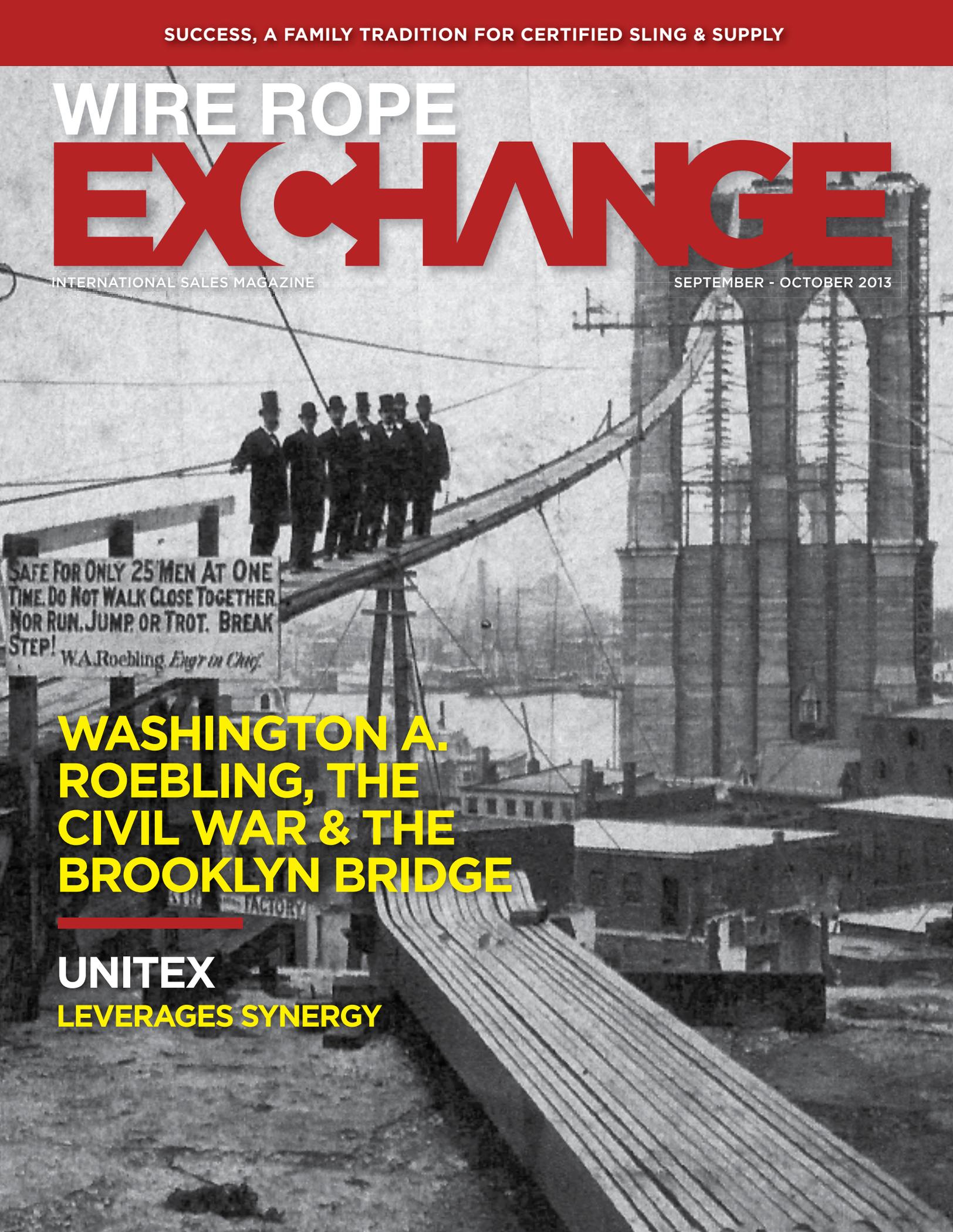


SUCCESS, A FAMILY TRADITION FOR CERTIFIED SLING & SUPPLY

# WIRE ROPE EXCHANGE

INTERNATIONAL SALES MAGAZINE

SEPTEMBER - OCTOBER 2013



SAFE FOR ONLY 25 MEN AT ONE  
TIME. DO NOT WALK CLOSE TOGETHER.  
NOR RUN, JUMP, OR TROT. BREAK  
STEP!  
*W.A. Roebling, Engr in Chief*

