North Village Bridge
Spanning the French River on North Main Street
Webster
Worcester County
Massachusetts

HAER No. MA-99

HAER
MASS,
14-WEB,
2-

PHOTOGRAPHS
REDUCED COPIES OF MEASURED DRAWINGS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, DC 20013-7127

HAER
MASS,
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HISTORIC AMERICAN ENGINEERING RECORD

NORTH VILLAGE BRIDGE
(NORTH MAIN STREET BRIDGE)
HAER No. MA-99

Location: Spanning the French River on North Main Street, one-quarter mile upstream from the North Village Dam, between the towns of Dudley and Webster, Worcester County, Massachusetts
UTM: Webster, Mass., Quad. 19/466080/2617500

Date of Construction: 1871

Structural Type: Wrought- and cast-iron Parker pony truss bridge

Engineer: Unknown; design based on 1870 patent by Charles H. Parker

Fabricator/Builder: National Bridge & Iron Works, Boston

Owner: Town of Webster, Massachusetts

Previous Use: Vehicular and pedestrian bridge

Present Use: Pedestrian bridge only, closed to vehicles

Significance: The North Village Bridge is one of only five known surviving Parker patent trusses in the United States, and the second oldest of the three located in Massachusetts. The bridge was built by the National Bridge & Iron Works of Boston, a significant late-nineteenth century bridge-building company, for which Parker was Chief Engineer. The bridge's design was particularly innovative in achieving the economies of material inherent in the curved top chord, yet lending itself to mass-production by the standardization of panel dimensions. The truss length could be adjusted by alterations to the end panels alone. The design could be mass-produced, and applied speedily and cheaply to pre-existing crossings.

Project Information: Documentation of the North Village Bridge is part of the Massachusetts Historic Bridge Recording Project, conducted during the summer of 1990 under the co-sponsorship of HABS/HAER and the Massachusetts Department of Public Works, in cooperation with the Massachusetts Historical Commission.

John Healey, HAER Historian, August 1990

Description

The North Village Bridge, also known as the North Main Street Bridge, crosses the French River one-quarter of a mile upstream from the North Village Dam in Webster, Massachusetts. Since the eighteenth century, the stream provided power for textile mills, and North Village developed in response to an increasing demand for worker's housing near the mills. The dam, thought to have been built in the early-nineteenth century, considerably broadened the stream, forming an elongated lagoon extending upstream for more than a mile.

The bridge is located at the narrowest crossing point, and shares this neck of land with a now-abandoned railroad bridge. Beyond the railroad, the land rises past a Victorian railroad depot to a low plateau, the site of the sprawling early-nineteenth century factory village. To the west, the land is undeveloped, save for a Catholic graveyard. The river forms the boundary between the townships of Webster and Dudley, though the present bridge has always been the exclusive responsibility of the former.

The bridge is a single-span, pin-connected, wrought- and cast-iron Parker pony truss. The bridge is approximately 68' long and 13'-3⅝" wide, with a 5'-3⅛" sidewalk extending from the north truss. The polygonal upper chord, comprised of straight built-up sections, appears as an upward curve in elevation, and rises to a height of 9'-6" above the bottom of the lower chord, at the center of the span. Each truss has nine panels, defined by vertical members connecting the upper and lower chords. While the truss geometry and member sizes are consistent in both trusses, one truss is slightly longer than the other, presumably to accomodate pre-existing abutments. The north truss measures 63'-0" in length, while the south truss measures 67'-8" in length. This was accomplished by varying the lengths of the upper and lower chord members in the end panels only, just as Charles Parker mentioned in his 1870 patent.

The upper chord, with inclined endposts, is built up of three plates and four angles, connected by rivets, with lacing on the underside. The camber of the chord above the hip intersection is 4'. The chord is comprised of five factory-riveted sections. The joints between them are made by gusset plates lapped onto all chord plates. The gusset plates are factory-riveted on that side of the joint away from the center line, and field-bolted on that side of the joint closest to the center line. The heads of the field bolts have the appearance of undriven rivets, and are made up with hexagonal bolts. The inclined endposts are connected to the upper chord by similar means, and are in section similar to--though deeper than--the upper chord.

The bottom chord is comprised of paired 6"x½" wrought bars. Each chord span is made up of five individual bars, bolted and fishplated together. The two chord spans are linked by a 6"x½" wrought bar that is wrapped around, and bolted to the terminal skewback. By this means the upper chord effectively becomes a tied arch. Web members are fastened by pin connections, elsewhere fastenings are made by a combination of rivets and field bolts, allowing differentiation of factory- and field-assembled units. All bridge components are made of wrought iron, save for the cast-iron skewbacks, connecting hip and lower chord, and the pin connection bosses.

