HISTORIC AMERICAN ENGINEERING RECORD

HAER OH-10

Center Street Bridge
.6 mi. SW of Public Square
Cleveland
Cuyahoga County
Ohio

PHOTOGRAPHS AND HISTORICAL DATA

HISTORIC AMERICAN ENGINEERING RECORD

CENTER STREET BRIDGE

OH-10

Location:	Spanning the Cuyahoga River at Center Street, .6 mile southwest of Public Square, Cleveland, Ohio UTM: 17.441280.4593650 Quad: Cleveland South
Date of Construction:	1900-1901. Rehabilitated 1946-1947.
Present Owner:	City of Cleveland City Hall 601 Lakeside Avenue Cleveland, Ohio 44114
Present Use:	Vehicular and pedestrian bridge. Horizontal draw accommodates navigation on the river.
Significance:	The Center Street Bridge is the last remaining swing bridge in Cleveland. The bridge is a rim-bearing bobtail through Pratt truss. It was fabricated and erected by the nationally-famous King Bridge Company of Cleveland.
Historian:	Carol Poh Miller, September 1978

Center Street, in the Flats, is the site of one of Cleveland's oldest river crossings. The first "bridge" here was a raft of "whitewood logs," secured by ropes and floated to one side to allow boats to pass.[1] In 1863, a wooden drawbridge was built. Within a decade this bridge was declared unsafe and, in 1871, it was replaced with an iron swing bridge. This was a "Post patent diagonal truss," according to one historian, fabricated by the McMairy & Claflin Manufacturing Company at a cost of $13,250.[2]

On ~~1 June~~ June 1, 1897, the Cleveland City Council passed an ordinance "to provide for the reconstruction and rebuilding of the bridge over the Cuyahoga River at Center street." The Council directed that the bridge be "reconstructed and rebuilt with a steel and iron superstructure" in accordance with plans to be filed in the office of the Chief City Engineer. The cost of the new bridge would be borne by "the proceeds of a sale of bonds."[3] The present Center Street "bobtail" swing bridge, constructed between 1900 and 1901, was built at a cost of $84,000. Including land and damages, the total cost of the bridge was $107,281.13.[4]

It is not surprising that the construction of the Center Street swing bridge over the Cuyahoga River drew virtually no attention from the engineering periodicals of the day. Swing bridges were still relatively common, and were in fact then being superseded in popularity by bascule and vertical-lift types wherever navigation and land travel demanded the frequent operation of a bridge. Thus the history of the Center Street Bridge is largely limited to those facts that can be gleaned from the original engineering drawings. Fortunately, the visual record is remarkably complete; in addition to the city plans,

there are some fifty-eight shop drawings prepared by the King Bridge Company for the fabrication of the superstructure.[5]

The bridge was designed during 1898 and 1899 under the direction of James Ritchie, Chief Engineer for the City of Cleveland. The name of James T. Pardee appears on the drawings as "Bridge Engineer." Construction of the bridge began in 1900 and was completed in September 1901. Work on the masonry substructure, which was contracted to the L. P. & J. A. Smith Company, took ten months. The King Bridge Company fabricated and erected the metal superstructure in eight months.[6] The drawings show that King subcontracted the construction of the bridge operator's house to another firm.

The Center Street Bridge is a rim-bearing bobtail through truss swing bridge (CSB Drwg.-1). By "bobtail" is meant that the arms of the bridge projecting from the pivot pier are of unequal lengths. "Rim-bearing" means that the dead load of the swing span is supported by a circular girder near the periphery of the pivot pier instead of near its axis. The bridge consists of a through Pratt truss swing span 245 feet long and a girder span 62 feet long, giving the bridge an overall length of 307 feet. The bridge was designed to carry a roadway 23 feet 8 inches wide and two sidewalks each 6 feet wide. The pivot pier is located on the west bank of the river, thus allowing practically the full width of the channel--or 112 feet--for navigation.

Essentially, when it is closed the bridge may be thought of as two separate truss spans; the pivot pier acts as an ordinary stationary pier. When the draw is open, the two arms of the truss act as cantilevers supported by the truss tower directly over the pivot pier; a counterweight in the shorter arm keeps the span in balance. The short

arm of the Center Street Bridge was counterweighted by "about 112½ tons, more or less, of scrap iron," which was tightly packed in the floor "so as to leave as few voids as possible" (CSB Drwgs.-2 & 3).

