Charles Conrad Schneider

By Frank Griggs, Jr., Ph.D., P.E., P.L.S.

Charles Schneider was born in Apolda, Germany and received his engineering education at the Royal School of Technology at Chemintz, Germany. After graduating in 1864, he worked as a mechanical engineer before immigrating to the United States in 1867. He went to work for the Paterson Locomotive Works for four years before going on to the Michigan Bridge and Construction Company in Detroit. This was his first professional involvement with bridges which would occupy most of his career. In 1873, he went to work for the Erie Railroad in New York City. Here he worked for Octave Chanute, who designed the Kansas City Bridge, the first bridge over the Missouri River in 1867-68. In addition, George Morison, who had worked with Chanute on the Kansas City Bridge, was there as his Principal Assistant Engineer. While with the Erie, "one of his duties was to check the strain sheets and plans submitted by bridge companies... Bridge work up to this time had usually been let on a competitive lump-sum basis. Mr. Schneider soon found that this method was unsatisfactory, and the Railroad Company's officials decided to make their own plans; and it was Mr. Schneider's duty to prepare them..."

In 1875, he went with Chanute who was selected as one of the Board of Engineers to review proposals for a bridge at Blackwell's Island across the East River in New York City. While reviewing them, he met Charles Macdonald who eventually won the competition. After leaving this position, he went to work for a year with the Delaware Bridge Company and Macdonald. During this period the Delaware Bridge Company had an agreement with the Edgemoor Iron Company to fabricate all of their bridges. Schneider was stationed at the Edgemoor Company, where he designed and supervised construction of several bridges including the Pennsylvania Railroad Rockville Bridge, 23 spans of 160 feet with two tracks, over the Susquehanna River and the Cohoes Bridge over the Mohawk River on the Delaware and Hudson Railroad.

From 1879-1883, he was associated with George Morison on the Plattsmouth, Bismarck and Blair Bridges across the Missouri River as well as the Snake River Bridge at Ainsworth, Washington. His mentors, Macdonald, Chanute and Morison were some of the most renowned bridge engineers of the time.

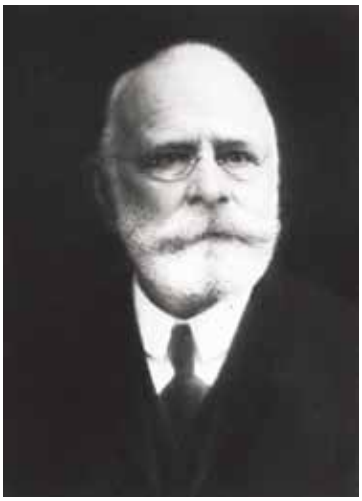
In 1883, he set himself up in business as a "civil engineer in New York making a specialty of designing and superintending bridges and structural work for buildings." One of his first large clients was the Canadian Pacific Railway which was racing westward in competition with Jim Hill's Great Northern. One of Schneider's first jobs was to design wooden Howe Trusses, his most famous being the Stoney Creek Viaduct in the Selkirk

Schneider's Second Stoney Creek Viaduct.

Mountains. The only iron in the bridge was the wrought-iron verticals and miscellaneous bolts and plates. Even though built of wood and considered to be a temporary bridge, it survived until 1893 and was replaced by a steel arch bridge designed by Schneider.

He was asked to design an iron bridge, just west of his Stoney Creek Viaduct, over the Fraser River. This river was a fast flowing stream which precluded placement of falseworks in the river bed. Schneider, based upon his previous exposure to the Blackwell's Island Bridge competition, decided to build this bridge using cantilever techniques. He

Fraser River Bridge.



C. C. Schneider

completed a design of the 525-foot span, located 125 feet above the river, in the spring of 1882. Due to slowness of the iron delivery, even though it was the first cantilever designed by Schneider, it would not be completed until 1887. It lasted until 1910, when it was replaced by a new steel bridge.

On October 13, 1882, the Michigan Central Railroad asked Schneider to submit a proposal for a bridge across the Niagara Gorge near Roebling's suspension bridge. They wanted "an estimate for a double-track railroad bridge of 900 feet clear span, for the purpose of ascertaining the probable cost of bridging the Niagara below the Falls... intimating that a braced arch reaching from cliff to cliff might be the proper design for the proposed structure." He submitted his completed design to the Central Bridge Works of Buffalo, New York who in turn submitted a tender to the Niagara Bridge Company. The tender was accepted by the Board of Directors on April 11, 1883.

The erection technique worked out by Central Bridge Company and Schneider became the pattern which was followed on many cantilevers in the future. They started by building their towers and anchor spans from falsework resting on rock banks. They designed and built two travelers to erect the rest of the bridge. The travelers worked outward on each cantilever until they reached the end of the cantilever span. The suspended span was 120 feet long and the maximum reach of each traveler was 40 feet. Schneider did not want the traveler to go beyond the end of the cantilever span, as he did not want to overload the cantilever span or anchorage. This left 40 feet of suspended span that could not be erected by the travelers. He

Niagara Cantilever from a postcard.

solved this by placing wooden beams across the 40-foot gap and erecting the rest of the truss by hand methods.