The bridge rests on uncoursed wet rubble abutments, which have been extended by concreting, thus concealing the skewback joint between the hip of the upper and lower chords. The (Lower) Rollstone Street Bridge at Fitchberg (HAER No. MA-102) has Parker-patent skewbacks that are still visible. They comprise of an integral hollow casting, shaped to receive both hip and bottom chord. The thrust of the top chord is transmitted to the skewback via a notch into which the hip top plate fits. The hip is fastened to the skewback by means of square headed set bolts, which are made up in factory drilled and tapped holes within the casting (i.e. no nuts are needed). The base of the skewback casting is corrugated. At the fixed end of the bridge, the castings rest directly on the abutment, the corrugations presumably giving additional grip. At the rolling end, the corrugations are occupied by round bar roller, which bear on a bedplate. It is assumed that these features are buried within the concrete at North Village Bridge.

The verticals are connected to the upper and lower chords by means of patented connections. The patented connections eliminate the saddle plates commonly used when making pin-connected joints. Both connections are factory fabrications comprising of a cast-iron boss connected by a wrought-iron strap riveted to the I-beam. The casting forms a journal for the pin that connects vertical and upper chord. The casting is 6" wide, thus its outer edges form a boss which provides a precise fit within the chord. No other members are connected to this joint. The casting for the bottom connections is rather more complex. At its lower end it is bored and slotted to receive the pin connections for the diagonals and counter diagonals. These are the only pin-connected members at this joint. The main body of the casting is wasted down above this connection to form a narrow seat on which the edge of the bottom chord is located. The paired bottom chords are separated by a factory-riveted spacer at this point, thus ensuring their location on the seats. The joint is secured in this position by bolts, which clamp the sides of the twin bottom chord members to the flats of the flanges of the vertical. Some verticals are identified as the product of the Phoenix Iron Works of Philadelphia.

The diagonals and counter diagonals are arranged in a Pratt configuration, and their dimensions vary according the stress distribution within the structure. Within the center panels both diagonals are of 1¼-inch rods. Elsewhere, the diagonal rods increase in dimension from 1" to 1¾" toward the end panels. Conversely, the counter diagonal rods increase in size from ½" to 1¼" towards the center panel. They are absent in the end panels. All diagonals have die-forged eyes at their base, and are threaded at the top. They are pinned at the base, while they pass through the upper chord to be tensioned by nuts, which bear on finely detailed cast spacing washers.

The transverse beams are of rolled wrought-iron "I" section of 6½"x4". They are arranged at each panel point, where they rest on the bottom chord, and are secured in position by a single bolt through the web of the vertical. A conventional system of longitudinal stringers and transverse planks forms the decking. The sidewalk is built on the transverse beams extended beyond the north truss. It features an example of National Bridge's standard balustrading, comprising of cast-iron posts with raised panel details and wrought-iron railings. Insofar as can be ascertained, the bridge was never embellished with the characteristic National Bridge decorative hip bollards bearing the maker's name.

Bridge Design

Charles Parker's patented truss (U.S. Patent #100,185) of February 22, 1870, represents a significant stage in the evolution of the iron bowstring tied arch truss bridge. Parker's design was notable in the extensive use of wrought iron, and was particularly innovative in the hipped termination of the upper chord, which allowed the truss to be altered in length "within certain limits," permitting standardization of members in all save the end panels.(See Appendix A.)

Engineers had long recognized the mechanical advantages inherent in the arched form, which combined great strength with minimal material requirements. Depending on how closely the arc of the upper chord resembled a parabola, the stresses within the chord were roughly equal, and corresponded to the minimum stresses that occur towards the end of a straight upper chord. In contrast, the straight upper chord has forces that vary along its length, minimum stresses equivalent to those of the entire arched chord occurring at the ends, while maximum stresses occur at the centre. Such characteristics had always presented a dilemma to bridge engineers. An arched form was mechanically efficient, and minimized the use of materials, however it did not lend itself to mass-production, for as span length was altered, so the geometry of all truss members would change. The parallel chords of the conventional truss could easily be varied, with little effect on the panel geometry; however, for a given span length they required greater amounts of material to balance the greater stresses present at the center of this form. Material requirements in the upper chord could be reduced by varying their amounts in relationship to the changes in stresses from center to end post. Such customizing of fabrication procedures incurred additional costs.

Parker might be seen as a successor to Burr, Whipple and Moseley. Burr introduced the arch to the wooden truss form. Whipple pioneered the arch form in iron, employing cast upper chords in his patented bridge of April 24, 1841 (U.S. Patent #2,064). Moseley's patented bridge of February 3, 1857 (U.S. Patent #16,572) used wrought iron exclusively. Parker's design was clearly an improvement over these designs, for it achieved the optimum use of material inherent in the curved upper chord, yet did so without sacrificing the economies of standardized mass-production of components. As both chord height at particular panel points, and panel width were standardized, so verticals, diagonals, and bottom chords could be produced to standard dimensions. The variation in end panel configuration was achieved by two means: varying the angle of the hip, and altering the length of the hip. It would appear the company produced a series of "skewback" castings, in which the angle of reception of the hip was altered. The hip angle at the Lower Rollstone Street Bridge (HAER No. MA-102) is 45 degrees, while that at the North Village Bridge is 60 degrees. Apparently, the steeper hip angle was used where the end panels were short, ensuring that the diagonal in that panel was acting at an efficient angle. When the end panel length was particularly long, then in addition to the use of the 45-degree skew-back, vertical rods were applied from the endpost-upper chord intersection to the bottom chord. Once the skewback had been selected the hip length was adjusted so that both top chords were of the same height. At the North Village Bridge, these lengths are 6'-0" on the shorter northerly truss, and 5'-3" on the longer southerly truss. The use of cast-iron pin connection journals, held in place by wrought-iron straps appears to be a means of achieving reasonable engineering tolerances of assembly at minimal cost.

