ADVANCES IN THE APPLIED ARTS & SCIENCES Part 4

William Scherzer, American Engineer & the Scherzer Rolling Lift Bascule Span

By John Marhoefer

Even though William Scherzer was young and relatively inexperienced, he had the ability to grasp a technical challenge and reimagine it in a new and innovative way. The American engineer, William Scherzer, died in 1893, at the early age of 35. Yet, during his brief professional career of barely 13 years he made significant and lasting contributions to bridge design by solving a movable bridge limitation that had perplexed engineers for generations. The Scherzer Rolling Lift Bascule Bridge illustrated how innovation could dramatically improve even well-used and time tested means and methods.

Scherzer lived during the peak of the Industrial Revolution. Advancements in industry, technology and transportation combined with socio-economic changes in the populations of Western Europe and America resulted in an increasing demand for and need to move chattel and people by ship and rail. The invention of the steam engine and its application in ships and railroad locomotives, created the modes of transportation able to meet this demand. However, the increased use of ships and railroads created other challenges.

Railroads were built to minimize changes in elevation along the route. Therefore when railroad alignments crossed waterways the bridges were designed to keep elevation changes to a minimum. However, such low level bridges impeded ship traffic on navigable waterways unless the bridge was moveable, that is, a drawbridge.

Moveable bridges had the flexibility to carry rail or road traffic when 'closed' yet could be 'opened' to permit the passage of vessels. Historically, two types of moveable bridges, the center pier swing span and the trunnion bascule type, were commonly used. *(While lift spans*

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com

were also in use, this design did not enjoy the same level of popularity for use.) However, the increasing need for railroad and ship traffic to co-exist, elicited significant developments in moveable bridge building and technology throughout the 1800's.

Center Pier Swing Bridge in Open Position

Twin Leaf Trunnion Bascule Span in Open Position

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com

While these bridge designs were effective choices in many settings, as the density of rail lines and road traffic increased, especially within growing cities, the limitations of these bridges became increasingly apparent.

View of the Chicago River illustrating density of crossings.

Center pier swing bridges required that a pier be built at or near the middle of the waterway and therefore diminished the width available for boat traffic. On narrow waterways, where width could already be an issue, the swing bridge made a poor choice. Furthermore, no other structures could be built within the radius of the swing bridge severely limiting the number of crossing points available.

By contrast, trunnion-mounted bascule bridges could be built within close alignment of each other. Still, due to the nature of their operation and design they often encroached on the width of the navigable waterway.

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com

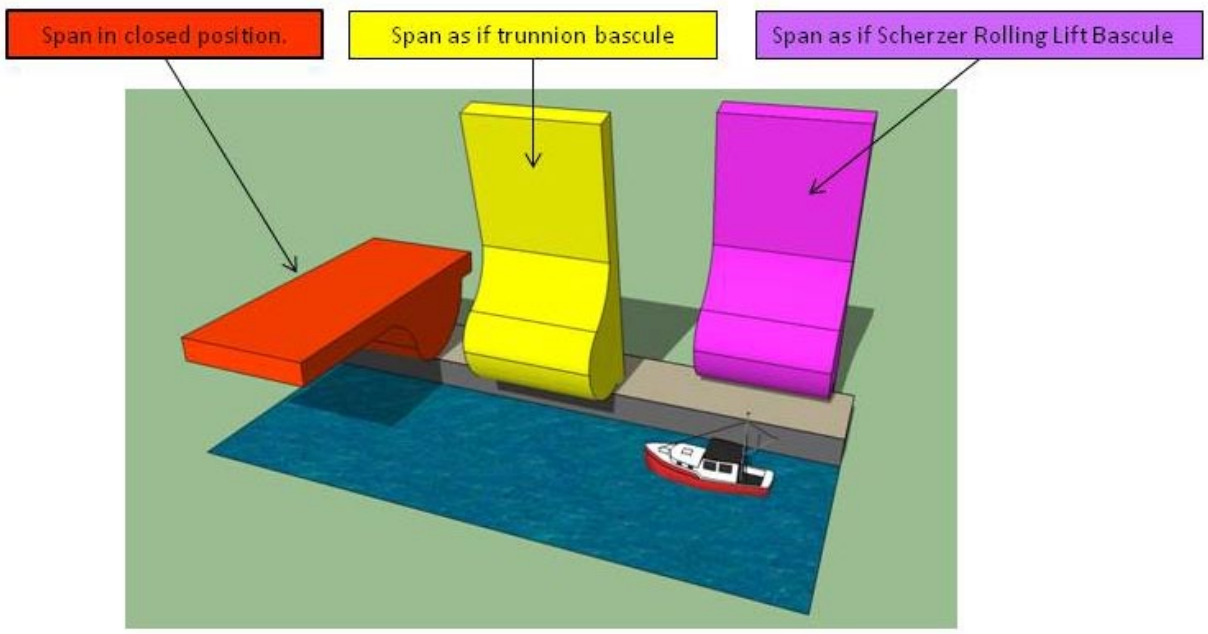
This was the state of movable bridge design when, in the early 1890's, the Metropolitan West Side Elevated Company set out to determine what kind of bridge to build to carry its four tracks across the Chicago River. The site, between Jackson and Van Buren Streets, was impractical for a swing bridge as such a bridge would strike the adjacent swing bridges. A pivot bascule structure, a better, but still poor choice was all but decided upon, when Mr. William Scherzer was brought into the consultation.