The speed at which the bridge was erected was impressive, with the entire bridge taking four months. What Schneider and Central Bridge did was to erect the superstructure of a new style bridge, using new techniques, over 900 feet long and 230 feet over the Niagara River in less than two months.

In June 1885, three commissioners were appointed to oversee building of a bridge across the Harlem River near John Jervis' High Bridge. They set up a design competition and offered premiums of $1,500, $1,000 and $500 to the top three entries. On December 3, 1885 seventeen designs were submitted. Designs of the Union Bridge Company, Edward Shaw, Julius Adams, C. C. Schneider and Wilhelm Hildenbrand were favored by the commission. To help them in making a decision, they formed a Board of Experts consisting of Theodore Cooper, P. P. Dickinson, Edward Kendall and McAlpine to review the plans. The Commission recommended Schneider's design for the first premium. The design was modified by the Union Bridge Company, and the bridge was completed on February 22. It wasn't totally opened until December 1889, when residents tore down the barricades and started using the bridge.

In 1886, he entered into a partnership with the Pencoyd Iron Works to design, fabricate and erect their bridges. During this period, Schneider designed or built the Delaware River Bridge for the Pennsylvania Railroad, L. L. Buck's record setting arch bridge over the Niagara River below the falls, The James River Bridge for the Chesapeake and Ohio Railroad and many other smaller bridges in the United States, Mexico and Japan.

One of his potentially greatest bridges was at Blackwell's Island where, in 1893, the Long Island Railroad Company was planning a bridge across the East River. Schneider was selected as engineer and designed a cantilever bridge crossing the two river channels and the island. It had two identical cantilever spans of 810 feet in the clear, 840 feet center to center of piers, making them the longest cantilevers in the United States. Foundations were started, and steel contracts for the superstructure awarded in March 1895. After a fast start the company ran out of funds and construction halted.

He remained with Pencoyd until 1900, when it was purchased by the American Bridge Company, a J. P. Morgan led consolidation of 28 of the largest steel fabricators and constructors in the United States. At American Bridge Company, he was appointed Chief Engineer as well as Director and Vice President until 1903, and then until his death as Consulting Engineer. The President of the firm noted, "Mr. Schneider, without question, stood at the very head of his profession. And, in addition, I believe never had an enemy in his entire career." In 1903 he, along with Theodore Cooper, was appointed by the Government of Japan to develop sets of plans for Japanese railroad bridges,

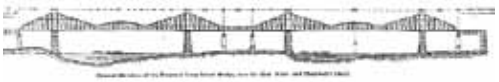
Around 1895, Theodore Cooper suggested Schneider should take his place as consulting engineer before construction of the Quebec Bridge commenced, due to his age and declining health. The bridge company did not accept this recommendation, and Cooper continued in nominal charge with the Phoenix Bridge Company taking over more and more of the design. In 1907, after the August failure of the bridge, Schneider was selected to investigate the failure of Cooper's Bridge. He wrote an extensive report on the bridge design which was included with the Report of the Royal Commission. He was asked to respond to three questions, the most important being, "The advisability of discarding the present plans of the Quebec Bridge, and recommendations as to a new design." Schneider's report was finished early in 1908, but not released until the Commission's report was released. He, after a lengthy structural analysis of the bridge, had eight conclusions, the most important being, "The present design is not well adapted to a structure of the magnitude of the Quebec Bridge and should, therefore, be discarded and a different design adopted for the new bridge, retaining only the length of the spans in order to use the present piers."

On May 17, 1911, Schneider was appointed a full member of the Board that was to oversee design and construction of the replacement bridge, serving with Charles Monsarrat and Ralph Modjeski. Schneider died January 8, 1916, eight months before another major bridge failure when the suspended span being lifted into place slipped off its supports into the river resulting in the deaths of 13 men. The bridge was finally opened on October 27, 1917.

Washington Bridge over the Harlem River.

Schneider was active in ASCE, serving as Director, Vice-President and President in 1905. He won the Rowland Prize for his paper *The Cantilever Bridge at Niagara Falls* in 1886, the Norman Medal for his paper *The Structural Design of Buildings* in 1905 and *Movable Bridges* in 1908. In addition, he contributed to many discussions of the papers of his colleagues.

His memoir in the *Transactions ASCE* noted, "Mr. Schneider was dearly beloved by his many friends on account of his sterling character and his kindly disposition. He was always willing and ready to assist brother engineers with advice, giving to them freely from his rich fund of knowledge, and large indeed is the number of engineers today in responsible positions, who owe their training and their position to him. He was most democratic in his ways and of a lovable disposition, and gained, in the highest degree the respect of everybody who came in contact with him. He always stood for good work, good designs, and good details, and the Engineering Profession is greatly indebted to him for the present high standard that has been obtained in bridge and structural work. His was a most useful life, well lived, an example and an inspiration to the Profession, that will remain in the memory of all who had the privilege of knowing him."▪



Schneider's Blackwell's Island Plan.

Dr. Griggs specializes in the restoration of historic bridges, having restored many 19th Century cast and wrought iron bridges. He was formerly Director of Historic Bridge Programs for Clough, Harbour & Associates LLP in Albany, NY, and is now an independent Consulting Engineer. Dr. Griggs can be reached via email at ***fgriggs@nycap.rr.com****.*