## WASHINGTON A. ROEBLING, THE CIVIL WAR & THE BROOKLYN BRIDGE

---

**UNITEX**

**LEVERAGES SYNERGY**



20 Celebrating 130 years of history



26 Strategic coordination weaves Unitex together



Certified Sling & Supply relies on a tradition of core values

76

# WIRE ROPE EXCHANGE

SEPTEMBER/OCTOBER 2013

VOLUME 28 | ISSUE 5

[FEATURES]

**20 | WASHINGTON A. ROEBLING, THE CIVIL WAR & BUILDING BROOKLYN BRIDGE**

The Roebling family played a pivotal role in many iconic structures throughout the United States. Renowned writer and historian, Clifford Zink, discusses the remarkable life of Washington A. Roebling and the Brooklyn Bridge as we celebrate the 130th anniversary.

**26 | UNITEX LEVERAGES SUPERIOR SYNERGY**

Part of a large, multi-national manufacturing company specializing in synthetic slings and tie-down products, Unitex has made a strong footprint in the U.S. in the past few years to complement a growing trend in its other locations worldwide. Citing success from strategic coordination of many companies under one roof; Unitex is uniquely positioned to continue this pattern of manufacturing growth and product innovation.

[WRE CATALOG GUIDE]

**31 | WHATS NEW**

Modulift unveils the CMOD Spreader Frame; Columbus McKinnon launches the CM Bandit Ratchet Lever Hoist in Canada; Miller Lifting Products Announces the introduction of DIN Hook Latches and much more.

**33 | WRE CATALOG GUIDE**

View the latest product offerings and updated listings.

[IN THIS ISSUE]

- 2 | EDITOR'S NOTE
- 7 | INDUSTRY NEWS
- 19 | WRE SPOTLIGHT
- 76 | WRE UPDATE | BUSINESS
- 79 | ADVERTISER'S INDEX
- 80 | RIGGER'S CORNER

**ON THE COVER: BROOKLYN BRIDGE CONSTRUCTION, MAY 1877.** As the first cable wires were readied for running across the towers, bridge company directors gathered ceremoniously on the Brooklyn Tower footbridge. Washington A. Roebling's sign admonished footbridge users, "Do not walk close together, nor run, jump or trot. Break step!" The eyebars in the foreground were used to connect the cables to large plates at the bottom of the anchorage. *Collection of Robert M. Vogel*

Wire Rope Exchange  
September/October 2013, Vol. 28, Issue 5

Wire Rope Exchange is published bimonthly by Wire Rope Exchange, P.O. Box 159323, Nashville, TN 37215. Periodical postage pending at Nashville, TN and additional mailing offices. U.S. and International Annual Subscription rate: \$124. Complimentary subscriptions are given on a controlled circulation basis.

WIREROPEEXCHANGE.COM | 800.643.5189

**“I’VE LIVED THROUGH HARD TIMES BEFORE AND I CAN DO IT AGAIN:”**

**WASHINGTON A. ROEBLING,  
THE CIVIL WAR AND BUILDING**

# **BROOKLYN BRIDGE**

**CLIFFORD ZINK**

**Two anniversaries this year highlight the remarkable life of Washington A. Roebling,** who served as the chief engineer of the Brooklyn Bridge (Fig. 1) and as the president of the John A. Roeblings Sons Company, which for many decades was the primary manufacture of wire rope in the U.S.

The Brooklyn Bridge opened to world acclaim 130 years ago in 1883, and at the Battle of Gettysburg 150 years ago in 1863, Washington Roebling notably helped the Union Arm defend the key position of Little Round Top from a Confederate assault.

