam Road (now Macombs Place); a tall outcropping of rock at this location, also considered unsightly, rendered the approach hazardous. The solution was to remove the rock, redesign the approach and create a triangular landscaped plaza at the juncture of the viaduct and bridge, which, in the view of the New York City Department of Public Works, was to be "one of the most remarkable and attractive spots within the boundaries of the city".¹⁰ The Viaduct was finally completed and officially opened on October 10, 1893, at a total cost of \$739,000 (Figure E).

Central (Macombs Dam) Bridge¹¹

Alfred P. Boller, Consulting Engineer to the New York City Department of Public Works for the 155th Street Viaduct, was also hired in June of 1880 as a Consulting Engineer to the New York City Department of Public Parks¹² for the design and supervision of the construction of the proposed new Central (Macombs Dam) Bridge. In December of 1890, Boller submitted preliminary plans for a steel bridge, and detailed plans were ready in July of 1891 (Figures F and G), at which time, the placement of the bridge was determined; the U. S. Secretary of War subsequently approved this placement. In November, Boller submitted his first plans for the Jerome Avenue approach to the bridge on the Bronx side, which was to be a long deck truss Viaduct, necessary because of the marshland conditions there north of Cromwell Creek. The contract for the construction of the bridge and the Jerome Avenue approach was awarded in March 1892 to the Passaic Rolling Mill Company of Paterson, New Jersey, and work was begun in May. Herbert Steward (later Steward & McDermott), General Contractor for the 155th Street Viaduct, acted as Subcontractor for the masonry work. Upon Boller's recommendation, an arrangement was made whereby the Engineers of the New York City Department of Public Works (including Assistant Engineer Martin Gay), then involved with the 155th Street Viaduct, would extend their jurisdiction over the bridge as well, thus dividing their time and expenses between the two projects. According to Martin Gay in 1892 "to accommodate travel while the new bridge was building, the old draw was picked upon on scows and moved to One Hundred and fifty-sixth Street, where a pier had been prepared for it and approaches built".¹³

The construction of foundations for the bridge proved more difficult than expected, due to the variation in ground conditions (foundations varied in depth from 24 to 100 feet below mean water level). The foundations of the masonry pivot and western piers of the Swing Span were established by pneumatic steel caissons, while the eastern pier was built with a cofferdam.¹⁴ The masonry piers of the Bronx approach were to be set on contract piling, but because of the "great depth of soft bottom at that point",¹⁵ two of the pier foundations between the river and the New York & Hudson River Railroad tracks were built using pneumatic caissons, while the other piers on pilings required "concreting"; this unforeseen work necessitated an amendment to the Passaic Rolling Mill Company's contract in 1893. Apparently, in connection with these changes, the number of proposed Bronx approach lattice deck truss spans was reduced; the spans as built were longer and deeper (and thus closer to the ground), and a subsidiary Camelback Truss Span was designed to go over the railroad tracks in order to provide clearance.¹⁶ The need for an additional Bronx approach to the bridge was also determined at the intersection of Sedgwick and Ogden Avenues, which would connect into the Jerome Avenue approach from the north (at the east end of the Camelback Span); Boller prepared plans for such an approach in January of 1893, the Legislature authorized this addition,¹⁷ and the contract was also awarded to the Passaic Rolling Mill Company at the beginning of the following year.

The bridge was constructed with the use of falsework. After the floor level was built, two lines of rails were set on the edges of the bridge in order to carry a traveling scaffold from which material was hoisted into place. In July of 1894, Valentine Cook & Son received the contract for the ornamental cast- and wrought-iron railings and lampposts for the bridge and its approaches, according to Boller's specifications.¹⁸ The new Central Bridge (still familiarly know as the Macombs Dam Bridge) was finally declared completed and opened on May 1, 1895, at a total construction cost of about \$1,366,500 (the total including land acquisition was \$1,774,000) (Figures H and I). Work apparently continued for some time on the approaches and their adjacent park spaces.

Alfred P. Boller¹⁹

Alfred Pancoast Boller (1840-1912) (Figure J), one of the most distinguished American Structural Engineers of the late nineteenth and early twentieth centuries, achieved a considerable national and international reputation throughout his long career. Born in Philadelphia, he received a degree in Civil Engineering from Rensselaer Polytechnic Institute in 1861, and began his career as an Engineer mainly with various railroad and bridge companies. Boller became an agent for the Phoenix Iron Company (1866-70), then Vice-President and Engineer for the Phillipsburg Manufacturing Company (1871-73). In 1874, he formed a consulting engineering and contracting company in New York City, specializing in bridge and railroad work, which became one of the foremost such firms in the United States and continued until Boller's death. Boller acquired a reputation for expertise in various aspects of structural engineering, as well as for aesthetic accomplishment and originality in his bridge designs; noted architectural critic Montgomery Schuyler thought Boller's bridges "honorably distinguished, among those of his profession, by the evident and generally successful pains taken with respect to their appearance".²⁰ Boller's early views were set forth in his *Practical Treatise on the Construction of Iron Highway Bridges for the Use of Town Committees* (1876):

Possibly to bridges more than to any other class of public works does the Ruskinian axiom (which can not be repeated too often) apply: 'Decorate the construction, but not construct decoration'... This matter of treating bridge construction as architectural works, in the true sense of that term, deserves the most thoughtful consideration of engineers and committees, as bridges nearly always form prominent objects of observation in cities and towns, particularly when across large watercourses.²¹

Boller's aesthetic principles, including his intentions regarding the Macombs Dam Bridge, were further set forth in his 1897 article on the aesthetics of bridge design in *Engineering News*.²²

As Chief Engineer, Boller was involved with numerous bridge construction projects in New York State during the 1880's, including those for the West Side & Yonkers Railroad, the Yonkers Rapid Transit Commission, the Manhattan Elevated Railroad Company, the Albany & Greenbush Bridge Company, and the Staten Island Rapid Transit Railroad Company. The Thames River (New York, Providence & Boston Railroad) Bridge in New London, Connecticut (1887-89), for which Boller was Chief Engineer, was the longest draw-span bridge and one of the most complex feats of engineering at the time. As Consulting Engineer to the New York City Department of Public Parks and Public Works in the 1880's and 1890's, Boller had a particular impact upon the Harlem River through his designs for the New York & Northern (later Putnam Division, New York Central) Railroad Bridge, Eighth Avenue (1880-81, demolished); the Madison Avenue Bridge (1881-84), replaced in 1907-10; the Harlem Ship Canal Bridge (1893-95, in association with William H. Burr, moved in 1905-08 and became the University Heights Bridge, now a designated New York City Landmark); as well as the Macombs Dam Bridge and the 155th Street Viaduct (1890-95). Other bridges designed by Boller include: the Central Avenue Bridge, Morris Canal, Newark, New Jersey, the Duluth-West Superior Bridge, St. Croix River, Minnesota-Wisconsin (completed in 1897); and the State Bridge, Connecticut River, Saybrook, Connecticut.

