JACKSON STREET BRIDGE
spanning the Passaic River
at Jackson Street between
Newark
Essex County
Harrison
Hudson County
New Jersey

HAER No. NJ-54

HAER
NJ
7-NEWARK,
18-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
MID-ATLANTIC REGION, NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
PHILADELPHIA, PENNSYLVANIA 19106

HAER NJ, 7-NEARK, 18-

# HISTORIC AMERICAN ENGINEERING RECORD

## JACKSON STREET BRIDGE

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LOCATION: Spanning the Passaic River at Jackson Street, between Newark, Essex County and Harrison, Hudson County, New Jersey.

USGS Quadrangle: Elizabeth, New Jersey

UTM Coordinates: 18.4509365.571312 (North End)
18.4509183.571318 (South End)

DATE OF CONSTRUCTION: 1897-1898

PRESENT OWNER: Joint Bridge Committee of Essex and Hudson Counties, New Jersey.

PRESENT USE: Closed to vehicular and pedestrian traffic. Swing span accommodates navigation on the river.

SIGNIFICANCE: The Jackson Street Bridge was constructed in the area of the Morris Canal, a current National Register property, on the former site of Balback Smelting and Refining Company, by Fagan Iron Works whose founder, Lawrence Fagan, was a prominent and influential businessman and politician.

The structure is an early steel span truss bridge that has a unique curved chord lattice truss (also known as curved chord quadruple intersection truss), for both fixed and swing spans.

DOCUMENTED BY: Goodkind & O'Dea, Inc., Rutherford, New Jersey and Raber Assoc., Cobalt, Connecticut, in 1985 for the New Jersey State Department of Transportation.

## DESCRIPTION

The Jackson Street Bridge, which was constructed in 1897-1898, is an early steel span truss bridge that has a unique riveted curved chord lattice truss (known also as curved chord quadruple intersection trusses). This unusual truss type is utilized for both the fixed north span and the swing span.

The bridge spans 710 feet over the Passaic River connecting the City of Newark in Essex County with the Township of Harrison in Hudson County (see photograph 1). Oriented in a north/south direction, the bridge connects South 4th Street in Harrison with Jackson Street in Newark, which runs perpendicular to Raymond Boulevard. The bridge is located just past a sharp eastward bend in the Passaic River and is the last local-traffic bridge before the Passaic empties into Newark Bay, several miles east of its location.

Constructed by the Fagan Iron Works of Jersey City (formerly Hoboken), New Jersey, in 1897, materials for the bridge were supplied by the Passaic Rolling Mill of Paterson, New Jersey. It was officially opened to pedestrians on April 11, 1898. This bridge was designed under the direction of the Essex and Hudson County Engineering Department. Chief Engineers James Owen (Essex County 1896) and Thomas McBarn (Hudson County 1896) supervised the project. The roadway width, curb to curb, is 39'-0", providing room for two substandard lanes of traffic in each direction (see photograph 6). Outside the trusses are 6'-6" wide sidewalks on each side.

The superstructure consists of a 221' rim bearing swing span, a 170' fixed span on the north approach, and seven south approach spans with a total length of 319'.

The swing span and fixed north span (see photographs 1, 2 and 3) are comprised of a stringer and floorbeam roadway system supported by two, riveted, curved chord, lattice trusses (known also as curved chord quadruple intersection trusses) (see photographs 2, 7, 10, 11 and 21). The floorbeams (see photograph 20) consist of variable depth, steel, plate girders spanning between the bridge trusses. Sidewalk brackets are connected to both ends of each floorbeam outside the truss. The rolled, 7" deep, roadway floor stringers are framed, eight across, between each floorbeam on both spans. The swing span has 25 floorbeams spaced variably between 8 feet (±) and 11 feet (±) and the north fixed span has 20 floorbeams spaced at 8'-6" apart.

The present deck for both spans consists of a 5" average thickness of concrete on 3/8" steel buckle plates topped by approximately 5" of asphalt wearing courses, added through the years. Timber blocks, found incorporated in the asphalt wearing surface in the vicinity of the South Gate House (see photograph 17), would raise the question of whether the original pavement was of timber blocks, either entirely across the bridge or only local over the south approach spans. Original shop drawings and historical data could neither confirm nor deny this possibility.

A 20 feet wide x 28 feet long control house, for the operation of the machinery, is supported by four truss verticals at the center of the swing span and is framed directly over the roadway surface (see photograph 8 and 12). A 6 foot (±) wide x 8 foot (±) long gatehouse is located on one end of both the north and south approaches next to the swing span (see photographs 2 and 9).

The south approach consists of seven through girder spans with a stringer and floorbeam roadway system that is similar to the swing and north fixed spans (see photographs 4 and 5). Spans vary from approximately 32 feet long to 57 feet long and the through girders vary in depth from 4 feet (±) to 7 feet. The deck is constructed of steel buckle plates and concrete with an asphalt wearing surface similar to the truss spans.