Washington was born in 1837 in Saxonburg, Pennsylvania, the town founded by his father, John A. Roebling, the German-born engineer who was the preeminent designer and builder of suspension bridges in the 19th Century. John completed the Niagara Falls Suspension Bridge in 1855, the Cincinnati-Covington Suspension Bridge (now known as the John A. Roebling Bridge), in 1867, and he designed the Brooklyn Bridge and served as its Chief Engineer until his death in 1869 from an injury while preparing for its construction.

While working as an engineer for the Pennsylvania Canal System in 1841, John made a wire rope on his Saxonburg farm to replace the costly hemp ropes used to haul canal boats on inclined planes over the Allegheny Mountains. He had never seen a wire rope but had read about this innovation in Germany, and he devised a rope walk that removed the twist in wires as they were wound around a core wire, a process that he recognized as essential. He remarkably made 19-wire strands and twisted them into 1½ in., 7x19 wire ropes for the inclined planes.

As demand grew for his engineering work and his wire ropes, John moved in 1849 to a site in Trenton on the Delaware & Raritan Canal that was suggested by Peter Cooper, the famous iron master and founder of Cooper Union in New York. Cooper



**Fig. 1: The Great East River Suspension Bridge, Connecting the Cities of New York and Brooklyn, 1884.**  
Library of Congress

thought that Roebling would buy wire from his Trenton Iron Company across the canal, but Roebling instead drew his own wire and Cooper subsequently started making wire rope. The two factories competitively manufactured wire rope for more than 125 years. American Steel & Wire Company acquired the Trenton Iron plant in 1903, and Bridon American acquired it in 1984 and operated it until 1987. Colorado Fuel and Iron Company acquired the Roebling plant in 1953 and operated it until 1973.

John Roebling sent Washington, his first child, to study engineering at Rensselaer Polytechnic Institute, founded as the nation's first engineering school in Troy, N.Y., in 1824. After graduating from RPI in 1857, Washington helped his father complete the Allegheny Suspension Bridge in Pittsburgh in 1859, and then worked at the Roebling factory in Trenton.

Three days after the attack on Fort Sumter in April 1861, Washington enlisted in the New Jersey Militia (Fig. 2). Two months later he joined the 9th New York Regiment and served with an artillery brigade in Maryland and Virginia, where

he witnessed the battle of the Monitor and the Merrimack. Fearing that the Merrimack might sail up the Potomac, the Army leadership decided to barricade the river. As Washington later recalled,



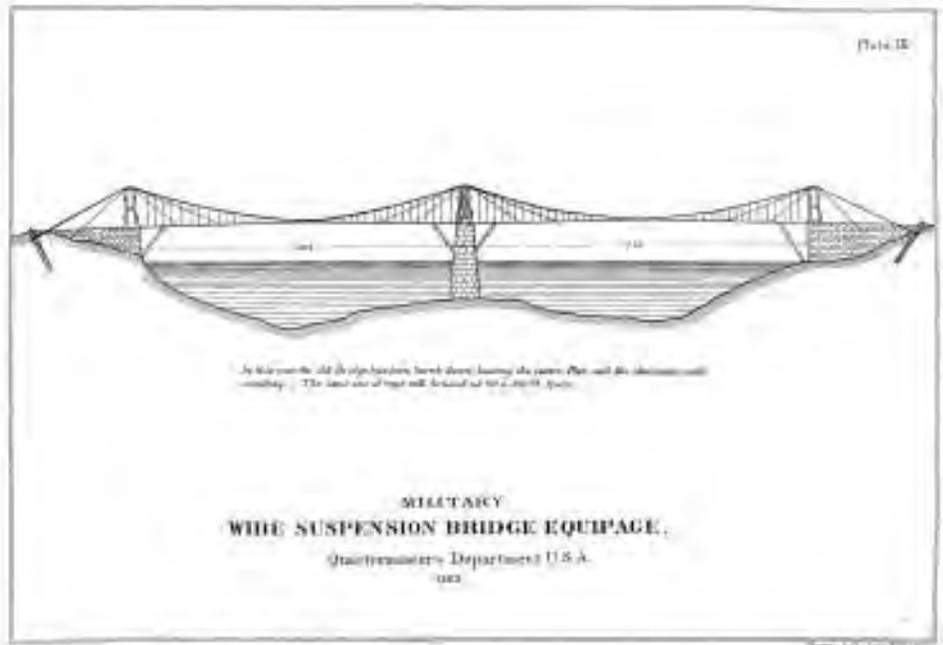
*Two plans were proposed - one, to load a number of canal boats with stone and sink them in the channel. Another, to support a lot of chain or big wire ropes on buoyant logs and anchor them to the shore. Large chains would have taken too much to make, so General Montgomery Meigs (the Army Quartermaster) telegraphed to Trenton for John A. Roebling to come down to make the necessary arrangements. He came and got the order. . .*