As a Contractor, Boller was engaged in construction for the Erie (Bergen County Branch) and Pittsburgh & Lake Erie Railroads, the concrete foundation of the Statue of Liberty (1883-84), a designated New York City Landmark, and the substructure of the Arthur Kill (B & O Railroad) Bridge, Staten Island (1898, demolished). In 1898, Boller was joined by Henry M. Hodge to form the engineering consulting firm of Boller & Hodge; it became Boller, Hodge & Baird in 1912, with the addition of Howard C. Baird. The firm was responsible for the construction of 32 bridges and viaducts for Jay Gould's Wabash-Pittsburgh Terminal (later Pittsburgh & West Virginia) Railroad in 1901-04, which included two important cantilever bridges: the Wabash Bridge, Monongahela River, Pittsburgh, Pennsylvania (demolished), and the Mingo Junction Bridge, Ohio River. The firm also designed the Municipal Bridge, Mississippi River, St. Louis (1910-12), which had the longest fixed truss span in the world at the time, and acted as Consulting Engineers on the steel framework of the Singer Building (1906-08, Earnest Flagg, demolished) and the Metropolitan Life Insurance Company Tower (1907-09, Napoleon LeBrun & Sons, 1 Madison Avenue, a designated New York City Landmark). Boller's international engineering involvements included bridge and railroad projects in Haiti, Cuba, the Philippines and Central and South America.

The Contractors²³

The Passaic Rolling Mill Company of Paterson, New Jersey, Contractor for the Macombs Dam Bridge, was founded in 1867 and established mills and shops in Paterson in 1870. The Company designed, manufactured and contracted for all types of structural steel and high-grade ironwork, particularly for bridges

and railroads, and became one of the largest such manufacturers of its day. Although the firm's location was farther from the sources of raw materials than that of the firms in the great steel centers of Pennsylvania, it depended for its success upon its proximity to New York City -- its mills were the ones closest to New York in which structural steel was rolled. The Passaic Rolling Mill Company maintained offices in New York City and Boston, and furnished the steel for the great steel-arched Washington Bridge, Harlem River (1886-89), New York City's second oldest major bridge (and today a designated New York City Landmark), and for a large portion of the elevated railroad construction in New York City. After 1903, the firm was known as the Passaic Steel Company.

The Union Bridge Company, Structural Metalwork Contractor for the 155th Street Viaduct, was formed in 1884 through the merger of (Charles) Kellogg & (Charles S.) Maurice (organized in 1871), of Athens, Pennsylvania, and the Central Bridge Company (established in 1876) of Buffalo, New York; the two firms had often worked cooperatively prior to their combination. The shop in Athens, started in 1870, became the Union Bridge Company's center of operations after the Buffalo shop was closed around 1890. The Company also maintained an office in New York City. In 1885, the firm built one of the first 600-ton testing machines in the United States. The Union Bridge Company was one of 24 bridge manufacturing concerns (about half the national capacity) that were acquired in 1900 by the American Bridge Company, organized by J. P. Morgan & Company.

Very little is known about Herbert Steward, General Contractor for the 155th Street Viaduct and Subcontractor for the masonry work of the Macombs Dam Bridge. Although records of the New York City Department of Public Works indicate that he was from Trenton, New Jersey, *Fitzgerald's Director of Trenton* lists an "H. Steward, contractor" only in 1890, the year the Viaduct contract was awarded. Steward apparently took a partner during construction of the bridge. A plaque, dated 1894, which is located on the bridge's central Swing Span, lists "Steward & McDermott" as Contractor.²⁴

Hecla Iron Works of Brooklyn, responsible for the ornamental iron railings and stairways of the 155th Street Viaduct (and the above-mentioned plaque), was one of the leading architectural and ornamental iron and bronze companies in the United States. Founded in 1876 as Poulson & Eger (both principals had started out with Daniel D. Badger's Architectural Iron Works), the firm made many of the technical and aesthetic innovations that advanced the quality of American ornamental metalwork, and produced metalwork for many important buildings in New York City.

Valentine Cook (1824-1897), an Iron Founder, was Subcontractor for the iron and bronze railings and lampposts of the Macombs Dam Bridge and the Jerome Avenue Approach Viaduct (of a similar design to those on the 155th Street Viaduct). Born Valentine Koch in Bavaria, he changed his name to Cook after arriving in the United States with his father in 1836. After serving an

apprenticeship with Founder James C. Freeman, Cook established what became a successful business. The firm of Cook & Radley operated for 20 years until 1889, at which time Cook operated the business alone; his son Martin later became a Partner in the firm of C. Valentine Cook & Son.

Metal Truss Swing Bridges²⁶

The Macombs Dam Bridge is a metal truss bridge, the most common type of bridge employed in the United States during the years between 1850 and 1925. This type of bridge is composed of a combination of metal trusses, each truss made up of pieces of iron or steel connected to form triangles which are joined together. The arrangement of the members determines the specific truss type; three truss forms were particularly popular for American bridges in the nineteenth and early twentieth centuries. The Howe truss, named after Massachusetts Millwright William Howe and patented in 1840, became the predominant nineteenth century truss form for railroad bridges, first all in wood and later with iron. The Pratt truss, patented in 1844 by Boston Bridge Designer Thomas Pratt, later became (with a number of variations), the standard type at the end of the era of major railroad bridge construction. The Warren truss, patented in 1848 by English Engineers James Warren and Theobald W. Monsani, rose in popularity in the late nineteenth century; the steel version appeared increasingly after the 1890's, and by the 1920's, the Warren truss became a dominant bridge form for two decades. The Macombs Dam Bridge employs Warren trusses and two variations of Pratt trusses.

The bridge is, as well, a swing-type bridge, in which the main span pivots on a large central pier. The Swing Span bridge is one of the three main types of movable bridges (the others being vertical lift and bascule or drawbridge). Swing Spans came into popularity in the United States in the mid-nineteenth century, following the construction of such bridges along the Mississippi River. In New York City, this bridge type was built primarily along the Harlem River; the first swing bridges were for the railroads and included one at Second Avenue for the Suburban Rapid Transit Company (demolished in 1878) and Boller's New York & Northern Railroad Bridge (1880-81). The first high-level iron swing bridge on the Harlem River was Boller's Madison Avenue Bridge (1881-84); there are still six such bridges located there, all of which were completed between 1895 and 1910. After 1910, vertical lift bridges were employed along the Harlem River. The Macombs Dam Bridge is the oldest extant swing-type bridge in New York City, and is the third oldest major bridge in the City after the Brooklyn and George Washington Bridges.

Critiques of the Bridge and Viaduct

The Macombs Dam Bridge and the 155th Street Viaduct attracted favorable comment from the time of construction. The *Scientific American* in 1890 complimented Boller's ornamental lampposts and iron railings "whose appearance certainly indicates excellent taste on the part of the designer"²⁶ and later, in 1894, commented that "the two viaducts and bridge together are one of the greatest engineering operations hitherto carried out by this city".²⁷ The *Real Estate Record & Guide* in 1895 remarked upon:

*the 155th street viaduct, a beautiful piece of engineering work splendidly conceived, running in a gentle incline from the junction of several important roads on the heights at the west to the entrance of the fine bridge thrown over the river at Macomb's Dam, the old wooden affair lying below to afford a fitting illustration of the difference between the old and the new, the small necessities and modest ideas of the past with the great requirements and comprehensive provisions of the present. The bridge approaches are carried right to the junction with Sedgewick and Jerome avenues, without any shrinking in the scope of the work, and this very fact impresses one as much as anything with the capacity and fullness of the idea which dominated the undertaking.*²⁸

Martin Gay, Engineer-in-Charge of the Harlem and Manhattan Bridges, reminisced in 1904 that "the opportunity for architectural effect offered at this bridge was taken advantage of by Mr. Boller, as can be seen in the fine lines of the masonry and the graceful sweep of the upper chord of the draw span",²⁹ while in *Architectural Record* in 1905, Montgomery Schuyler praised the bridge:

Of [the "attractive" Harlem River bridges] the Central Bridge at Seventh Avenue is the most pretentious and costly, is plainly that in which the most extensive sacrifice to the Graces has been made, and it cannot be said that they have been made in vain. The architectural accessories, the shelter towers and the like are as carefully and successfully designed as the architectural essentials, the piers pierced by arches which carry the approaches, or when it is at rest, take the ends of the swinging central span, while the substructure and the superstructure alike of this central span are so designed as to tell their story of the enormous weight detachable from its terminal supports and thrown upon the arms that reach out from the central pivot to hold it, and these in turn are distinguished in treatment from the central structure. The design is here an expression of the mechanical facts... [is a] highly creditable work... in an artistic as well as in a scientific sense...³⁰

The *National Cyclopaedia of American Biography* (1907) observed that Boller's "great viaduct and bridge over the Harlem river at One hundred and fifty-fifth street... is noted not only for its architectural character, but constructively, as one of the most difficult works in engineering, both in the foundation difficulties overcome and in its unprecedented draw span..."³¹ Samuel Whinery, an Engineer commemorating Boller in 1922, thought that:

*Not a few of his bridges were characterized by their originality and boldness of design... Another remarkable structure, the great viaduct (or Central Bridge) over the Harlem River at 155th Street, New York City, 4,500 ft. long, costing over \$2,000,000, and having a draw-span weighing 2,400 tons, was stated at the time to be the heaviest movable mass in the world... His appreciation of architectural symmetry had a marked influence on his bridge designs, his constant effort being to combine technical principles and practical utility with symmetrical and pleasing outlines.*³²

Finally, in 1935, the Macombs Dam Bridge was immortalized in the painting "Macomb's Dam Bridge" by eminent American Artist, Edward Hopper (Figure K).³³

Subsequent History³⁴

The name of the Central Bridge was changed officially in 1902 to the Macombs Dam Bridge by the New York City Board of Aldermen to reflect the more common usage. In 1904, the Union Railway Company laid two sets of tracks over the Viaduct and bridge for trolley service (at the east end of the Camelback Span, the tracks veered northward); horse traffic lessened on the bridge with the arrival of trolleys and automobiles, and was diverted to the Harlem River Speedway, which had opened in 1898 for recreational driving of horses (the Speedway, the south end of which adjoined the west end of the 155th Street Viaduct, was later converted to Harlem River Drive). Also around 1904, the bridge was electrified: the steam engine which originally turned the central Swing Span and operated the hydraulic ram that lifted the ends was replaced by an electric 24-horsepower motor,³⁵ and the gas lighting was also replaced by electric. From the turn of the century into the 1910's, the marshland on the Bronx side was filled in for the creation of Macombs Dam Park. The south side of the Jerome Avenue Approach received two new ramp connections at East 161st Street in 1920 (near Yankee Stadium, then under construction), which also entailed the dismantling of the south face of the masonry abutment and stairway and their re-installation on the north side (at the west side of 161st Street). A new Seventh Avenue Approach from the south, which merged into Macombs Place (formerly Macombs Dam Road), was constructed in 1929-30 and resulted in a reconfigured triangular park. In connection with this work, all to the designs of Architect Andrew J. Thomas, parts of the two westernmost spans of the Macombs Place Approach to the bridge, originally built at a straight angle, were rebuilt and reconfigured in a flared polygonal outline

(including the rebuilding of the two lattice trusses along the south face and some columns); the Macombs Place masonry abutment was extended southward at an angle (to support the reconfigured road deck), reusing the masonry taken from the (then) dismantling of an original stairway at this location. (In 1960, this abutment extension was removed, and a new abutment extension as built, this time in a straight line with the original; the original stairway masonry was apparently once more recycled. The westernmost approach span and lattice truss was also again partially rebuilt.) In 1949-51, the New York State Department of Public Works, as part of its construction of what became the Major Deegan Expressway, altered the Bronx approaches to the bridge; this work included the removal of the entire Ogden-Sedgwick Avenues Approach, the removal of two sets of masonry piers and three steel deck truss spans of the Jerome Avenue Approach Viaduct over the new highway (these were replaced by new steel deck spans set on concrete "bents" faced with granite), and the installation of four new highway exit and entrance ramps. The trolley tracks were also removed at this time. Rehabilitations of the road decks of the bridge and Viaduct around 1960 to 1964 resulted in the replacement of the original fascias and loss of most of the original railings and lampposts.

Description: Macombs Dam Bridge and the 155th Street Viaduct

(See Figures L to V)

Macombs Dam Bridge

The Macombs Dam Bridge is composed of:

A) A 415-foot steel 19-panel Pratt through-truss central Swing Span over the Harlem River; B) Approximately 140-foot steel (with masonry abutment) V-shaped, double approach on the Manhattan side (over Harlem River Drive), which connects the bridge to the 155th Street Viaduct and Macombs Place (formerly Macombs Dam Road); and C) Approximately 1,800-foot long Jerome Avenue Approach Viaduct on the Bronx side, which consists mostly of steel double-intersection Warren Fixed deck truss spans, carried by masonry piers, but has, additionally, a 221-foot subsidiary steel nine-panel Camelback Through-Truss Span over the railroad tracks, replacement steel spans set on concrete bents (dating from 1949-51) over the Major Deegan Expressway, and an end masonry abutment.

A) The central Swing Span, roughly 65 feet in width, has a square central tower, with ornamental finials, which is flanked by trusses having top chords with concave profiles; it is built up of a variety of steel structural members, such as riveted latticework and eyebars, and is braced laterally and diagonally. Boller relieved the angularity of the latticework by using such elements as steel disks at the intersections of members. The ends of this span form decorative "portals". The curved brackets of the lateral truss bracing above the roadway were originally opened latticework, but are now

solid. The Manhattan end carries a plaque which bears the date 1894 and name "Central Bridge" (as well as the names of the Engineer, Contractors and City Officials), surmounted by the New York City coat of arms (executed by the Hecla Iron Works) (Figure W). Other surviving decorative elements include three projecting wrought-iron signs and two wrought-iron electric lamp brackets (a 1901 design). The Swing Span is supported by a large round central pivot pier, which has a double drum and coned rollers, located on an oblong island with wooden fenders. The wide end piers, battered and roughly H-shaped, are built of dark rock-faced granite, with cut light granite copings and trim, are pierced by semi-circular arches below the bridge deck, and terminate on either side of the span with stone shelterhouses (gate tender's houses) that have red (originally tile, now shingle) roofs and (altered) finials. Pairs of latticework gates (replacements) are set at both ends of the span. The cantilevered sidewalks have steel replacement facias and railings (circa 1963) at the outer edge, as well as chain link fencing; the original Swing Span fascia had a molded cornice, and the original ornamental railings were of bronze and cast and wrought-iron.

