

The St. Lawrence County Historical Association

QUARTERLY

Volume LXVII • Number 3 • FALL 2023



FEATURED ARTICLES

Kids! Help Save Our Fighting Men
by Dave Waite

The First Aluminum Bridges and
Alcoa – Massena Operations
by Stephen J. Lindsay, NAPHA

The Notorious Thomas Hand Murder
by Bryan Thompson

The First Aluminum Bridges and Alcoa – Massena Operations

By: Stephen J. Lindsay, NAPHA

Former Editor's note: Because I asked the author about the various acronyms used for what we know today as ALCOA in Massena, he politely gave me a quick history lesson on the company's name: **1888-1907**, Pittsburgh Reduction Co. was the name used when Massena Operations began producing metal in 1903; **1907-1908**, Aluminum Company of America, shortened to A.C.O.A., name used when bridge was produced in Pittsburgh in 1933 and bridge built in Massena in 1946; **1999-2016**, the company name was officially shortened to ALCOA. The company was publicly listed on the NYSE as Alcoa Inc.; **2016**, Alcoa Inc. officially changed its name to Arconic Inc., separating the fabricating side from the commodity side of the business; **2016-present**, the commodity side of the business became known as Alcoa, Corporation, a spin-off of Alcoa, Inc., technically a new company. Even though Alcoa became Arconic, the part of the company that more closely connects with its origins kept the original acronym. This timeline of acronyms is included at the beginning of Stephen's article to ease the reader's curiosity of name variations, as it did for me. **Former Editor Mary Ellen Jones.**

In 1933, Massena Operations of the Aluminum Company of America, the forerunner of Alcoa Corp., made history by fabricating the first aluminum components for use on a bridge. These products were destined for use on the Smithfield Street bridge in Pittsburgh, PA, not far from Alcoa's headquarters. Less than fifty years earlier, aluminum had been so rare that it was a precious metal, at one time having sold for more than silver, gold or platinum.



fig. 1 The Smithfield Street Bridge in Pittsburgh, Pennsylvania, looking "from upstream," 1933. Photo online from Brookline Connection. ¹

The Smithfield Street Bridge, the oldest surviving river bridge in Pittsburgh, opened to horse-drawn wagon and carriage traffic on March 19, 1883. Cost effective means of aluminum production had not yet been invented. In 1883, steel was the name of the game. Three years later, Charles Martin Hall produced the first pure aluminum by the modern process of electrolysis.

Originally, this bridge was only 23 feet wide. It was widened from two trusses to three in 1891 and widened again to 48 feet in 1911, becoming the most heavily used bridge in Pittsburgh. By 1933, it had developed a weight problem. The two expansions plus the heavy load of vehicular and trolley traffic threatened the bridge's 4-1/2 ton load-bearing capacity.

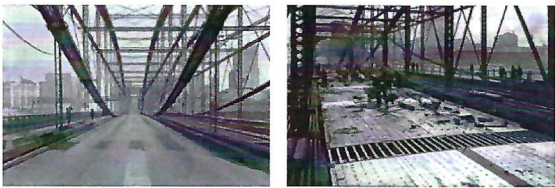
The solution was to remove the heavy decking of steel and wrought iron and replace it with aluminum channels and decking. This change reduced the dead weight of the bridge by 750 tons, quadrupling its load-bearing capacity for traffic. ²

According to London's *The Engineer*, July 1934:

This is, as far as we have been able to ascertain, the largest bridge undertaking in aluminum that has yet been carried out. It has afforded engineers an opportunity to gain experience in the use of aluminum on a large scale. Regarded as an experiment in bridge building we suggest that its importance cannot be overrated. ³



Replacing the roadbed and deck on the downstream side of the Smithfield Street Bridge in 1933.
 fig. 2 Smithfield Street Bridge renovation, 1933. Photo online from Brookline Connection.⁴



The iron and steel roadbed on the downstream side was replaced with lightweight aluminum decking.
 fig. 3 Smithfield Street Bridge decking, 1933. Photo online from Brookline Connection.⁵

All of these lightweight aluminum channels that supported the aluminum decking had been produced by Massena Operations in August 1933.



fig. 4 The Massena fabricating mill rolling sections that were each 90 feet in length with an aluminum channel at center of photo. Photo courtesy of NAPHA.⁶