C.H. Parker and the National Bridge & Iron Works

Neither the biographical history of C.H. Parker or the company history of the National Bridge & Iron Works is well documented. Charles H. Parker was born ca.1842 at Ashburnham, Massachusetts.[1] It appears he was born into a family with a manufacturing and engineering background, having begun his engineering career in the firm of J.B. Parker, designing textile and shoe-making machinery. Until he became involved with the National Bridge & Ironworks in 1868, he applied himself to motive power applications, taking a position, in 1860 with J.R. Robinson of Boston. He then became involved in experimental work for the Shaw Hot Air Engine Company.[2] His first bridge design appears to have been a cantilevered Warren truss. The Solid Lever Bridge Company of Boston was apparently founded in 1867 to manufacture the bridge, however it is uncertain whether the company built any bridges.[3] The company does not appear in the Boston city directories of the period.

Although Parker's "truss bridge" was not patented until February 22, 1870, it is clear from advertising literature that it had been in production for some time prior to this date. The National Bridge & Iron Works was always closely associated with C.H. Parker. There is no record of any other company producing the patented design, however, bridges and roof trusses designed by others were also produced at National Bridge under the direction of Parker, notably The Quinnipiac Bridge at New Haven, and the roofs for the Museum of Fine Arts, the Post Office and Treasury in Boston.[4] National Bridge was in operation from 1868 until 1875. D.H. Andrews, a former employee, bought the machinery of the company in 1876, when it was in receivership. The Boston Bridge Works evolved two years later with Andrews as proprietor. National Bridge formed around the operations of two metal working companies: Blodgett & White Iron and Steel, of 70 Fulton Street, Boston, William A. Blodgett having been established in that trade for some time; and Cadwalader Curry's younger Boston-based company, The Metallic Compression Casting Company. The National Bridge and Iron Works was first listed in the 1869 Boston Directory, at which time the company shared an office with Curry's company, at 46 Congress Street. The first listing for C.H. Parker was in this directory as well. He resided in Charlestown. By the following year, Blodgett and Curry were listed as the proprietors of the National Bridge & Iron Works, and C.H. Parker was listed as a consulting engineer in bridge construction. Later company advertising refers to C.H. Parker as the company's Chief Engineer. A period of stability in company affairs prevailed for the next two years, the company advertising its expertise in building bridges "in difficult foundations, deep water, and soft bottoms."

From 1873 until the company went out of business in 1875, the Boston Directory shows the company undergoing annual changes in its management. By 1873, Blodgett had left the company, and Parker had taken his place as co-proprietor. The company had also moved its headquarters to 15 State Street.

In addition to listing their expertise in bridge and foundation work, the advertising for that year also mentions the company's abilities to provide roof trusses, having special designs for long span roofs for railroad termini.

By the following year, Curry had left the company to be replaced as joint proprietor with C.H. Parker by one Carey B. Dopp of New York. The company has become C.H. Parker & Co, trading as National Bridge & Ironworks, with offices now at 27 Pemberton Square, and works on the East Boston waterfront at McKay's Wharf, Border Street. An 1874 Boston atlas shows an extensive facility of some 15,000 square feet. The premises appear to have been purpose-built, 1867 fire insurance maps showing none of this development. During 1875, the last year of trading the company remained as restructured in 1874.[5]

During C.H. Parker's tenure at National Bridge over 150 bridges are said to have been produced.[6] It is uncertain how many of these were to C.H. Parker's own design, and of these how many conformed to his patented truss. The largest bridges to his design were built across the Merrimack at Lowell, Haverhill, and Tyngsborough.[7]

Parker appears to have maintained his association with the iron trade. He headed the firm of Parker, Field & Mitchell, and was involved with The Charles River Iron Works of Cambridgeport. His later work seems to have been principally concerned with the production of manufacturing plants. Parker died on August 31, 1897, at his home in Cambridge.

Local History

Originally part of the town of Dudley, Webster was incorporated in its own right in 1832, as it outgrew its older neighbor to become a significant center of textile manufacture. Correspondingly, the old center of Dudley became a backwater as this town developed as a twin sister to Webster, on the opposite side of the French River.