**Fig. 2: Washington A. Roebling served in the Union Army from April 1861 to January 1865, rising to the rank of Lieutenant Colonel. He participated in the battles of Second Bull Run, South Mountain, Antietam, Chancellorsville, Gettysburg, the Wilderness, Spotsylvania and Petersburg. The Roebling Museum in Roebling, N.J., is currently featuring an exhibit on Washington Roebling's Civil War service." Rensselaer Polytechnic Institute**

*While my father was consulting with General Meigs, the General stated that light military suspension bridges would be a good thing for the army to have. My father thought so, too, mentioning at the same time that he had a son in the army with sufficient technical experience to put them up...*

*Arriving in Washington, I was ordered to write a book on military suspension bridges, which I did in three weeks.*

The Army Quartermaster's Department published 500 copies of Washington Roebling's booklet, in May 1862, (Fig. 3) and General Meigs subsequently ordered Roebling to build a suspension bridge over the Rappahannock River near Fredericksburg, Va., to replace a bridge destroyed by Confederate soldiers. With wire ropes supplied by his father in Trenton,



**Fig. 3: Instructions for Transport and Erection of Military Wire Suspension-Bridge Equipage.** Quartermaster's Department, U.S. Army, 1862. Written by Washington Roebling in 1862, the booklet's "Bill of Materials" for 150 and 200-ft. spans specified 1 1/2 in. diameter main suspension ropes, 1/2 in. diameter suspender ropes, and 7/8 in. diameter guy ropes. Washington built temporary suspension bridges for the Union Army over the Rappahannock and Shenandoah Rivers. *Rensselaer Polytechnic Institute*

**“Arriving in Washington, I was ordered to write a book on military suspension bridges, which I did in three weeks.” - Washington A. Roebling**

Roebling built the 1,000 ft. long bridge on 14 piers of the old bridge, and as he later recalled,

*It was in use over a month. When the place was evacuated, General Burnside blew up the anchorage, precipitating the bridge and cables into the river. The rebels later fished them out and used them as ferry ropes down south... One never knows what military exigencies may compel the abandonment of such structures.*

In early 1863, Washington was assigned to Brigadier General Gouverneur Warren, the Chief Engineer of the Army, who ordered him to build a suspension bridge over the Shenandoah River at Harpers Ferry. Gen. Warren characterized Washington's construction of the bridge with three spans ranging from 250 to 275 ft. as "a delicate operation which no one but an expert in this kind of bridge could have safely performed."

Ascending in a hot air balloon after the Battle of Chancellorsville, Washington observed Confederate troops heading northwest. As the Confederates approached Gettysburg, Gen. Warren needed topographical maps of the area, and

Washington rode quickly to Trenton to obtain maps that his father had, and he nearly fell into Confederate hands upon his return.

On July 2, with Union forces arrayed along Cemetery Ridge, General George Mead sent General Warren and his aides to see that Little Round Top, the strategic hill to the south, was adequately defended. Discovering that it was not, Washington helped hoist cannons and direct Union troops to the top, and the famous defense of Little Round Top that day kept Confederate troops from flanking the Union line. Washington was subsequently promoted to Lieutenant, and Gen. Warren wrote, "Lieut. W. A. Roebling's services to me are invaluable and by his ability and his exertions he has won the promotion."