Within months Scherzer created an insightful design for what came to be known as the Scherzer Rolling Lift Bascule Span. Beautiful in its simplicity and obvious once executed, it took the innovative perception of Scherzer to perfect and implement the rolling lift design.

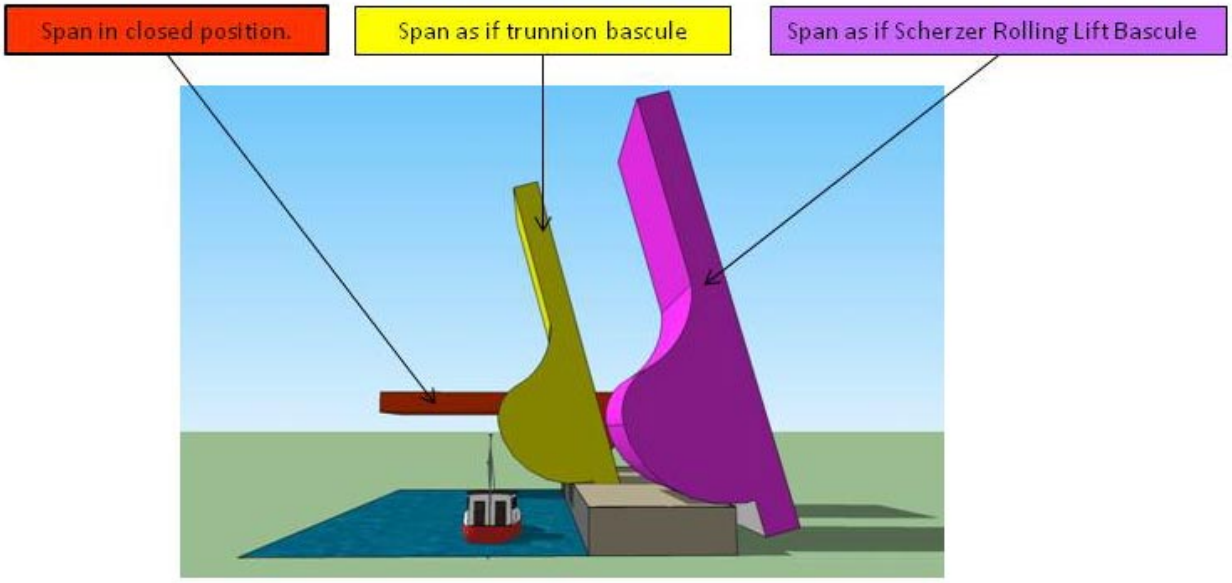
Scherzer's design was patented, vigorously advocated and widely used in the United States and several other countries in the industrialized world. The design was attractive to bridge builders for several reasons. First, the relative simplicity of its construction made it more cost effective to build. Second, the clear channel width it allowed did not encroach on the width of the navigable waterway. Third, it used a relatively small amount of power to operate due to the substitution of rolling friction for sliding friction in the trunnion journal bearings of the time.