The substructure for the swing span and fixed span includes a north abutment (see photograph 21) with wingwalls, two quarter piers and a center pivot pier constructed of rubble masonry supported on timber piles. The substructure for the south approach consists of six pairs of pier columns and a south abutment with wingwalls. The piers are constructed with either reinforced concrete columns or built-up steel columns embedded in reinforced concrete. Both types of columns are supported by concrete footings. A concrete stairway provides access from the west fascia sidewalk on Jackson Street to Raymond Boulevard below between the fifth and sixth span from the north (see photograph 5). Access to the center pier from the swing span superstructure is provided by a steel ladder over the east fascia pedestrian railing (see photograph 14).

The swing span is carried on sixty (60)-17 1/2" diameter cast steel wheels, bearing against upper and lower cast steel tracks. The upper track is attached to the lower flange of the drum girder and the lower track is anchored to the top of the center pier (see photographs 16 and 23). The wheels are held in a ring which is connected to the center pivot in a single horizontal plane by twelve double angle radial struts (3 1/2" x 3" x 5/16") with additional angle bracing (see photograph 22). The ring is fabricated of a 6" x 3/4" plate, serving as an outer guide and an inner guide consisting of two horizontal, back to back 10" channels separated by a series of two 9" x 8 1/2" long plates connected to the channel flanges. The shop drawings which show the dimensions and details of the tracks and wheels, as manufactured, are available at the Essex County Engineer's office.

The drum panel is 22'-0" long, and the top of the roadway is 14'-1 1/4" above the top of the center pier. The span rests on four pair of short, 5'-0" deep, longitudinal girders which transfer the load to four (5'-6"$\pm$ deep x 42'-0"$\pm$ long) transverse girders. Further load distribution occurs through two additional 5'-6 1/2" deep, open webbed transverse girders and four short longitudinal supporting girders. Altogether, this girder system provides twelve

points of load transfer into the drum girder. The drum girder (see photograph 23) has a diameter of 38', is 3'-6" deep and is braced to the center pivot by twelve, four-angle laced struts (see photograph 22).

The swing span was originally driven by a two pinion powered system (see photograph 16). These pinions operated on a rack on top of the center pier and were connected by shafts and gear trains to the machinery located in the control house above the roadway (see photograph 8). The span was rotated by a vertical two cylinder steam engine (see photographs 18 and 19). A 1942 report indicated that the engine was originally rated at 130 horsepower on 80 pounds steam pressure at 180 revolutions per minute. Two separate clutches mechanically interlocked, providing connections for driving the span and the end wedge mechanism.

In May, 1974, the steam engines were converted to air engines by replacing the coal fired boilers with a gasoline powered air compressor and five compressed air receiver tanks (see photographs 12 and 13).

In February, 1975 the gasoline powered air compressor was converted to operate on propane gas, since gasoline deliveries could not reach the bridge, due to its deteriorated condition.

For emergency situations, the span originally could be hand-operated, through a capstan, from the deck, directly through a set of spur gears attached to the shaft of the main pinion (independent of the two main pinions used for normal operation). Parts of this emergency system have been removed.

The original end lifts, which consisted of end wedge seats, end wedges and wedge guides, were operated by toggles, cranks and links driven by the steam engine through gears, screws, shafting and pull rods. The span lock consisted of a horizontal steel latch bar at the end of each span, which engaged a steel receiving casting at

the quarter pier. These end latches were driven by the same cross shaft and pull rods which operated the end wedges and served to accurately align the span in its closed position.

In August, 1974, the lift wedge machinery system was replaced with a temporary hydraulic jack system controlled from each gate house, and the end dams were cut back to provide additional clearance for thermal expansion.

In July, 1975 the temporary hydraulic jacks were replaced with electric screw jacks (see photograph 15). At that time, a new power submarine cable was installed, the existing rack gear was reanchored to the center pier and the bearings of the pinion gear shaft were restored with new Babbitt material.

In November, 1977 a scour condition at the north and south quarter piers was repaired. Steel sheet piling was driven along the channel face of both quarter pier footings and tremie concrete was placed behind the sheeting to fill the voids.

The major structural components of the truss spans are in fair condition. Local areas have extensive corrosion, particularly within the lower joint areas. The south approach girder spans are in poor condition with the webs completely rusted through and extensive corrosion at the deck joint, floorbeams and columns. The west fascia girder of the span over Raymond Boulevard has been struck by trucks many times because of low vertical clearance and a temporary reinforcing girder was installed above the existing girder with web reinforcing plates, brackets and hanger rods transferring the load to the temporary girder. The many leaks in the deck contribute to corrosion of the supporting members and the concrete deck slab is disintegrating. The only traceable structural bridge members on the bridge are the rolled deck stringers supplied by the Passaic Rolling Mills.