B) The V-shaped, double approach on the Manhattan side, formed by the juncture of the 155th Street Viaduct on the north and Macombs Place/Seventh Avenue on the south, is composed mainly of steel plate girders, except for three steel double-intersection Warren truss spans on the south face of the approach, set along a polygonal outline (originally set at a straight angle, but altered in 1929-30 and 1960), carried by box girder columns with flared latticework brackets (the columns on the edges have two brackets, while the interior ones have four, some of these are altered). The replacement cantilevered sidewalks and railings (added Circa 1963), as well as the chain link fencing, are similar to those on the Swing Span; the original fascias had two roll moldings and rosettes. The abutment pier (extended and altered in 1929-30 and 1960), apparently of recycled original masonry), supporting the roadway of Macombs Place, has a wingwall on the west side of Macombs Place, is built of rock-faced limestone and granite, and terminates at the approach sidewalk level in cut granite posts (that on the east side dates from Circa 1960). A stairway (originally one of two),³⁶ adjacent to the wingwall and leading from the approach to 155th Street below, has about half of its original decorative cast- and wrought-iron railing by Valentine Cook (including a section at the top landing).

C) The long Jerome Avenue Approach Viaduct on the Bronx side, approximately 60 feet wide, is composed, from west to east, of two steel, double-intersection Warren deck truss spans, the steel Camelback Through-Truss Span, six steel and concrete spans (1949-51), which replaced three original truss spans (and two pairs of masonry piers), and six more double-intersection Warren deck truss spans set on a curve to the northeast. The original spans are carried on pairs of battered rectangular, dock, rock-faced granite piers, with cut light granite openings. The replacement spans are carried on pierced concrete "bents", faced with granite. The Camelback Truss Span is built of structural members similar to the central Swing Span; the curved brackets

above the roadway (originally latticework) have also been replaced by solid ones. The original railings and fascias (similar to the Manhattan Approach) have been replaced on the Viaduct (Circa 1963) and chain link fencing installed. The approach is terminated at the eastern end by a limestone and granite abutment on the north side. East 161st Street is flanked by granite piers and stairways (with replacement railings); the pier and stairs on the west side were originally on the south side of the approach, but were dismantled and re-installed when the ramps at 161st Street were built in 1920. [The four entrance and exit ramps of the Major Deegan Expressway (1949-51) and two East 161st Street ramps (1920) are excluded from this designation.]

155th Street Viaduct

The 155th Street Viaduct, approximately 1,600 feet long and 61 feet wide, consists of a fixed deck, steel girder superstructure, carried on two parallel rows of steel box girder-type columns (varying in height from about 20 to 60 feet), with two riveted lattice-braced sides (the interior sides have been covered with plates). The columns of the westernmost 22 spans of the Viaduct are braced, every alternate span, by horizontal, lateral and diagonal latticework, with curved latticework brackets, while the columns of the easternmost nine spans are unbraced; a deck truss spans Eighth Avenue. The concrete road deck and cantilevered sidewalks are replacements (Circa 1960); the sidewalks were originally supported by curved latticework brackets, and the original fascias were similar to those on the approaches of the bridge. Two long flights of stairs (originally there were four -- the eastern pair was removed between 1938 and 1960), which once connected the Viaduct with the station of the elevated railway and the New York & Northern Railroad and lower 155th Street, are located at the west side of Eighth Avenue;³⁷ roofs (of wood and corrugated metal) cover the stairs on the upper portions, which terminate in cantilevered pavilions (with hipped roofs) at the top and midway, while the lower stairs are open. A walkway below the Viaduct connects the two lower pavilions (both have wood plank flooring). The original ornamental iron railings (with an Art Nouveau design different than the other bridge and Viaduct railings) by Hecla Iron Works survive on these stairways, pavilions and connecting walkway, as do the slender colonnettes supporting the roofs and railings and riveted fleurs-de-lis on the fascias. The west end of the Viaduct is supported by a large rock-faced granite and limestone abutment pier, which is terminated at the Viaduct sidewalk level by cut limestone posts and has a wingwall on the north side. Two panels of original cast- and wrought-iron railing by Hecla Iron Works survive on the south side of the Viaduct, west of the termination post; a long section of original railing (as well as one original cast-iron gas lamp base and post) survives on the north side of the Viaduct, west of the termination post. A long stairway, adjacent to the abutment wingwall connects the Viaduct with lower 155th Street; the stairway has cut granite steps, the majority of its original railing and three original gas lamp bases (and two posts). The roadbed of lower 155th Street,

from the abutment pier to Bradhurst Avenue, is paved with exposed Belgian block.

At the southwest end of the 155th Street Viaduct is a paved island known as Maher Circle (included in this designation), which contains the John Hopper fountain, designed to provide drinking water for humans, horses, dogs and cats, now consists of a large round horse trough, carved pedestal drinking fountain and a base (that originally held an Ionic column with a glass globe and weathervane), flanked by two small basins.³⁸

NOTES

Acknowledgement: The Commission wishes to thank Ms. Nancy E. Kahl, Engineer, with the firm of Modjeski and Masters, Inc., Consulting Engineers, whose work with, and knowledge of, the New York City Department of Transportation's original and alteration drawings of the bridge, has been of great assistance.

1. This section was compiled from the following sources: Martin Gay, "Harlem River Bridges", *Proceedings* (1904) (New York: Municipal Engineers of the City of New York, 1905), 71-72; Gary Hermalyn, "The Harlem River Ship Canal", *Bronx County Historical Society Journal* 20 (Spring 1983), 1-23; Stephen Jenkins, *The Story of the Bronx* (New York: G. P. Putnam's Sons, 1912), 198-202; Sharon Reier, *The Bridges of New York* (New York: Quadrant Press, 1977), 69-72; and I. N. Phelps Stokes, *The Iconography of Manhattan Island* 6 (New York: Robert H. Dodd, 1915), 329.
2. The spelling of this name is also frequently seen as "McComb".
3. The 1860 Central Bridge cornerstone, having inscriptions, survives on the Macombs Dam Bridge pivot pier island.
4. 51st Congress, Session I, Chapter 907 (September 19, 1890).
5. This section was compiled from the following sources: "The Central Bridge and St. Nicholas Viaduct", *Real Estate Record & Guide* (November 5, 1892), 572-573; "The Harlem River Bridge at 155th Street, New York", *Engineering News* 27 (May 26, 1892), 526-527; Moses King, *King's Handbook of New York* (Boston: Matthews-Northrup Company, 1892), 176-177; "The Macomb's Dam Bridge Improvement", *Real Estate Record & Guide* (April 23, 1892), 641-644; New York City Department of Public Works, *[Quarterly] Reports* (December 1889 to December 1895); New York City Department of Transportation, Macomb's Dam Bridge Drawings (1880's - 1960's), and "The 155th Street Viaduct, New York City, New York", *Scientific American* 62 (June 21, 1890), 385-394.
[Note: Very few original drawings of the Viaduct have been located to-date.]
6. Part of the ridge is occupied by Colonial Park to the south of the Viaduct and Highbridge Park to the north.
7. King, 176.
8. New York State Laws, Chapter 576.
9. New York City Department of Public Works, *[Quarterly] Report* (September 1890), 28.

