Today in History - June 12



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Roebling and the Brooklyn Bridge

On **June 12**, 1806, John A. Roebling, civil engineer and designer of bridges, was born in Mühlhausen, Prussia. The Brooklyn Bridge, Roebling's last and greatest achievement, spans New York's East River to connect Manhattan with Brooklyn. When completed in 1883, the bridge, with its massive stone towers and a main span of 1,595.5 feet between them, was by far the longest suspension bridge in the world. Today, the Brooklyn Bridge is hailed as a key feature of New York's City's urban landscape, standing as a monument to progress and ingenuity as well as symbolizing New York's ongoing cultural vitality.



New York & Bridges from Brooklyn. Irving Underhill, c1913. Panoramic Photographs. Prints & Photographs Division

John A. Roebling came to design suspension bridges through his earlier work on canals. Trained as an engineer at Berlin's Royal Polytechnic Institute, Roebling emigrated to the United States in 1831, helping to settle the farming community of Saxonburg in western Pennsylvania. He was soon employed to work on the extensive canal system then being built for travel across the state. One element of that system was a series of inclined planes used to haul barges along railway tracks over steep terrain. Troubled by their reliance on dangerously breakable hemp rope, in about 1839, Roebling turned his efforts toward the manufacture of strong but flexible wire rope as an alternative. Roebling's invention soon was being used by the Allegheny Portage Railroad; he received a patent for his "new and Improved Mode of Manufacturing Wire Ropes" in 1842.

Roebling quickly found additional uses for his invention. His first wire cable suspension bridge (1844-45) was a wooden aqueduct that carried Pennsylvania's main east-west canal above and across the Allegheny River into downtown Pittsburgh. He received additional patents in 1846 and 1847. Roebling's Delaware Aqueduct (1847-48) followed closely on his earlier design and is the oldest surviving suspension bridge in America. In pursuing these projects, Roebling developed a viable method of spinning the heavy wrought iron wire cables on site, as well as a simple and secure way to anchor them—both of which made the construction of long suspension bridges feasible.

Roebling moved his family to Trenton, New Jersey, in 1848, where he established a business manufacturing twisted wire cable for a wide variety of engineering applications. (This successful business continued as the John A. Roebling's Sons Company through the mid-twentieth century.) Bridges that Roebling designed, such as the Niagara River Gorge Bridge (1855) and Pittsburgh's Sixth Street Bridge (1859) were admired for their technical innovation as well as their expressive design. His Covington & Cincinnati Suspension Bridge (1856-67), which was itself the longest suspension bridge of its time, served in part as a prototype for his monumental East River project.



On the Promenade, Brooklyn Bridge, New York. Strohmeyer & Wyman, c1899. Stereograph Cards. Prints & Photographs Division

New Yorkers had long desired a bridge directly linking Manhattan and Brooklyn, which were by 1860 the country's first and third largest cities, respectively. Roebling's first plan for an East River bridge, developed in the 1850s, was nearly as ambitious as the one that was eventually built. In late 1866, a private Brooklyn-based venture called The New York Bridge Company was founded (with the infamous Boss Tweed as a trustee). Roebling—whose Cincinnati bridge had just opened to great acclaim—was soon hired as chief engineer.

Roebling planned his Manhattan and Brooklyn Bridge (its most official name at the time) to be made with newly available steel wire, which allowed it to be stronger, larger, and longer then any bridge yet built. The two-tier design offered cable car transportation as well as roadways for vehicles and an elevated pedestrian promenade. The project soon met with full approval, receiving New York state funding as well as Congressional authorization by 1869.

In July 1869, soon after construction of the Brooklyn Bridge began, John Roebling died from tetanus contracted when his foot was crushed in an accident on site. Almost immediately, Roebling's 32-year-old son and partner, Washington A. Roebling, was named chief engineer in his place. Other mishaps, including an explosion, a fire, contractor fraud, and Washington Roebling's own illness, hampered timely completion of the project.