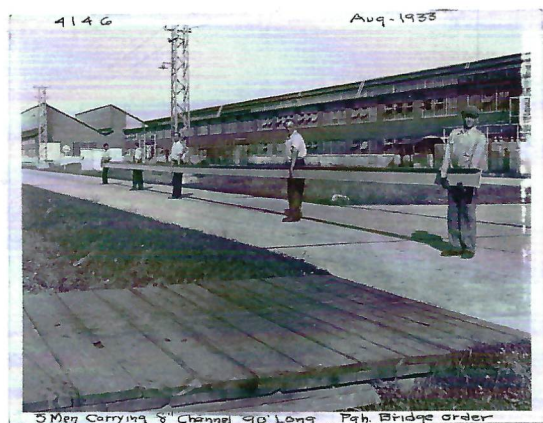


fig.5 Massena Operations employees carrying a 90 foot section of 8 inch tall, U-shaped channel. Photo courtesy of NAPHA.⁷

This corrosion-resistant, lightweight metal made its mark in engineering and bridge construction circles. However, another thirteen years passed before aluminum was again used as a structural material in a bridge, especially one that supported heavy loads. World War II accounted for some of the delay when aluminum was diverted from civilian applications to serve wartime needs such as the construction of airplanes and M4 type pontoon bridges.⁸

After the war ended, David Reynolds of Reynolds Metals declared that aluminum was "battle tested metal." The battle then became a race to repurpose aluminum smelting capacity that had been built for the war effort. Reynolds Metals pursued production of aluminum siding (1945) and Reynolds Wrap (1947). In 1957, they also broke ground for a new primary aluminum reduction plant in Massena.

The Aluminum Company of America, also known as A.C.O.A at the time, also got busy developing new uses for its metal. These included structural applications for bridge construction. Again, the focus fell on Massena. The 500-foot-long truss railroad bridge over the Grasse River that had been built in 1900 needed to be replaced with an elevated rail line to separate rail traffic from road traffic.



fig. 6 Massena rail bridges crossing the Grasse River, truss bridge in foreground, girder bridge in background. Photo credit Russ Nelson.⁹

The new rail bridge was 925 feet long composed of five 100-foot long spans across the river. Four of these spans were made of steel from the Rankin Works of Bethlehem Steel near Pittsburgh, PA. The fifth span was made of aluminum from the Aluminum Company of America. Serving as a demonstration span, it has since been noted as being the very first aluminum bridge that was built anywhere in the world. It was put into use during the autumn of 1946. Its 75th service anniversary was in the autumn of 2021.

It was quite fitting that this particular span is located less than one kilometer away from where the first production of aluminum metal occurred in Massena; that happened on August 27, 1903. Massena is not only the longest continually producing site for primary aluminum in the world, it also has the oldest working aluminum bridge in the world. Perhaps it's a pity that the product name for the material used in this bridge wasn't known as MassenAl.

After 34 years of service, the aluminum in the Smithfield Street bridge was eventually replaced with a more corrosion resistant aluminum alloy during another re-decking project in 1967. That aluminum bridge material was then removed in 1994 when the bridge itself was re-built to accommodate yet more traffic.

The aluminum span of the Grasse River rail bridge can be seen to the left in Russ Nelson's photo above. The 100-foot long, plate-girder aluminum span weighs 26-½ tons vs. 64 tons for a similar span made of steel. Alcoa's 14 S-T plate was used to make the span. This alloy is now known as Alclad 2014-T6 plate, an alloy with copper, iron, magnesium and chromium. It is designed around having long service life, low maintenance needs and excellent protection against corrosion. Because of its reduced weight, the span was able to be constructed using special fabrication procedures in the Rankin works and carried to the site to be set as one piece. Steel spans were far too heavy for rail cranes to lift and had to be constructed on site. See the series of photos that follow below.

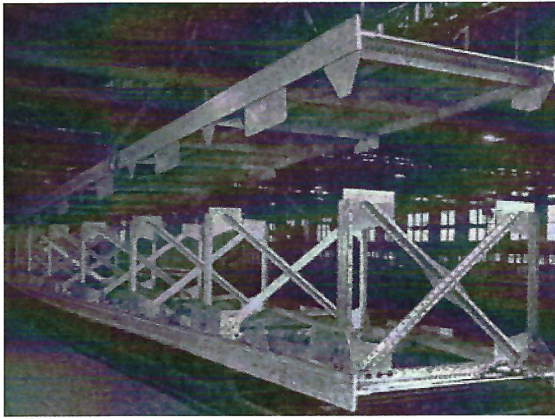


fig. 7 Lowering one of the girders into position to complete the shop assembly of the all-aluminum span. Photo from Railway Age.¹²