The river piers are generally in good condition, but the south approach piers are corroded and tilted toward the river.

## HISTORICAL CONTEXT

The standard archaeological survey literature records extensive prehistoric settlement for both banks of the Passaic to the north of the present City of Newark and around Newark Bay (Cross: 1941; Skinner and Schrabisch: 1913). No scientifically recorded or excavated sites, however, are present in the area now occupied by Newark itself. Three or more centuries of urban growth and development have severely altered the landscape, and the probability for the preservation of any prehistoric site is slight.

The colonial settlement of Newark began in May of 1666. Official purchase of the land from the Hackensack Indians by a group of Connecticut colonists led by Robert Treat took place in 1667. A nuclear village was laid out on a bluff lying from 30 to 50 feet above the Passaic River but having ready access to contiguous salt and fresh water marshes, and fertile well-drained upland soils (Wacker: 1975). This early settlement took place west of the present-day Jackson Street.

For almost 150 years after its founding, Newark remained an agricultural township. The Connecticut Puritans had laid out several broad, tree-lined streets and a Common in the New England manner and by 1800, most houses still had at least enough land for vegetable plots. Local craftsman produced many articles for home consumption since most towns folk were farmers.

In the 1830's, industrialization began to revolutionize Newark's crafts and by 1860, a spurt of economic and physical growth had made Newark America's major industrial city (Hirsch: 1978).

Newark enhanced its transportation facilities and thereby created a stimulus to further production in 1832. In that year, the Morris Canal opened connecting Newark with the Delaware Valley. This new, easy access to natural resources stimulated the range of iron-

dependent and leather-dependent industries since coal, ore, hides and wood bark could now reach Newark in large quantities (Lane: 1939). Its proximity to New York enabled Newark to rely on the capital supply, labor force and customers there to facilitate production.

East of Newark, the Morris Canal was located to the north of the Passaic River up to south Kearny where the canal boats were towed across the river to the canal in Newark and west.

> "In Newark, the canal began with Lock #20E, at the foot of present-day Raymond Boulevard. About 1,000 feet to the west, near Blanchard Street, was Lock #19E. Then, beyond Market and Canal Streets, the canal sent a branch, or spur, directly into the Passaic River, where Lock #18E gave boats access to the city's docks." (National Register of Historic Places-Morris Canal-Nomination Form).

The opening of the railroad to Jersey City reduced traveling time between Newark and New York to about one hour, and also greatly aided industrial expansion. The jewelry industry depended on this proximity, where wholesalers from all over the U.S. and Canada met (Hirsh: 1978).

Jewelry manufacturing is one of the old and important industries in New Jersey, and especially in Newark. In 1906, Meeker records 98 jewelry establishments in Newark out of the 100 credited to the whole state. "The manufacture of jewelry was established in Newark about the year 1830 and the city acquired a reputation for solid gold jewelry and fine workmanship." (Meeker: 1906; 240).

Edward Balbach, a German immigrant who came to Newark in 1848, was one of those establishing a successful business along the Passaic River and Raymond Boulevard (then River Street). While fortune hunters hastened to discover gold and California riches, Balbach

studied the jewelry industry in Newark and realized that he could find his gold right on the shores of the Passaic.

In 1850,

> "... he established a silver and gold refining plant, principally to handle the gold-filled sweepings from Newark's jewelry factory floors. No other plant in America could handle such sweepings; before 1850, jewelry makers sold their floor dust to speculators, who in turn took the dust to European refiners. Quickly, Newark jewelry makers turned to Balbach, to escape the rapacity of the speculators. Soon other cities sent their sweepings, too ..." (Cunningham, 1966).

Some idea of the amount of waste metal deposited on the factory and

> "... of the great saving of material (effected by installation of percolating exhaust fans), may be obtained from the fact that for years the agents of smelters have been exploring the ancient sites of jewelry factories in the City of Newark, looking for the cesspools into which the waste water of these workshops was turned, before the sewers were built. It is said that many such places, when discovered, yielded rich returns to the enterprising smelters. One is reported to have had eight thousand dollars worth of pure gold taken from the black deposits which filled the place formerly occupied by the cesspool ..." (Stainsby: 1902).

By 1861, Balbach handled silver from as far away as Mexico, but the firm's chief spurt came after Edward Balbach, Jr. patented Balbach's Desilverizing Process in 1864, permitting rapid separation of precious metal from base metals. "Only Balbach's and the U.S. Government mints and assay offices could do such work, and often Balbach could do more than the government. In 1875, for example, Balbach handled $2,820,000 in gold and silver, as against only $2,125,000 for the Philadelphia mint." (Cunningham: 1954; 59).