It is said that in pre-colonial times the Indians used the site of the North Village Bridge as a ford across the river, and that such a use continued as the area was settled, and was only to be dislocated by the flooding consequent upon the construction of the North Village Dam. Samuel Slater's "Plan of the Town of Dudley," dated 1740, provides evidence of early developments in the community. The river, then known as the Stony River, was bridged at two points only, both carrying county roads: one on the road that was to become known as the Central Turnpike (Boston to Hartford), about which the settlements of Webster, and Dudley were to nucleate; and the other close to the Connecticut border, near the present Perryville Crossing. The site of the North Village Dam was already the site of a grist mill and a saw mill, but there is no evidence of a bridge at that location.

Textile manufacture began at North Village in 1812, with the establishment of the Village Cotton, Wool & Linen Manufacturing Company. It is thought likely that a dam was constructed to power this company's factory, although it is not clear whether it was constructed to the full dimensions of the present structure. The company's finances were uncertain, and in 1814 the company was reestablished as the Village Factory Company. The effects of these developments were twofold: the old ford was flooded, and the growth of the North Village began. Both events contributed to the need for a new crossing, possibly satisfied as early as 1812.

Samuel Slater, the textile manufacturing pioneer, was closely associated with developments at North Village. His first manufacturing site became the East Village. In 1824 Slater purchased the Village Factory Company, together with the water power rights, and the scale of activity increased apace as Slater expanded his cotton manufacturing activities at this site, forming The Phoenix Thread Company. The North Village correspondingly grew, to house Slater's operatives. By 1830 the North Dam had certainly reached its present dimensions, retaining an 18-foot head of water behind the 130-foot long granite wall. In 1829 Slater introduced power looms, presumably demanding additional power provision, the North Village being involved in both spinning and weaving.

North Village Bridge

A bridge at the North Village site is first positively identified in Worcester County deeds. In 1827 Samuel Slater acquired from Stephen Bartlett (deceased) a parcel of land, "down said river [and] said road [to] the river [and] the Bridge and Road beyond." The accompanying deed map, dated May 1839, clearly shows that the bridge spoken of occupied the site of the present North Village Bridge.(See Figure 1.) At that date the bridge appears to have been a timber trestle, approximately 70' in length, supported on seven piers. The parcel sold included the grist and saw mills, together with all water rights. The ownership of the bridge was not stated, but by that date the river had assumed its current name. Zephaniah Keach's 1831 map of Dudley shows that in addition to the Central Turnpike and Perryville Bridges, several new crossings of the French River had been completed.(See Figure 2.) North Village Bridge is shown for the first time, as is the Hill Street Bridge, both the new structures carrying town roads. The same document shows that the grist and saw mills still remain accompanied by "Slater's Cotton Thread Factory."

On April 22, 1841, the Town of Webster voted "to appoint an agent to collect of the Town of Dudley, or of persons of that town, one half the expenses of building the bridge across the French River near the North Factory."[8] This appears to be a reference to the North Village Bridge. The Dudley records apparently have not survived, and their response is not recorded. Although the records use the term "building," it seems more likely to have been a rebuilding. Civen the short twenty-year average lifespan of such timber bridges, it would appear the original bridge dated from the second decade of the century.

Within eighteen years, the North Village Bridge was again in need of replacement. On September 1, 1859, The Webster Times reported:

> A new bridge is being constructed over the French River at the North Village. The old one has been in an unsafe condition for a long time, notwithstanding it has been subject to frequent repairs. The new one is similar in model to the old, being entirely of wood.

The construction apparently went well, for just one week later, the newspaper reported:

> The new bridge at the North Village is completed, it being but a week from the time the workmen commenced demolishing the old structure until the new one was completed ... [we] congratulate the contractors for the speedy, and thorough manner in which this bridge has been constructed.

Town records give no account of the rebuilding of the bridge. It is suggested that perhaps the Town of Dudley was responsible, under some kind of reciprocal agreement with the Town of Webster. Later records show that--in common with many towns sharing a river as a boundary--the location and cost of crossings was often a matter of dispute.

After little more than a decade the bridge was again requiring replacement. On September 29, 1871, The Webster Times referred to the bridge as "an old narrow wooden affair in a very unsafe condition." A town meeting was called for September 25:

> to see if the Town will vote to build a bridge over the French River at the North Village, near the Catholic Cemetery, [and also] to determine what kind of bridges shall be built, and to make appropriations for the same.