The bridge consists of a total of fifteen truss panels. The center panel, or tower, over the pivot pier is a rectangular panel with a span of 20 feet. The long arm consists of nine panels, each 15 feet long, and the short arm consists of six panels each 15 feet long, ~~3/32 inches long~~. Except for the tower, which has a straight top chord, the top chords of all other panels are inclined. Vertical, or compression, members of the bridge are formed from two channel beams riveted together with lacing bars. The diagonal, or tension, members are die-forged eyebars. CSB Drwg.-4 shows the stress calculations for the bridge.

The plan of the bridge substructure (CSB Drwg.-5) shows that ~~both~~ the octagonal pivot pier and the rectangular east pier (which supported the west end of the girder span and the east end of the draw span) were founded on wood piles driven to a depth of 22 feet below city datum. The piles were capped by a concrete crib 10 feet high enclosed in a timber caisson 12 inches thick on all sides. The masonry of the pivot pier measured 13 feet, 10 inches high by 36 feet in diameter; that for the east pier measured 16 feet high by 8 feet wide by 40 feet long.[7] The east abutment of the girder span rested on wood piles varying in length from 30 to 45 feet, capped by a concrete crib. No piles were driven for the west abutment, which rested on a concrete pier measuring 12 feet, 6 inches in diameter by 42 feet. The arrangement of the piers and abutments is clearly illustrated on the plan (CSB Drwg.-1).

The bridge was powered by two 25 h.p. electric motors located at the top of the circular drum. The motors were connected to a

single shaft that ran across the diameter of the turntable. This was coupled to two drive shafts, each 5 inches in diameter, by means of beveled gears. Both drive shafts extended vertically the full height of the drum (5 feet, 6 inches), and were coupled at the base by a rack and pinion (CSB Drwg.-6). The circular rack extended a full 360° around the drum. Two motors were used to operate the swing in order to equalize the pressure on the pinions and prevent the teeth of the rack and pinions from breaking. "The reason for this," bridge engineer J. A. L. Waddell explained in his treatise on swing bridges, "is that it is impossible to make the toothing of the rack so perfect in the distance of the semi-circumference that opposite pinions operated by a single shaft shall at all times act equally."[8] The erection plan for the drum prepared by the King Bridge Company called for a filling under the track base and turntable pedestal, to consist of "a mixture of seven parts of powdered sulphur to one part of coal tar heated and melted over a slow fire in a large kettle." The mixture was to be "ladled out in cans . . ., completely filling the space above the stone work."[9] This substance presumably acted as a bonding agent between the stone pier and the metal drum of the turntable.

All swing bridges require some means of lifting the ends of the draw span when it is closed. In the Center Street Bridge, this was accomplished by a pair of rollers located under the deck at each end of the draw span. The rollers were moved downward by the pistons of a pneumatic jack when the bridge was closed; in this way the draw span was supported in proper juxtaposition to the approaches. To open the draw, the jack was released and the rollers swung upward toward the

center of the deck. The draw span was then free to swing open (CSB Drwg.-7).

All metal bridge members were painted one coat prior to leaving the shop. After erection, the metal was cleaned and painted with one coat "equal, in the opinion of the Eng'r, to the National Paint Works Red Lead paint #300 mixed with ten percent Lamp Black." After this had dried, a final coat of Red Lead mixed with 25 percent Lamp Black was applied.[10] The roadway floor on the swing span consisted of "the best quality of White Cak Bridge Timber cut from live trees during the last season," according to one shop drawing (#4 of 58). The pavement consisted of 4-inch wood blocks, with stone block paving on the girder span. The bridge was controlled by an operator stationed in a small wocd frame house located on a raised platform directly over the center pier. There was a safety gate at the east end of the bridge, but apparently there was none at the west end. An early photograph (CSB Photo-1) shows that there was a small shanty on this side, however, and there may have been an attendant tc stop traffic when the draw was ready to swing.