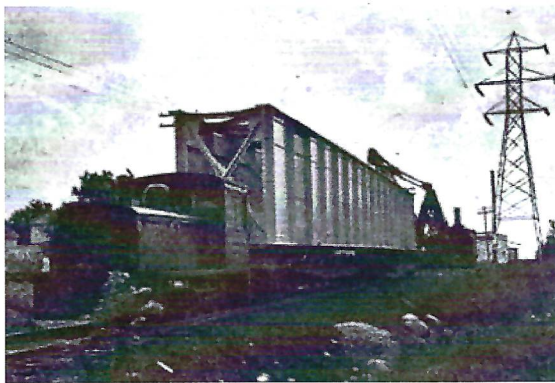


fig. 8 Pre-assembled 100 foot, aluminum, deck plate-girder span being transported. Photo from Railway Age.¹³

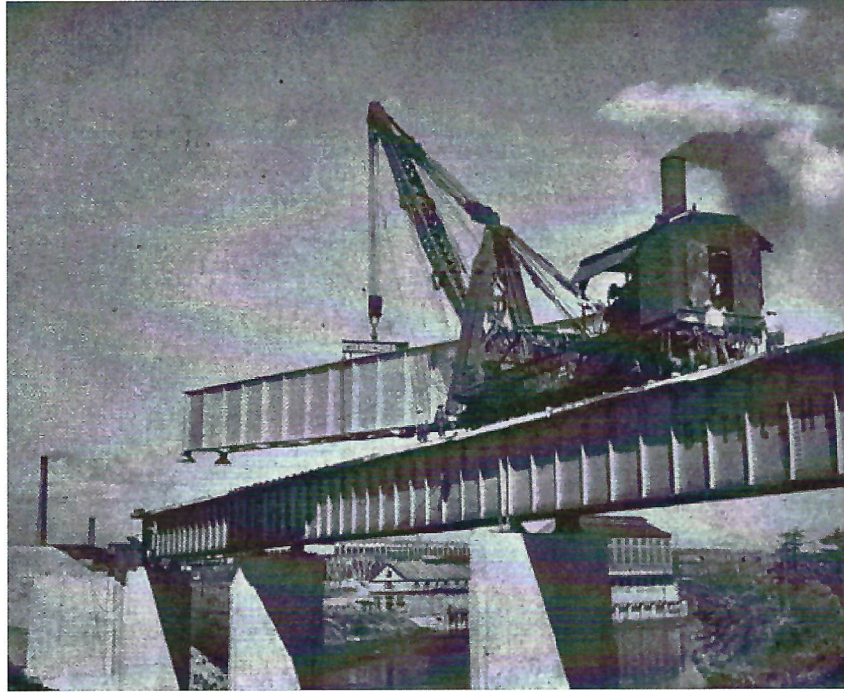


fig. 9 Setting the 100-ft. all-aluminum span, completely assembled, with a single 30-ton erecting crane. Photo from Railway Age.¹⁴

When we examine the timeline of the earliest applications of aluminum in bridges, the first and the second ever to use this material are intertwined with the history of Massena. The fourth was an all-aluminum bridge built in 1950 in Arvida, Québec. Like the bridge in Massena, it remains in use today.

Today's aluminum is used in hundreds of bridges. Some are for road traffic; most are for pedestrian traffic. Although aluminum has shown itself to be a more sustainable material with lower total costs for maintenance over its life cycle, it remains confined to applications with special needs or in those projects which long-term service costs win out over initial construction costs. As infrastructure renewal projects begin to emerge, it may just be possible that once again the world may turn to have a look at the first aluminum bridge that was located in Massena, New York.