The same meeting wished to seek the opinion of the town on the construction of two other bridges across the French River. Funds were sought from Dudley only in the case of the proposed bridge on Oxford Avenue. The meeting was attended by thirty townsfolk, and was reported in newspaper to have been "entirely harmonious." The town voted, "to appoint a committee with authority to contract with Messers Blodgett and Curry of Boston for a wrought iron bridge at the North Village, with twelve feet driveway, and five feet sidewalk at an expense not exceeding $2100." A similar vote was passed regarding the Oxford Avenue crossing. Webster favored either a wrought-iron bridge by Blogett & Curry of Boston, or a cast-iron bridge by A.D. Briggs of Springfield. The expenses were not to exceed $4500. The Town of Dudley refused to go along with eith proposal. The high initial cost of an iron bridge is adequately illustrated in the proposals for the third bridge discussed at the meeting. The Chase Avenue Bridge, which together with the Oxford Avenue Bridge cut across a meander in the French River, was to be a conventional "wooden truss" structure costing a mere $300. The dispute between Webster and Dudley over these shared crossings was to continue, and at a meeting later that year, Webster wished to come to "some arrangement with the Town of Dudley for a division of the bridges over the French River." Failing an agreement on the building of the Oxford Avenue Bridge, Webster was prepared to "apply to the County Commissioners for orders to build said bridge." At that meeting, according to the local newspaper, $400 was added to the bridge appropriation, "making it $2500 to build an iron bridge at North Village," which was "entirely in the hands of Webster." There follows a report on Dudley's preference for wooden bridges at two French River crossings, costing $1500 in total. The "two crossings" were not identified, however on November 25, the newspaper reported that a new bridge had been completed across the French River at Perryville. This bridge had been "executed by John D. May of Dudley, and superintended by A.E. Edwards of Dudley Board of Supervisors." It may be deduced that the Perryville Bridge was one of the aforementioned "two crossings." Apparently, it was irksome to the citizens of the senior town (Dudley) to find their younger and wealthier neighbor in a position to afford such expressions of municipal wellbeing as iron bridges.[9]

It would seem that North Village Bridge represented Webster's first experience of the process of contracting for an iron bridge. Indeed, only one other iron truss was to be built over the French River--that at Perryville, which was apparently the responsibility of Dudley. No details are given of the relationship between Blodgett and Curry of National Bridge & Iron Works and the towns. It is uncertain whether National Bridge was contacted directly by the town in response to that company's advertising circulars, or whether that company tendered in reply to a general invitation to bid made by the town. Unlike the proposed crossing at Oxford Avenue, there is no evidence of other companies devising plans for the North Village crossing.

Few details of the bridge's construction can be found. It would seem that National Bridge was able to fulfil their contract speedily, for within some ten weeks of the town meeting in September 1871, the newspaper could report, "The North Village Bridge is ready for passage, though not quite complete." The North Village contract seems to be very representative of the type of work which most suited National Bridge & Iron Works. The Parker-patent design, which the company specialized in producing, could be applied speedily--and with little adaptation--to pre-existing crossings, giving the company significant cost advantages over competitors. The North Village Bridge shows how the standardized Parker components were adjusted in the end panels only so that the bridge might correspond to the dimensions of the existing abutments. Of the five Parker-patent National Bridge & Iron Works bridges surviving nationally, three demonstrate how the truss lengths have been similarly adjusted. The company's advertising places particular emphasis on the replacement of aging spans.[10] In the case of a Parker-patent railway span, the advertisement boasts that "it was completed without a single interruption to the passage of a train."

The account for the North Village Bridge appears in the Webster Town Report of 1871-72. It is clear from the entries that the bridge was constructed on pre-existing abutments. The total cost "of changing the bridge" was $2493.69, $2315 being paid to Blodgett & Curry "for iron bridge". The cost of the provision of abutments often equaled or exceeded the cost of the ironwork, yet only $19.50 was spent on masonry materials, D. Willington being paid $15.50 "for stone and drawing same," and Chase & Sons being paid $4 for "corner stones." It was common practice for the bridge-building company to hire their own building team, and it is suggested that the other two entries for "work" on the bridge (Dyer Freeman, $83.29;and Timothy Higgins, $13.75) were for modifications to the abutments and demolition of the old structure. The final cost of the new span exceeded the appropriation by $93.69. The ironwork was supplied at a cost of some $35 per foot. The engineering tolerances to which the bridge was constructed were not specified, however in a report on the completion of the bridge in The Webster Times, on January 6, 1872, it was said that the bridge "will bear up a hundred tons or more."

Bad winter weather seems to have hindered final completion of the bridge until January 1, 1872, as reported by the newspaper, but the bridge celebration was held a few weeks earlier. A party of local selectmen and dignitaries gathered at about one o'clock with "the thermometer nearly down to zero," and the possibility of "good sleighing." Five teams and a two horse sleigh all gathered on the bridge, speeches were made, and "three cheers" given "for Mr Parsons of Boston, the superintendent of construction" (possibly a reference to A.W. Parker, the company's Superintendent of Works).

The subsequent history of the bridge seems to have remained uneventful until 1936, when a severe flood occurred in March. The structure was struck by an oil tank that had floated down from upstream, and the abutments were damaged. Plans dated from May of that year show that it was in repairing this damage that the concrete additions to the abutments were made. Although the waters were to rise above the level of the deck, the bridge withstood the severe floods of 1955, which carried away the iron truss at Perryville. The bridge deck was replanked in 1971, and continued in vehicular use for several more years, until the structure sustained substantial damage, as a result of a loaded timber truck striking--and then becoming jammed across--the bridge. Repairs were made, and the bridge was re-opened in 1988, only to be closed once more in 1989, following a state inspection. The Webster Engineering Department is anxious to renovate the structure, while others wish to see the span replaced, either at the same location or slightly upstream.