In February 1864, Gen. Warren ordered Lt. Roebling to build a pavilion in Culpeper, Va., for the 2nd Army Corps Ball, and the General invited his sister, Miss Emily Warren, to attend from Cold Spring, N.Y. (Fig. 4). Washington soon reported to his own sister Elvira in Trenton that Emily had captured his heart; "I don't suppose you can imagine the splendid opportunities we have for courting each other; the General went away to Baltimore leaving



**Fig. 4: Washington Roebling met Emily Warren, the sister of his commanding officer, at a Union Army ball in 1864, and five weeks later he wrote to her, "You are my guiding star." They were married in January 1865, and Emily famously helped Washington complete the Brooklyn Bridge after he became disabled by the bends in 1872. Rensselaer Polytechnic Institute**

her in my entire charge and care and I assure that I perform the duties to our mutual satisfaction."

Three weeks later, Washington wrote to Emily, "Oh how I wish I had just one of those sweet kisses that you can give; my lips have fully recovered from your attacks and are in excellent fighting trim to receive you." He also wrote to her about his dreams that he would meet a lady who would be his "helpmate during life;" and that he was "more and more convinced that you are the one thus foreshadowed." In January in 1865 Washington resigned from the Army and he and Emily were married in Cold Spring.

Washington joined his father, John, in Cincinnati in the spring of 1865 to help him complete the 1,056-ft. span Cincinnati-Covington Bridge, the precursor to the Brooklyn Bridge. In 1867, John sent Washington to Europe to study the use of caissons for building the foundations of the Brooklyn Bridge towers. While in John's hometown of Mühlhausen in Prussia, Emily gave birth to a boy that would be her and Washington's only child, and they named him John A. Roebling II.

In his plans for the 1,600-ft. span Brooklyn Bridge, John specified the use of steel wire for the first time in a major suspension bridge. While he and Washington were inspecting the site for the Brooklyn tower in June 1869, a ferry boat unexpectedly slammed into the slip where they were standing, crushing John's foot, and he died a horrible death ten days later from tetanus. As Washington recalled years later,

*Hardened as I was by the scenes of many a bloody battlefield, these horrors often overcame me. When he finally died one morning at sunrise, I was nearly dead myself from exhaustion...*

*After a week I had become sufficiently composed to take a sober look at my situation. Here I was at the age of 32 put in charge of the most stupendous engineering structure of the age.*

*The prop on which I had hitherto leaned had fallen; henceforth I must rely on myself...*

*At first I thought I would succumb, but I had a strong tower to lean upon, my wife, a woman of infinite tact and wisest council.*

Washington soon had to lean extensively on Emily, as he became partially disabled after spending too much time in the caissons for the tower foundations. He and many of the workers suffered, and several died, from what we now know as the bends, or nitrogen narcosis, which results from returning too quickly to the surface from underwater compression. Washington's disability confined him to his house overlooking the bridge site, and Emily became his chief assistant, carrying drawings and instructions between the Chief Engineer and the assistant engineers at the bridge. This continued for years and only a handful of people were able to actually see the Chief Engineer. When some Brooklyn newspapers and Bridge Trustees called for Washington's replacement, Emily rallied to his defense and convinced the Trustees at an official meeting to keep him as Chief Engineer.

Washington had become the head of the John A. Roebling's Sons wire and wire rope company in Trenton after his father's death, but to avoid any potential conflicts of interest, he resigned this position and temporarily sold his stock so that the company could bid on the contracts for the wire for the bridge's 15 in. cables and for the 1 3/4 in. wire ropes for its 1,520 suspenders and 400 stays.

In August 1876, workmen ferried a 7/8 in. wire rope across the East River to link the two towers for the first time, and master mechanic E. F. Farrington famously made the first crossing between the towers in a boatswain's chair (Fig. 5). A Brooklyn firm initially won the cable wire contract thanks to connections with the Bridge Trustees, but problems with the quality of the wire led to the Roebling Company becoming the supplier, and it eventually also supplied wire ropes.



**Fig. 5: Master Mechanic E. F. Farrington made the first crossing between the Brooklyn Bridge towers on a 7/8 in. wire rope in 1872.**

Fig. 7: Brooklyn Bridge, Brooklyn Tower, May 2008. More than two million pedestrians and bicyclists annually cross the Brooklyn Bridge, which Mayor Michael Bloomberg has called “a universal symbol of New York.”