The Center Street Bridge was re-painted in 1914, and a new roadway floor was laid "by city forces" the same year. This consisted of 4-inch deck plank and 4-inch wood block paving.[11] In 1940, fenders and a land fill eliminated that portion of the channel between the east bank and the rectangular river pier that supported the east end of the draw; this work was part of the multi-million dollar P.W.A. Cuyahoga River Improvement Project. The bridge was rehabilitated in 1946-1947. The deck and stringers were replaced and the bridge tension members (diagonals) were replaced up to the turnbuckles. A new turning assembly

was fabricated by the Allis-Chalmers Company (CSB Photo-2), and the operator's house on the bridge was replaced.[12]

A history of the Center Street Bridge would be incomplete without a sketch illustrating exactly how the bridge responds to traffic on the river. This writer spoke with Joe Parenti, who has been tending the Center Street Bridge for several years now. ~~Mr.~~ ~~Parenti~~ described the operation this way:

> A boat comes up the river, rounds the bend, half straightens out, and blows: 1 long, 2 short /blasts on the horn/. The bridge operator answers: 1 long, 2 short. This means: "I heard you and will open the bridge to let you pass." If for some reason the bridge cannot immediately be opened, the operator answers with 3 short blasts. If there is danger and the bridge cannot be opened, the operator sounds 7 or 8 short blasts.
>
> Next, the bridge operator gives a "toot" to the tender at the east approach to the bridge /Parenti's job/. The tender here sees if all's clear, hits the bell located at the east end of the bridge, and releases the lock that holds the bridge in place. The operator on the bridge closes the west gate /barring vehicular traffic from the bridge/ automatically. The tender at the east end closes the gate there /manually/ and fastens it with a chain. The bridge operator releases the jack and the bridge swings open in the direction of the approaching boat. (This is done to save time, so that the bridge can begin to close even as the boat is clearing the channel.) The boat clears, the bridge is swung closed. The operator lines it up with the approaches visually, then gives air to set the rollers in place. The rollers at the west end are set first, then the east end. The operator gives a short "toot" to the tender, telling him to open the gate and lock the bridge in place.

According to Parenti, the bridge opens and closes from six to twenty times a day during the navigation season, depending on traffic.[13]

Cleveland's only remaining swing bridge is maintained by the City of Cleveland, which has no plans to replace it. The Center Street Bridge is extremely economical to operate, according to the city's Chief Civil Engineer, John Bowersock.[14] Furthermore, the bridge is a popular tourist attraction, and the tenders talk about

their charge with pride. "It's the best bridge on the river," according to bridge tender Parenti. With proper maintenance, this still-functional engineering landmark will continue to respond promptly--and efficiently--to the demands of traffic on the Cuyahoga.

Center Street Bridge--footnotes

[1]Elroy McKendree Avery, "The Early Bridges of Cleveland," in Stanley L. McMichael, et. al., Bridges of Cleveland and Cuyahoga County (Cleveland: Stanley L. McMichael, 1918), p. 24.

[2]Samuel P. Orth, A History of Cleveland, Ohio, 3 vols. (Chicago and Cleveland: The S. J. Clarke Publishing Co., 1910), 1:66.

[3]Ordinance No. 16000, in Cleveland, Ohio, City Council Proceedings, April 19,1897 to April 17, 1898, Vol. 30-31, p. 80.

[4]City of Cleveland, "Record of Bridges," p. 7. This catalog of city-owned bridges is located in the Bureau of Bridges and Docks, Division of Engineering and Construction, City Hall.

[5]All of the drawings of the Center Street Bridge are located in the Bureau of Bridges and Docks, cited above.

[6]"Record of Bridges," p. 7.

[7]Both masonry piers were beveled, or graduated in width. The dimensions given here are those of the crown.

[8]Bridge Engineering, 2 vols. (New York: John Wiley & Sons, Inc., 1916), 1:693.

[9]"Erection Plan of Drum, Etc., New Center Street Draw-Bridge," King Bridge Company shop drawing #3 of 58.

[10]"Erection Plan, New Center St. Draw Bridge," CSB Drwg.-3.

[11]"Record of Bridges," p. 7.

[12]Interwiew with John Bowersock, Chief Civil Engineer, Bureau of Bridges and Docks, Division of Engineering and Costruction, City Hall,

Cleveland, Ohio, ~~30 August~~ AUGUST 30, 1978.

[13]Interview with Joe Parenti, bridge tender, Center Street Bridge, Cleveland, Ohio, ~~6 September~~ SEPTEMBER 6, 1978.

[14]Interview, ~~30 August~~ AUGUST 30, 1978.

ADDENDUM TO
CENTER STREET SWING BRIDGE
Southwest of Public Square
Cleveland
Cuyahoga County
Ohio

HAER No. OH-10

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National Park Service
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