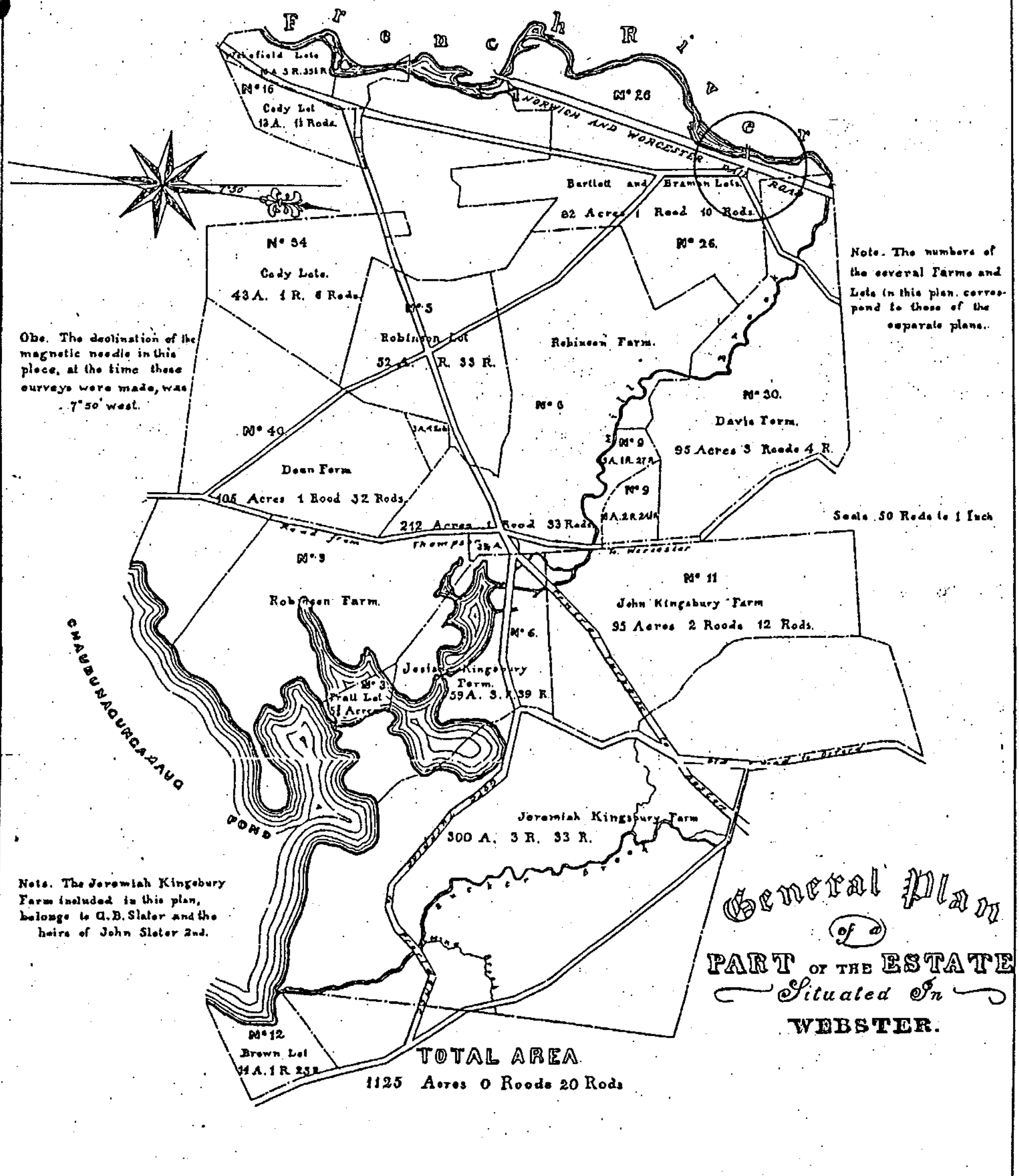


FIGURE 1: Plan of Webster, 1839, <u>Worcester County Deed Books</u>.

E57

FIGURE 2: Zephaniah Keach's Plan of Dudley, 1831.

United States Patent Office.

CHARLES H. PARKER, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 100,185, dated February 22, 1870.

IMPROVED BRIDGE.

The Schedule referred to in these Letters Patent and making part of the same.

To whom it may concern:

Be it known that I, CHARLES H. PARKER, civil engineer, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in the Construction of Bridges; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, in which—

Figure 1 is a side elevation of a bridge embodying my invention.

Figures 2, 3, 4, and 5 are views representing in detail the construction and arrangement of the compression member.

Figures 6, 7, and 8 are like views of the skew-back or thrust-block.

Figure 9 is a view on an enlarged scale of the upper portion of one of the end panels of the structure.