For the Metropolitan West Side Elevated Company the deciding factor was the clear channel width as illustrated below.

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com



Comparison of Trunnion Bascule Span with Scherzer Rolling Lift Design.
Notice how the Scherzer Rolling Lift retreats from the edge of the pier as it is raised.



Side View of Trunnion Bascule Span with Scherzer Rolling Lift Design.
Notice how the Scherzer Rolling Lift retreats from the edge of the pier as it is raised.

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com

Scherzer Rolling Lift design partially opened.
Notice that span has further to 'roll' to open to a greater degree.

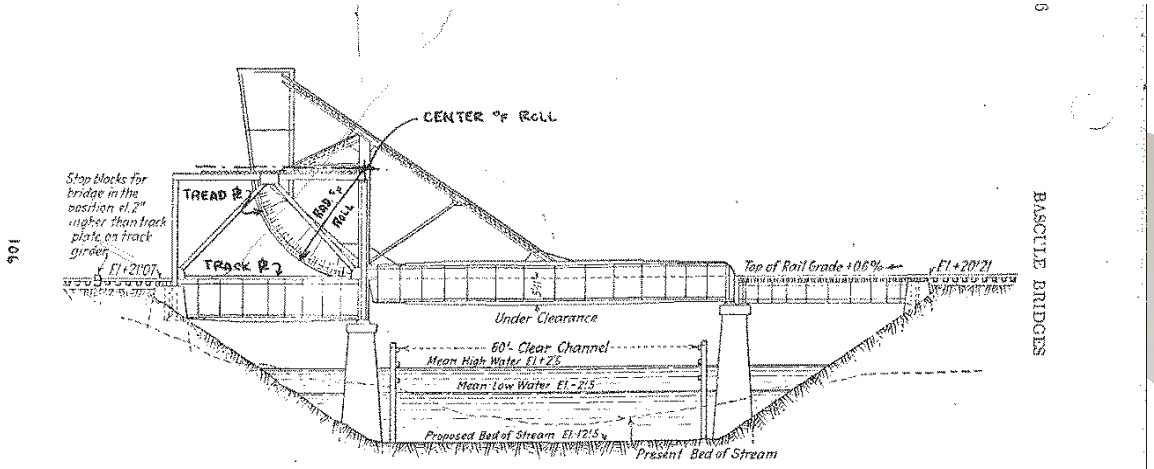


FIG. 4M.
CENTRAL R.R. OF N.J. - ELIZABETH RIVER - ELIZABETH, N.J. - 1912
SCHERZER ROLLING LIFT BASCULE

106 6 BASCULE BRIDGES [CHAP. IV

Scherzer Rolling Lift in Closed Position.

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com

In May 1893, two months before his death, William Scherzer filed a patent for a lift bridge which was granted the following December as No. 511,713. Its principal claim, and the feature which distinguishes all Scherzer spans, is:

> A lift-bridge having a moveable span provided at one end with a curved part adapted to rest and roll upon a stationary supporting surface. Other characteristics noted in the patent include: teeth or projections on the said curved part adapted to interlock with projections on the supporting surface to hold the said curved part from moving or slipping on said surface; and means for moving the span, comprising a horizontally moving part connected with the span at or near the central point of said segmental or sector-shaped part.

After his death, William Scherzer's work was taken up by his brother, Albert H. Scherzer who organized the Scherzer Rolling Lift Bridge Company. In the following decades, many rolling lift bridges were built, both for rail and highway traffic. In a 1902 letter to the Railroad Gazette, Albert Scherzer wrote that more Scherzer rolling lift bridges had been built than all other types of bascules combined, a testament to the design's effectiveness.

In the 1908 Historical Review of Chicago & Cook County and Selected Biography, A.N. Waterman summed up Schrzer's contributions in the following tribute:

> ***William Scherzer [was] the inventor and patentee of what is acknowledged to be one of the most useful mechanisms of the generation. [His] invention has been of great benefit in the advancement of commerce and civilization. [Scherzer's contribution] has facilitated and made possible the opening and development of the great rivers, canals and waterways throughout the world for the passage of the largest vessels of commerce.***

10602 Satellite Blvd.
Orlando, FL 32837
P 407.251.9898
F 407.251.9904
www.entechcreative.com
info@entechcreative.com