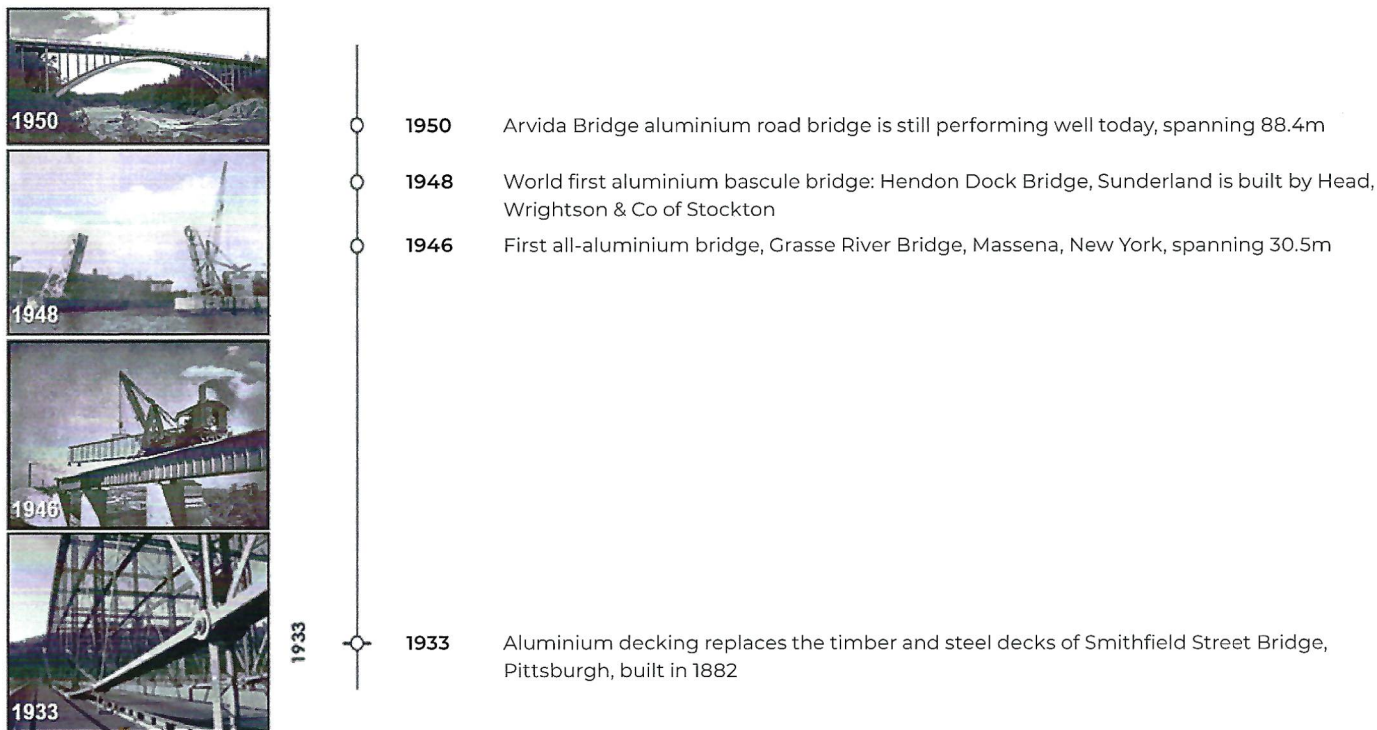


fig. 10 Timeline of early uses of aluminum in bridges. Photo from Aluminium.¹⁵

Acknowledgements:

The National Aluminum Production Heritage Association (NAPHA), <http://www.naphausa.org/> for sponsorship of this article and detailed history of aluminum production in Massena and the United States.

About the Author:

Stephen Lindsay is a former resident of the North Country and now lives in Maryville, TN. He graduated from Clarkson College of Technology in 1979 with a degree in Chemical Engineering and went on to have a long career with Alcoa that began at Massena Operations. He retired at the end of 2018 and is a world-recognized expert on pollution control systems and methods for primary aluminum smelters. He now works part time with Hatch, a global engineering firm.

Steve is a member of NAPHA, headquartered in Massena, and is proud to be a part of disseminating the rich history of aluminum production in the United States. Massena has had three primary aluminum smelters; the Alcoa site where Arconic is now located, the St. Lawrence County plant of the Defense Production Company [W/III] which is currently where the Alcoa smelter is located, and the Reynolds Metals Company – St. Lawrence Reduction plant. No other location in the world has had a history of primary aluminum production that is longer than that of Massena.

Steve has published more than three dozen technical articles on aluminum production in the proceedings of various technical conferences and journals. He is the co-inventor of two patents and has recently co-authored a book titled *Smelter Grade Alumina from Bauzite*, ISBN 978-3-030-88585-4.