The improvements in the construction of bridges which I desire to secure by Letters Patent are as follows:

First. The first portion of my invention relates to the construction of the end panels or bays of a truss.

In order to make a truss with a curved top member and straight bottom member, and sloping ends that shall be capable of being altered in length within certain limits, without changing the general proportions of the truss in other respects, I have designed the end panels, or in the following manner:

The truss is composed of a curved top member, a straight bottom member, and vertical posts or compression members A, with the usual system of longitudinal diagonal rods or braces.

With the vertical post at each end of the truss I combine the fractional length of the top member and a sloping end, as seen in the drawing, the curved top member being made some fractional length of the end panel or bay, as shown at G, figs. 1 and 9, and the balance of the length of this panel or bay being composed of the sloping end N, which is riveted or otherwise secured to the curved top member G, and, to its point of support at its other end in any suitable manner. The advantages of this plan are, that in practice if I wish to lengthen or shorten a given length of span within certain limits, I have only to shorten or lengthen the fractional top member of the end bays or panels, or increase or decrease the slope of the ends, without in any way altering or disturbing the patterns or dimensions or proportions of the vertical posts, or of that part of the truss between the end panels; and I am thus enabled in practice to make all patterns, measurements, and plans answer for different lengths of spans within certain limits.

Secondly. The second part of my invention relates to an improvement in the construction of a wrought-iron compression member, capable also of acting with equal efficiency as a tension member. The body of this member is formed of an I section-beam, A, either rolled or built up of plates and angles.

The ends of the I-beam A are cut to receive the casting eyes B B, having shoulders c, which are fitted to and so as to rest on the ends of the flanges of the I-beam and projecting lips D D, which fit on each side of the web of the I-beam.

To join the eye to and virtually make it a part of the I-beam, I employ a strap of wrought iron, E, which passes around the outside and is recessed into the casting B at I, extending down over the lips D D to the web of the I-beam A, to which it is securely riveted.

The strap recessed into the casting, in connection with the projecting lips D D, prevents any moving of the casting from position.

The hole through the castings for a pin or rivet forms the means of connection of this member with the top and bottom members of a truss.

To form a connection with the bottom chord of a truss and the diagonals of the the web, a further modification, shown in figs. 2, 3, and 4, is introduced into the lower eye. This consists in casting into the eye a slot, S, and cutting into the encircling strap E a similar slot, and then placing in this slot the eyes of the diagonals, so that by the common bolt all are held in place. By this construction I make a member which is effective in resisting both compression and tension, and is also capable of resisting effectually any lateral motion.

Thirdly. The third portion of my invention relates to an improved block or skew-back, which is used in the end panels or bays. The general form of this block is shown in figs. 6, 7, and 8. Along each side and around the end H is a recess, K, to receive the bar L, which passes completely around the thrust-block, and terminates at the ends in eyes or any equivalent instrumentalities to attach to the chord-bars of the bridge. To form the connection with the sloping end N of the arch or top member G, the block projects into said end. The thrust of this top member is received by a shoulder, O, cast upon the block and the upper edges of the encircling strap L.

To give additional lateral stiffness, and to more thoroughly join to the block the top member or arch, I introduce the plates P P recessed into the block and under the encircling strap L and under the side plates of the arch or top member, the whole being fastened together by bolts or rivets R R, or any equivalent, passing through the encircling strap L, the plates P, into the block, and through the side plates of the arch,

APPENDIX A. Charles Parker's Patent, 1870.

top member O, the plate P, and into the block; d also with bolts X, or any equivalent fastening, rough the top plate of the arch or top member into e block, thus binding the whole together firmly. e advantages of this are, that the thrusts and pulls the respective top and bottom members of a truss e resisted by the block, which receives from these o members only strains of compression through the edium of the encircling strap L; and the bolts, rivets, or any equivalent used to fasten said members to e block, are not called upon to resist the direct rains from the said top and bottom members.

What I claim as new, and desire to secure by etters Patent, is—

1. A truss having its vertical posts or compression embers fractional lengths of the curved top member, d sloping ends combined in the end panels or bays, bstantially in the manner and for the purpose specified.

2. A compression member of a truss, constructed the manner and for the purposes specified.

3. The cast-iron eye or end of the compression ember of a truss, constructed with lips to fit the web of the beam, shoulders to fit upon the flanges of the beam, and a recess to receive the encircling strap E, in the manner and for the purposes specified.

4. The thrust-block or [illegible] constructed in the manner and for the purposes specified.

5. The encircling bar or strap L, used in connection with the thrust-block, so as to [illegible] the chord-bars of the bridge, and at the same time to partially receive the thrust of the top member of the truss, in the manner and for the purposes specified.

6. The plate P, used in the manner and for the purposes specified.

7. The combination of the top and bottom members of a truss with the thrust-block, its encircling bar or strap, and the stiffening-plate P, under the arrangement shown and described.

In testimony whereof, I have signed my name to this specification before two subscribing witnesses.