10. New York City Department of Public Works, *[Quarterly] Report* (December 1894), 16-17.
11. This section was compiled from the following sources: "The Central Bridge and St. Nicholas Viaduct", 572-573; "The Harlem River Bridge at 155th Street Bridge", 526-527; King, 176-177; "The Macomb's Dam Bridge Improvement", 641-644; Modjeski and Masters, "Macombs Dam Bridge Chronological Inventory of Existing Drawings" and appendix; "A New Harlem River Bridge", *Scientific American* 65 (September 5, 1891), 150; New York City Department of Transportation; "The Seventh Avenue Bridge over the Harlem River, New York City", *Scientific American* 70 (June 2, 1894), 340; New York City Department of Public Parks, *Minutes & Documents (May 1889 to April 1897)*; and "The South Approach to Macomb's Dam Bridge", *Real Estate Record & Guide* (March 26, 1892), 467-468.
12. This was the agency authorized by the Legislature to build the bridge under the New York State Laws of 1871, Chapter 534; the Laws of 1882, Chapter 410, Section 676; the Laws of 1890, Chapter 207; and the Laws of 1892, Chapter 13.
13. Gay, 73. This procedure was also described in "Moving the Draw Span of the Macomb's Dam Bridge", *Engineering News*, 28 (August 18, 1892), 151-152. The firm of T. & A. Walsh was the Contractor for this "temporary" bridge in July-August of 1892. The west pier of the old Central Bridge was removed at this time; the stone pivot pier was not removed until the end of 1895. The Secretary of War finally ordered the removal of the old bridge at its "temporary" location in April 1897, almost two years after the completion of the new Macombs Dam Bridge; it was presumably demolished soon after.
14. SooySmith & Company was Subcontractor for the pneumatic caissons. The construction of these foundations is described in: W. Gustav Triest, "The Substructure of the Seventh Avenue Swingbridge, New York City", *Engineering News* 30 (September 7, 1893), 198-200.
15. New York City Department of Public Parks, *Minutes & Documents* (April 1893), 223.
16. A drawing of the bridge published in "The Macomb's Dam Bridge Improvement" (April 23, 1892) shows a continuous deck truss Viaduct on the Bronx approach, the easternmost spans have steel columns, rather than masonry piers. Further corroboration for the amended design is given by the fact that the bridge contract numbers of the Passaic Company are sequential in 1892-93 (Nos. 485-488), while the contract for the Camelback Span is No. 720 in 1894, and by surviving drawings of the proposed and as-built approach spans.
17. New York State Laws of 1893, Chapter 319.

18. New York City Department of Public Parks, *Minutes and Documents* (April 1895), 120.
19. This section was compiled from the following sources: "Alfred Pancoast Boller", *A Biographical Dictionary of American Civil Engineers* (New York: American Society of Civil Engineers, 1972), 10-11; "Alfred Pancoast Boller", *National Cyclopaedia of American Biography* 9 (New York: James T. White & Company, 1907), 43-44; Mitchell C. Harrison, Compiler, "Alfred P. Boller", *New York State's Prominent and Progressive Men: An Encyclopedia of Contemporaneous Biography* 2 (New York: New York Tribune, 1900), 18-20; Allen Johnson, ed., "Alfred Pancoast Boller", *Dictionary of American Biography* 1 (New York: Charles Scribner's Sons, 1964), 420-421; and Samuel Whinery, "Alfred Pancoast Boller", *Transactions* 85 (New York: American Society of Civil Engineers, 1922), 1653-1656.
20. Montgomery Schuyler, "Monumental Engineering", *Architectural Record* 11 (October 1901), 617.
21. Alfred P. Boller, *Practical Treatise on the Construction of Iron Highway Bridges* (New York: John Wiley & Sons, 1876), 83, 87.
22. Boller, "The Aesthetics of Bridge Design as Exemplified by Two Recent New York Bridges", *Engineering News* 38 (October 7, 1897), 226-228.
23. This section was compiled from the following sources: Valentine Cook obituary, *New York Times* (December 11, 1897), p. 9; Victor C. Darnell, *A Directory of American Bridge-Building Companies 1840-1900* (Washington: Society for Industrial Archeology, 1984) (Rpt. New York: Arno Press, 1967), 498, 500, 502, 505-506; E. McLean Long, "The Shops and Mills of the Passaic Steel Company, Paterson, New Jersey", *Proceedings* (1904) (New York: Municipal Engineers of the City of New York, 1905), 201-202; and *Passaic Rolling Mill Co., Paterson, New Jersey* (New York: Devinne Press, 1901).
24. "The Harlem River Bridge at 155th St., New York", 526, and Triest, 200. While the former (May 1892) mentioned only Steward, the latter (September 1893) included both names.
25. This section was adapted from: LPC, *University Heights Bridge Designation Report* (LP-1455) (New York: City of New York, 1984), report prepared by Jay Shockley.
26. "The 155th Street Viaduct...", 394.
27. "The Seventh Avenue Bridge...", 340.

28. "The Harlem River: The Beginning of a Developing Movement in which the City may take Pride", *Real Estate Record & Guide* (June 22, 1895), 1039.
29. Gay, 72-73.
30. Schuyler, "New York Bridges", *Architectural Record* 18 (October 1905), 253-255.
31. "Alfred Pancoast Boller", *National Cyclopaedia...*, 43-44.
32. Whinery, 1655.
33. This painting is in the collection of the Brooklyn Museum.
34. This section was compiled from the following sources: Gay, 73; Modjeski and Masters, Inc.; New York City Department of Bridges, *Annual Reports* (1898 to 1915); New York City Department of Plant and Structures, *[Annual] Reports* (1916 to 1936); New York City Department of Public Works, *Annual Reports* (1938 to 1964); New York City Department of Transportation; and President of the Borough of Manhattan, *[Annual] Reports* (1902-1920).

In 1921, for the very first time, the Macombs Dam Bridge and the 155th Street Viaduct were placed under the jurisdiction of the same New York City Department. The bridge, built by the Department of Public Parks, was placed under the Department of Bridges in 1898, the Department of Plant and Structures in 1916, the Department of Public Works in 1938, the Transportation Administration in 1966, and the Department of Transportation in 1977. The Viaduct, built by the Department of Public Works, was placed under the jurisdiction of the Manhattan Borough President in 1898, until its transfer to the Department of Plant and Structures in 1921.