Bibliography:

1. "Smithfield Street Bridge." Brookline Connection. Accessed September 23, 2025. <https://www.brooklineconnection.com/history/Facts/Smithfield.html>.
2. Wright, William. "Building The Bridge to The 21st Century with Aluminum." *Public Roads* – Spring 1997 60, no. 4 (Spring 1997). <https://www.fhwa.dot.gov/publications/publicroads/97spring/alum.cfm>.
3. "Alcoa Massena, New York." National Aluminum Production Heritage Association. Accessed September 25, 2023. <https://www.naphausa.org>.
4. "Aluminum Floor for an Old Bridge." *The Engineer* 157 (1934).
5. "All-Aluminum Bridge Span Makes Debut." *Railway Age* 122, no. 2 (1947): 136-138.
6. Nelson, Russ. Massena-Terminal-Railroad, November 25, 2008, Massena. Accessed September 25, 2023. <https://www.flickr.com/photos/russnelson/3058227288/>.
7. "Aluminum Bridge One of Very Few." *The Massena Observer* (Massena), Aug. 20, 1985.
8. Stacey, Michael. *Aluminium: Sympathetic and Powerful Towards Sustainable Cities*. Llundain: Cwningen Press, 2017. <https://international-aluminium.org/wp-content/uploads/2021/03/Aluminium-Sympathetic-and-Powerful-TSC-1.pdf>.

Endnotes:

¹ *The Smithfield Street Bridge in Pittsburgh, Pennsylvania, looking from upstream, in 1933*, accessed September 25, 2023, <https://www.brooklineconnection.com/history/Facts/Smithfield.html>.

² William Wright, "Building The Bridge to The 21st Century with Aluminum," *Public Roads – Spring 1997* 60, no. 4 (Spring 1997), <https://www.fhwa.dot.gov/publications/publicroads/97spring/alum.cfm>.

³ "Aluminum Floor for an Old Bridge," *The Engineer* 157 (1934): 91.

⁴ *Replacement on the Smithfield Street Bridge in 1933*, accessed September 25, 2023, <https://www.brooklineconnection.com/history/Facts/Smithfield.html>.

⁵ *Replacement on the Smithfield Street Bridge in 1933*, accessed September 25, 2023, <https://www.brooklineconnection.com/history/Facts/Smithfield.html>.

⁶ *Massena fabricating mill*, "Alcoa Massena, New York," National Aluminum Production Heritage Association, accessed September 25, 2023, <https://www.naphausa.org>

⁷ *Massena Operations employees*, "Alcoa Massena, New York," National Aluminum Production Heritage Association, accessed September 25, 2023, <https://www.naphausa.org>.

⁸ "All-Aluminum Bridge Span Makes Debut," *Railway Age* 122, no. 2 (1947): 137.

⁹ Russ Nelson, *Massena-Terminal-Railroad*, November 25, 2008, Massena, accessed September 25, 2023, <https://www.flickr.com/photos/russnelson/3058227288/>.

¹⁰ "Aluminum Bridge One of Very Few," *The Massena Observer* (Massena), Aug. 20, 1985.

¹¹ "All-Aluminum Bridge Span Makes Debut," *Railway Age* 122, no. 2 (1947): 137.

¹² *Lowering one of the girders into position to complete the shop assembly of the all-aluminum span*, "All-Aluminum Bridge Span Makes Debut," *Railway Age* 122, no. 2 (1947): 137.

¹³ *Pre-assembled 100 foot, aluminum, deck plate-girder span being transported*, "All-Aluminum Bridge Span Makes Debut," *Railway Age* 122, no. 2 (1947): 137.

¹⁴ *Setting the 100-ft. all-aluminum span, completely assembled, with a single 30-ton erecting crane*, "All-Aluminum Bridge Span Makes Debut," *Railway Age* 122, no. 2 (1947): 136.

¹⁵ *Timeline Aluminum Bridges from the Jazz Age to the Digital Age*, Michael Stacey, *Aluminium: Sympathetic and Powerful Towards Sustainable Cities* (Llundain: Cwningen Press, 2017), <https://international-aluminium.org/wp-content/uploads/2021/03/Aluminium-Sympathetic-and-Powerful-TSC-1.pdf>, 304.



When I came to SLCHA in 2019, I was delighted to return to St. Lawrence County — reuniting with old friends, meeting new people, and continuing to learn history about the "County of my heart."

After being here almost 4.5 years, it's time to head back closer to my home area among the Indian River lakes in Jefferson County. I'll miss SLCHA and you!

Aloha! (My last day was 10/27)

- Tracy