CHAS. H. PARKER.

Witnesses:

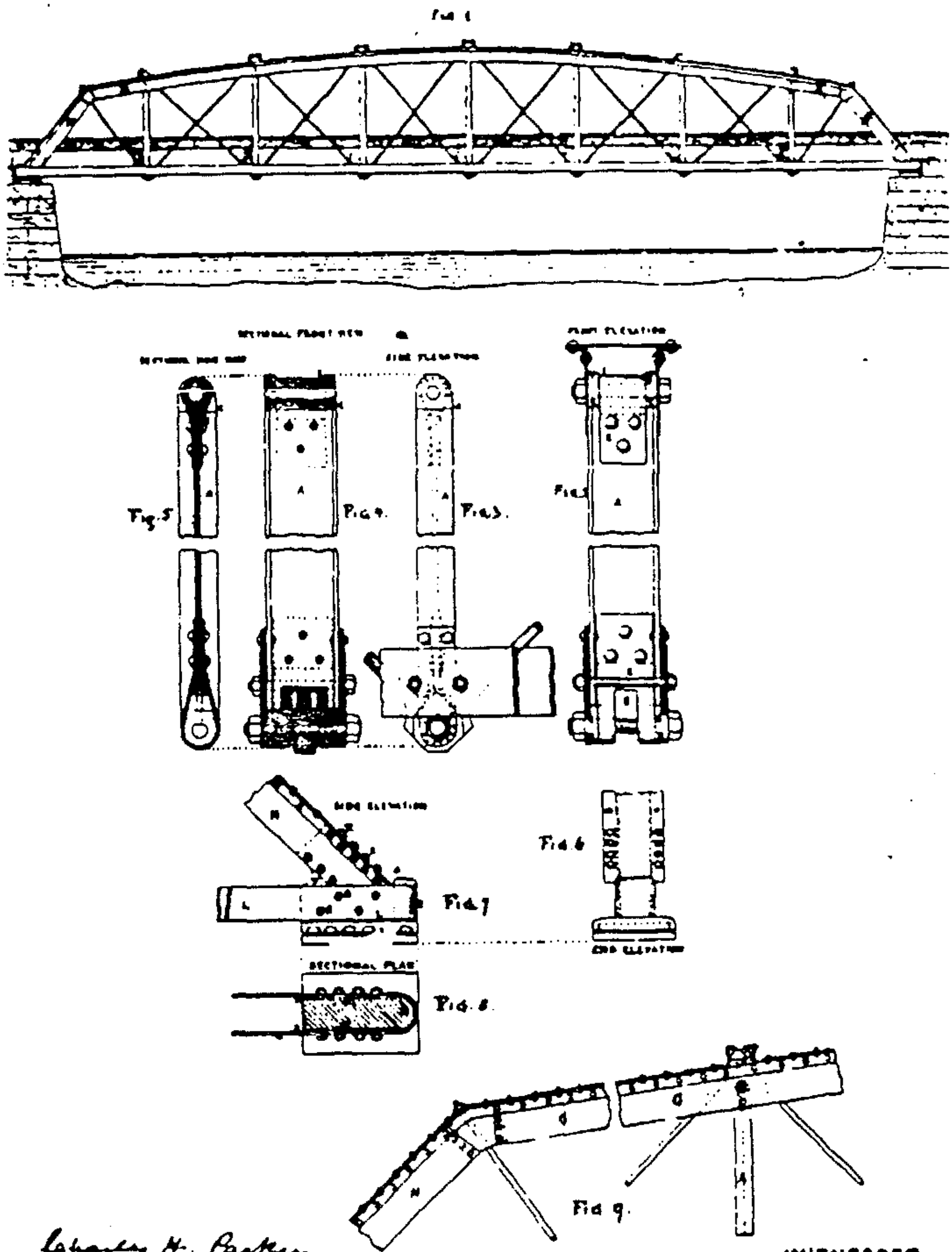
THOMAS G. BAKER,

CADWALLADER CURRY.

C. H. Parker.

Truss Bridge.

No. 100,185. Patented Feb. 22 1870



Charles H. Parker
by his attorney

WITNESSES.

ENDNOTES

1. "Charles H. Parker," memorial notice, Journal of the American Society of Mechanical Engineers, vol. 19 (1897), pp. 965-66; and, "Charles H. Parker," obituary, The Boston Journal, September 1, 1897, p. 2.

2. Ibid.

3. Carl W. Condit, American Building Art: The Nineteenth Century (New York, 1960), p. 144.

4. ASME memorial notice.

5. Boston City Directory, 1868-1890.

6. Condit.

7. ASME memorial notice.

8. Town of Webster, Record Book 1, Office of the Town Clerk, Webster, Massachusetts.

9. Town of Webster, Record Book 2, pp. 142-45 records the proceedings of the meeting.

10. The National Bridge & Iron Works Annual Illustrated Circular, 1869, in the collection of the Smithsonian Institute, Washington, DC.

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