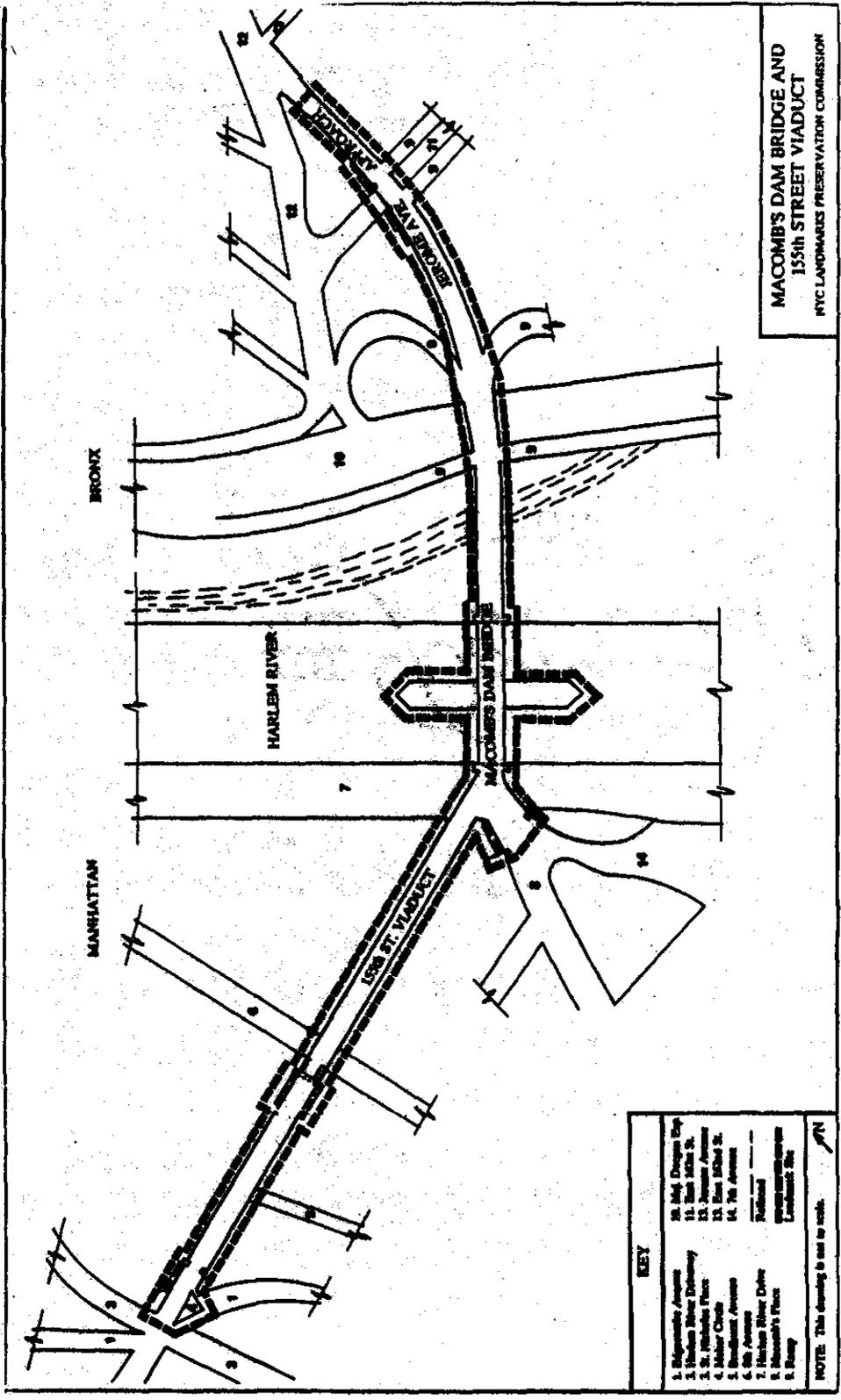
35. This motor, in turn, was replaced by one of 52-horsepower in 1917.
36. The other stairway was on the east side of Macombs Place; it was removed during the work on the Seventh Avenue Approach in 1929-30.
37. The Viaduct originally had platforms supported by deck trusses and columns on each side of the Viaduct at Eighth Avenue, forming a cross-shaped "plaza". The south side had a waiting pavilion, which was removed Circa 1927. These platforms were removed Circa 1960. *Engineering News* considered the stairways "of somewhat novel design" in "The Harlem River Bridge at 155th Street, New York", 526.
38. Information on the fountain was supplied by the Office of the Historian, New York City Department of Parks and Recreation. The column was toppled in 1981 and remains (damaged) in storage. John Hooper (Circa

1812-1889), a New York City businessman and philanthropist, started as a Civil Engineer, worked at the *Tribune*, and later founded what was thought to be the City's first advertising agency. In his will, he left \$5,000 for a Manhattan fountain "whereat man and best may drink", as well as a similar bequest for Brooklyn. John Hooper's obituary and "John Hopper's Bequests", *NYT* (December 23, 1889), p. 2, and (January 1, 1890), p. 2.

SUPPLEMENTAL MATERIAL

Original contract drawings and shop detail drawings for the construction and rehabilitation history of the Macombs Dam Bridge are stored at the New York City Department of Transportation. The drawings, totaling well over 1000 in number, are indicative of the entire history of the bridge, from the late 1880's through the present.

Macombs Dam Bridge (Central Bridge)
 HAER No. NY-269 (Page 21)



MACOMBS DAM BRIDGE AND
 135th STREET VIADUCT
 NYC LANDMARKS PRESERVATION COMMISSION

KEY	
1. Macombs Dam Bridge	10. 135th Street
2. 135th Street Viaduct	11. 136th Street
3. 136th Street	12. 137th Street
4. 137th Street	13. 138th Street
5. 138th Street	14. 139th Street
6. 139th Street	15. 140th Street
7. 140th Street	16. 141st Street
8. 141st Street	17. 142nd Street
9. 142nd Street	18. 143rd Street
	19. 144th Street
	20. 145th Street
	21. 146th Street
	22. 147th Street
	23. 148th Street
	24. 149th Street
	25. 150th Street
	26. 151st Street
	27. 152nd Street
	28. 153rd Street
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	32. 157th Street
	33. 158th Street
	34. 159th Street
	35. 160th Street
	36. 161st Street
	37. 162nd Street
	38. 163rd Street
	39. 164th Street
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	42. 167th Street
	43. 168th Street
	44. 169th Street
	45. 170th Street
	46. 171st Street
	47. 172nd Street
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	63. 188th Street
	64. 189th Street
	65. 190th Street
	66. 191st Street
	67. 192nd Street
	68. 193rd Street
	69. 194th Street
	70. 195th Street
	71. 196th Street
	72. 197th Street
	73. 198th Street
	74. 199th Street
	75. 200th Street

NOTE: This drawing is not to scale. JFN

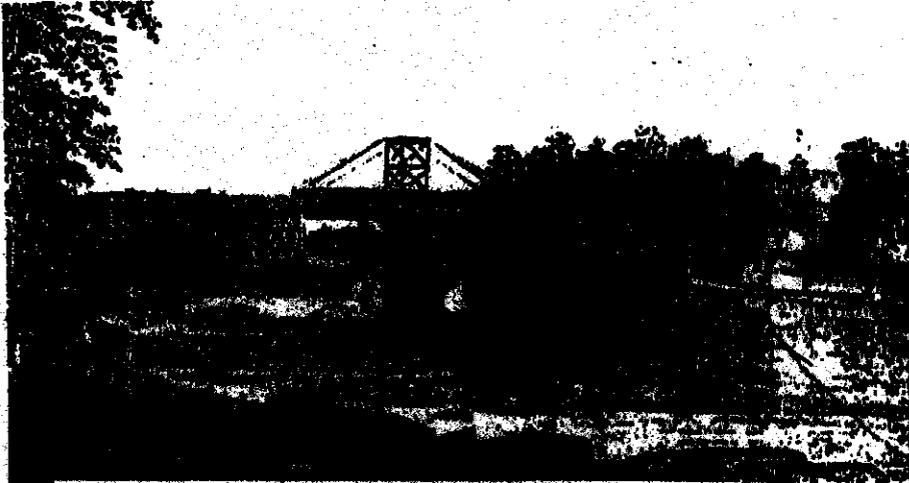


fig. B: *Bass Fishing at Macomb's Dam* (Carrier & Ives, 1852)

Source: Reiser (Museum of the City of NY)

fig. C: Central Bridge (1860-61)