C. W. Zink



**“You can’t desert your job; you can’t slink out of the work that life lays on you.” - Washington A. Roebling**

The Brooklyn Bridge opened to world acclaim on May 24, 1883, and Emily was one of the first to ride across that day in a carriage, while Washington watched from his room in Brooklyn Heights (Fig. 6 & 7).



Fig. 6: Designed by John A. Roebling and built by Washington A. Roebling with help from Emily Warren Roebling, the Brooklyn Bridge opened to acclaim in 1883 as the Eight Wonder of The World.

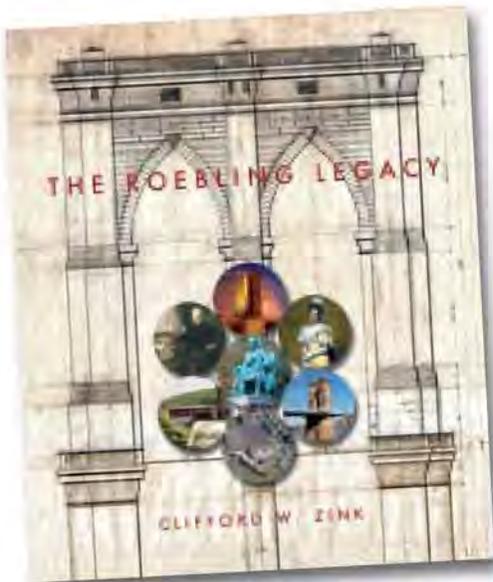
Library of Congress

At the opening ceremony, Abram Hewitt, a son in law of Peter Cooper and future mayor of New York, paid homage to

John Roebling, “who conceived the project and formulated the plan for the Bridge,” and to Washington Roebling, “who inheriting his father’s genius, and more than his father’s knowledge and skill, directed this great work from conception to completion...braved death and sacrificed his health.” Recognizing Emily Warren Roebling’s contributions, Hewitt proclaimed the bridge “an everlasting monument to the self-sacrificing devotion of woman, and for her capacity for that higher education from which she has too long been disbarred.”

Emily died in 1903 but Washington remarkably kept living. In 1921, when he assumed the presidency of the John A. Roebling’s Sons Company at the age of 84, he told a reporter, “It’s my job to carry the responsibility. And you can’t desert your job; you can’t slink out of life or out of the work that life lays on you. I haven’t any business plans but I’ve lived through hard times before and I can do it again.”

Under Washington’s guidance, the Roebling Company built 18 in. cables on the Bear Mountain Bridge over the Hudson River, and the bridge opened in 1924 when he was 87. As his health deteriorated two years later, he told a visitor “that about all of his physique which remained to serve him was his brain... and he was grateful for this much.” Washington Roebling died at the age of 89 on July 21, 1926. These and many other stories are chronicled in *The Roebling Legacy* ([www.roeblinglegacy.com](http://www.roeblinglegacy.com)). ■



## THE ROEBLING LEGACY

By Clifford W. Zink

The Roebling Story is a classic American saga spanning the continent and more than two centuries. The Roeblings built the Brooklyn Bridge - the "universal symbol of New York," and the great cables on the George Washington Bridge and on the Golden Gate Bridge - the symbol of San Francisco. Their wire rope products helped shape modern life, they created America's "first sports car," provided livelihoods for tens of thousands, and built one of America's best company towns - "a model in every respect."

\$25 with LOOK INSIDE pages at  
[www.roeblinglegacy.com](http://www.roeblinglegacy.com)

also available at Amazon

Princeton Landmark Publications  
Princeton, New Jersey  
609.439.7700

*The Roebling Legacy is a magnificent achievement. The reproduction of the graphics are some of the best I've ever seen, and the comprehensive collection of quotations from many varied sources accompanying the images makes it the kind of book I love to own...I recommend it to everyone without hesitation as one of the best industrial histories ever published.*

*- Don Sayenga, Historian for  
the Associated Wire Rope Fabricators*