Pressurized pneumatic caissons, eventually sunk to a depth of 44.5 feet on the Brooklyn side and 78.5 feet on the Manhattan side, provided dry underwater space for workers to dig the bridge's foundations down to solid rock. Alas, working in the caissons often brought on "the bends"—a serious medical condition caused by moving too quickly out of a high-pressure atmosphere. Washington Roebling himself was among the many workers permanently impaired (or in some cases killed) by this little-understood "caisson disease," now known to be decompression sickness. As a result of his disability, after 1872, Washington Roebling's wife, Emily, became actively involved in supervising construction—carrying messages and instructions back and forth between the bed-ridden chief engineer and his staff.



New York—Completing A Great Work—Lashing the Stays of the Brooklyn Bridge/from a sketch by a staff artist. Illus. in: *Frank Leslie's Illustrated Newspaper*, April 28, 1883, [149]. Prints & Photographs Division

In 1876, with the bridge towers completed to their final height of 277 feet above water, construction of the four great cables that suspend the bridge's roadway began. The longest and heaviest cables that had ever been made (containing over 14,000 miles of wire weighing almost 3,500 tons) were created using the same method that John A. Roebling had patented some thirty years before. Because of the scale of the operation, just making the cables took eighteen months. When it came time to finally build the bridge's deck, steel-manufacturing technology had improved so much that it was possible to use steel instead of iron, further strengthening the bridge. With the deck floor in place, the bridge's supporting trusses were assembled and the visually stunning diagonal stays that stabilized the cable system were installed.

The Brooklyn Bridge opened to citywide celebration on May 24, 1883. Over the next hundred years, the bridge became part of the romance of New York City. Poets and artists have long found the bridge a worthy subject and the Brooklyn Bridge continues to serve as the backdrop in countless photographs and films.

On September 11, 2001, the Brooklyn Bridge took on a different form of symbolism. In the wake of the attacks on the World Trade Center, thousands of pedestrians used the bridge to escape Lower Manhattan on foot.



Night View Looking NW Showing Bridge Lighted. Jet Lowe, photographer, 1982. Brooklyn Bridge Spanning East River...Brooklyn, New York County, NY. Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey. Prints & Photographs Division

New Brooklyn to New York via Brooklyn Bridge, no. 2



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New Brooklyn to New York via Brooklyn Bridge, no. 2. James H. White, production; United States: Edison Manufacturing Co., 1899. Inventing Entertainment: the Early Motion Pictures and Sound Recordings of the Edison Companies. Motion Picture, Broadcasting & Recorded Sound Division

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- Detroit Publishing Company contains over fifty photographs of the Brooklyn Bridge, including pictures of the Manhattan entrance and the approach from the Brooklyn side. Search the collection on *Brooklyn Bridge*. Examine a collection of stereoscopic views of the Brooklyn Bridge, part of the New York Public Library's Robert N. Dennis Collection of Stereoscopic Views 7, that include many construction photographs. Search the Dennis collection on *New York* or *Brooklyn* for additional city views. Search the Library of Congress pictorial collections for even more views of the bridge.
- The Life of a City: Early Films of New York, 1898 to 1906 includes two filmic panoramas that feature the Brooklyn Bridge, as well as many related New York landmarks.
- Several Today in History pages focus on New York City landmarks. Read features on the Metropolitan Opera House, Radio City Music Hall, the New York Subway System, the New York Public Library, the Empire State Building and Central Park.
- Search Panoramic Photographs on *bridges* to access almost 100 remarkable panoramic photographs of bridges.
- The John A. Roebling's Sons Company contributed to the construction of many major suspension bridges in the United States, including the George Washington Bridge, Golden Gate Bridge, and Williamsburg Bridge. Search on bridge and on other engineering terms such as aqueduct, canal, factory, or railroad to find engineering surveys in Historic American Buildings Survey/Historic American Engineering Record/Historic American Landscapes Survey, or browse the collection by place to find a broad variety of New York and Brooklyn structures.
- President George Washington signed the first federal patent law in 1790. The present Patent Office was established in 1836. Today, the United States Patent and Trademark Office provides a database of all U.S. patents ever issued. John A. Roebling's important bridge-related patents include No. 2720 (July 16,1842), No. 4710 (August 26, 1846), and No. 4945 (January 26, 1847). These patents document Roebling's method for manufacturing and using wire cable in suspension bridge construction.