Source: Gay

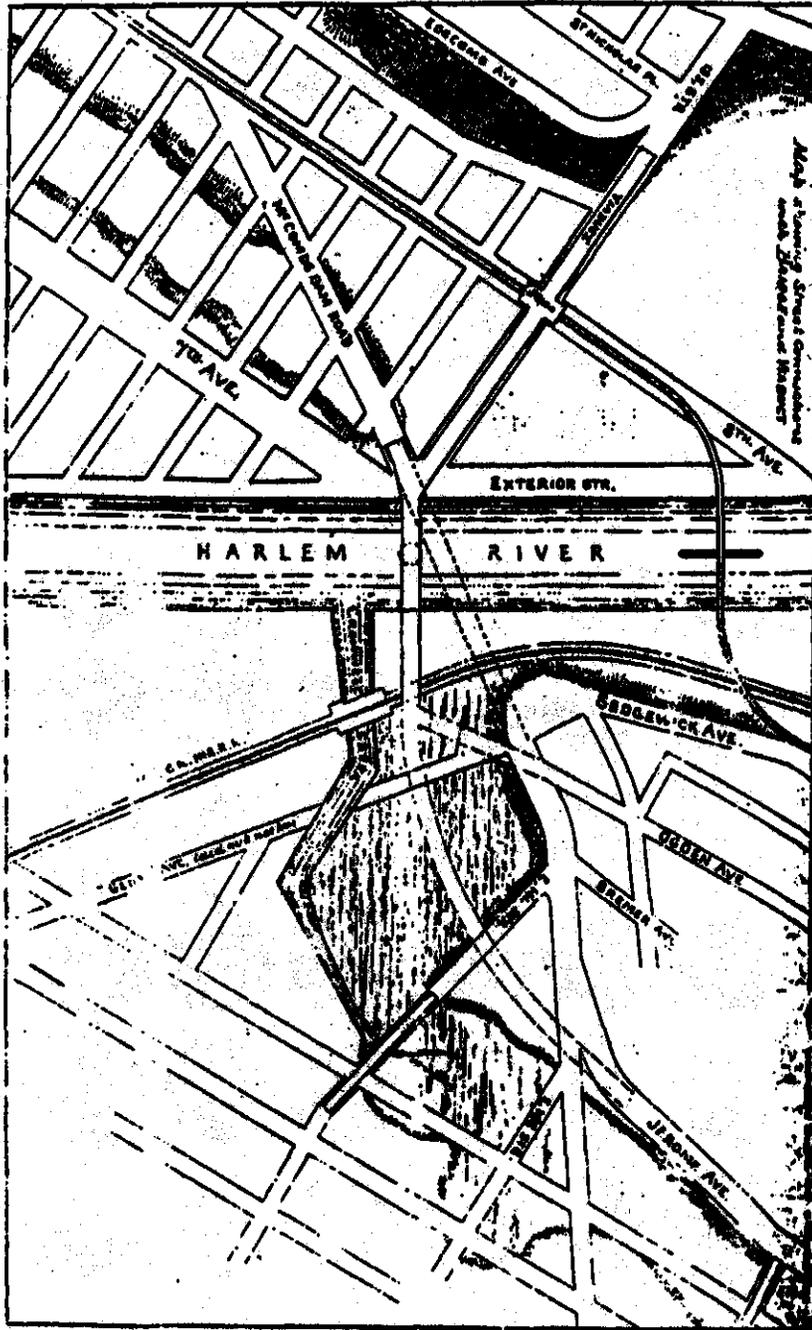


fig. D: Vicinity of Macomb's Dam Bridge (1892)

Source: RER&G (Apr. 23, 1892)

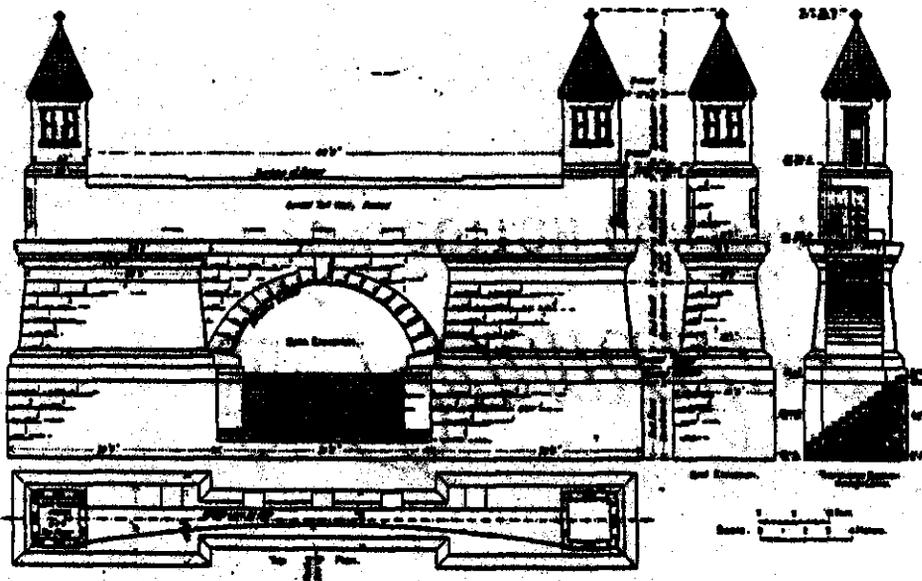
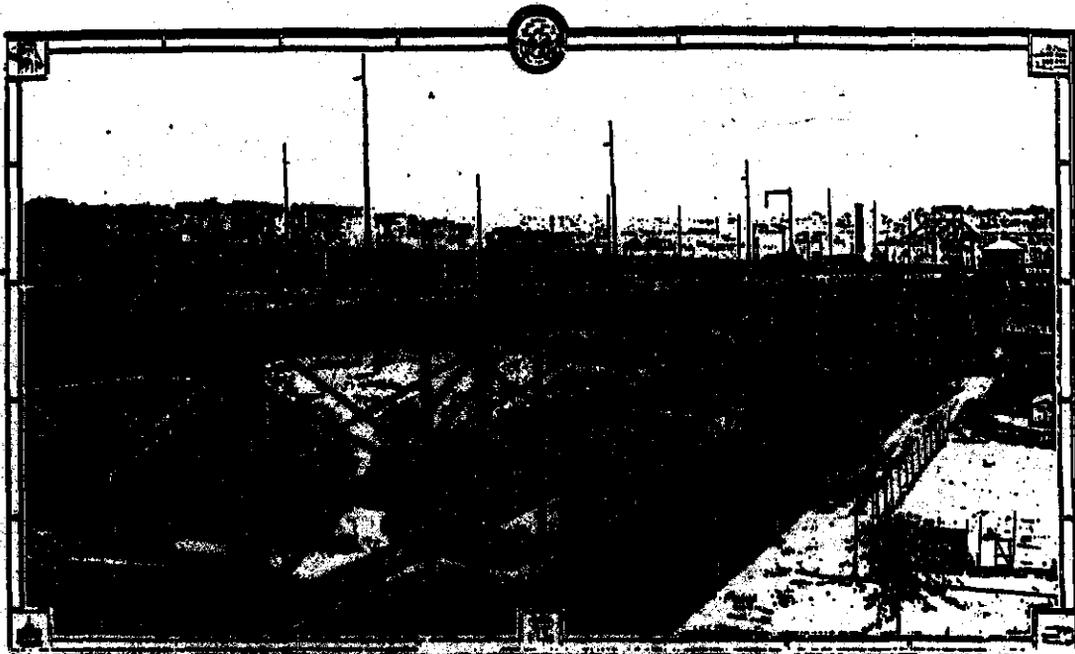


fig. E: 155th Street Viaduct (1921)

Source: NYC, Dept. of Plant & Structures

fig. F: Macomb's Dam Bridge, central swing span end pier

Source: *Engineering News* (Sept. 7, 1893)