The close of the 19th century saw Newark's continued industrial expansion translated into a growing population of laborers. Ethnic neighborhoods grew around several different industries. Yet, unlike other major Newark industries, the jewelry industry did not absorb many immigrants according to Hirsch. Jewelers remained skilled and the high wages paid made the craft attractive to natives.

At its peak, in the Jackson Street Bridge area, the Balbach plant covered some four or more acres. But "In 1903 a new plant on Newark Bay was started as a branch and gradually the entire works was moved there, the Passaic Avenue (now Raymond Boulevard) plant being given over to other uses." (Newark Evening News, April 27, 1927).

The Jackson Street Bridge was constructed by the Fagan Iron Works of Jersey City (formerly Hoboken), New Jersey, in 1897. Materials for the bridge were supplied by the Passaio Rolling Mill of Paterson, New Jersey. It was officially opened to pedestrians on April 11, 1898. This bridge was designed under the direction of the Essex and Hudson County Engineering Department. Chief Engineers James Owen (Essex County 1896) and Thomas McBarn (Hudson County 1896) supervised the project.

The bridge was constructed to connect Newark to Harrison, a suburb to the northeast. Although no specific reference to the impetus behind the building of the bridge was found its

construction facilitated the growth of Newark and its suburbs and added to the increasing mobility of the people. No structure preceeded the Jackson Street Bridge at the site.

Originally the structure carried two trolley lines in addition to providing for vehicular and pedestrian traffic. The exact locations of the trolley lines are evident by the spacing of the interior roadway stringers which were designed to coincide wi[illegible] the trolley tracks. Eventually, after the trolleys shut down, these tracks were removed.

Because of the long spans and the design requirements of a swing span bridge, trusses were used for the swing span and the north approach span. No specific reference was found as to why these unusual curved chord lattice trusses were utilized at this site or how many similar structures have been constructed.

The historical significance of the bridge lies within the history associated with the Fagan Iron Company, a locally prominent bridge contracting and iron works company, and its founder, Lawrence Fagan. The company was officially incorporated on June 4, 1891 and continued operation until 1929.

Lawrence Fagan was born in Ireland on January 1, 1851. The following year, the family left Ireland and relocated in Jersey City, New Jersey. After a public school education, he began an apprenticeship in the blacksmith trade. Lawrence Fagan's name first appears in the Jersey City directory of 1874 where he is listed as a railingmaker and residing at 92 Seventh Street, Hoboken. In that same year, Isaac Mansfield and George Scudder are listed as housesmiths with their business located at 234 Willow Street. The following year, 1875, the firm of Mansfield and Fagan (machinists) are listed at 232 Willow Street. This firm remained in business at its location on Willow Street and later at Third and Jefferson Streets in Hoboken until 1891 when it was dissolved and

replaced at the same location by Fagan Iron Works. It was not until 1902-1903 that a Jersey City location first occurs in the city directory.

Lawrence Fagan was a prominent and influential businessman and politician. He was elected to the New Jersey House of Assembly in 1888, 1889, and 1890. Mr. Fagan was elected Mayor of Hoboken four times (1893, 1895, 1897 and 1899). At the time of his death in 1921, Lawrence Fagan was President of the Fagan Iron Works, part-owner of the Hudson Observer, and a Director of the Trust Company.

In 1922, the water rights and Morris Canal properties were transferred to the State of New Jersey.

> "On March 12, 1924, the Legislature adopted an act providing for the drainage of the Morris Canal. That spring the canal was drained. Some sections of the canal bed were later converted to more modern transportation uses. For instance, in Newark, the City Subway has thundered along the old canal bed since the 1930's, while overhead, a wide strip of pavement, Raymond Boulevard, marks the original route of the canal through a part of the city." (Cunningham: 1966).

The construction of this subway in the canal bed occurs to the west of the project area, however. The canal in the Jackson Street vicinity was filled and buried. By 1927, the Sanborn Insurance Maps indicate that the desilverizing plant no longer exists in its former location along the canal.

The areas to either side of the Jackson Street bridge were conveyed to the City of Newark by the Balbach Smelting and Refining Co. in 1935. Two parcels of land, adjoining the Riverbank Park, were conveyed in lieu of $10,000 in taxes owed. This transaction

facilitated the company obtaining a loan from the Reconstruction Finance Corporation which required that applicants for loans be free of tax debt (Newark Evening News, October 30, 1935).

The city accepted the offer because the property might be used for park purposes, and several hundred persons would benefit by gaining employment. "The area once was about to be bought by the Essex County Park Commission or Newark for park purposes several years ago . . . The price then was $210,000. The depression, however, ended such negotiations." (Newark Evening News, October 9, 1935).

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