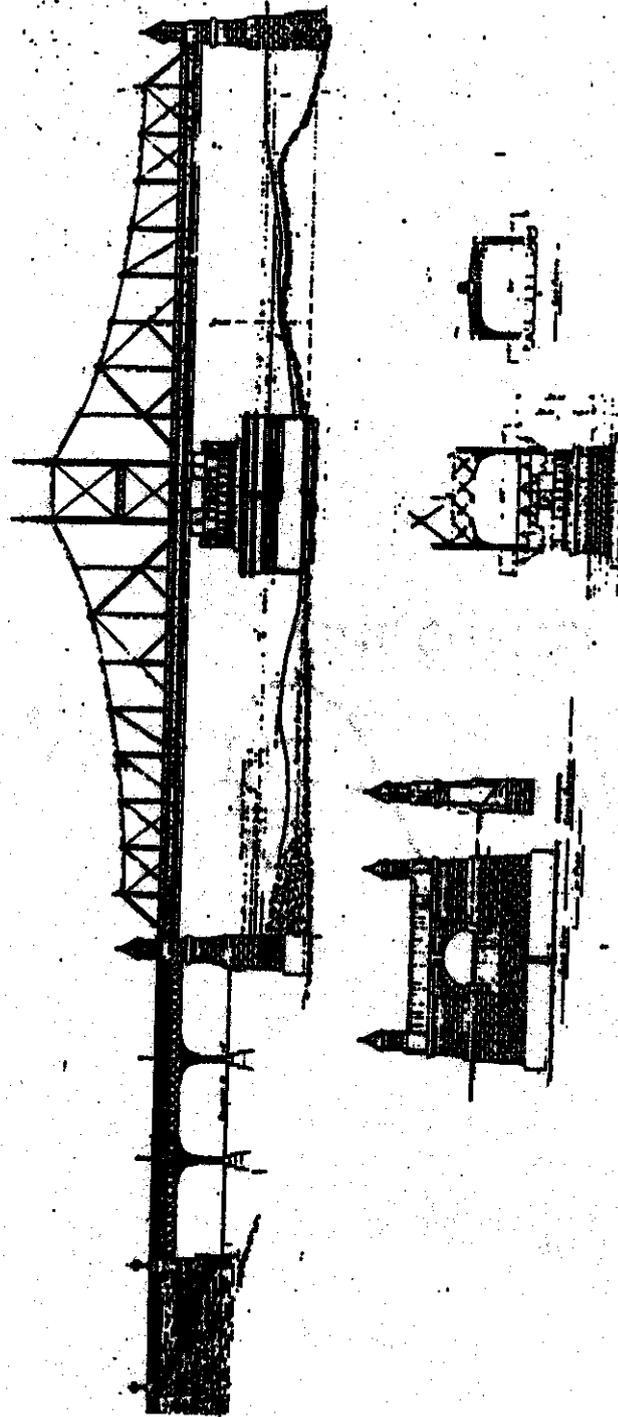


fig. G: Macomb's Dam Bridge (Alfred P. Boller, 1892)

Source: NYC, Dept. of Transportation

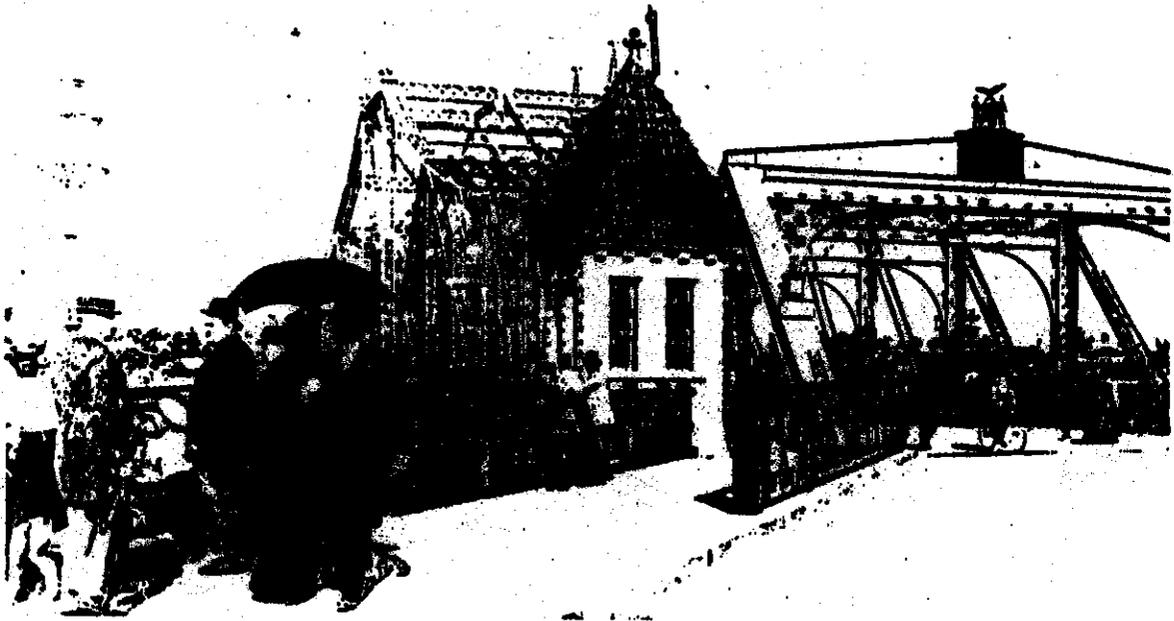
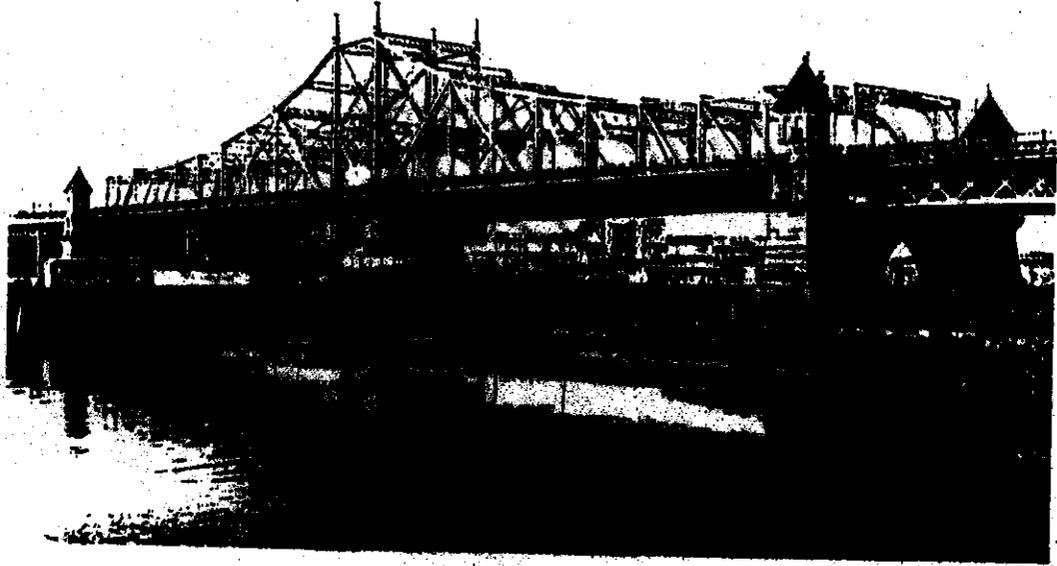


fig. H: Macomb's Dam Bridge (date unknown)

Source: Ruler (Bronx Co. Historical Society)

fig. I: Macomb's Dam Bridge (c. 1905)

Source: New-York Historical Society