



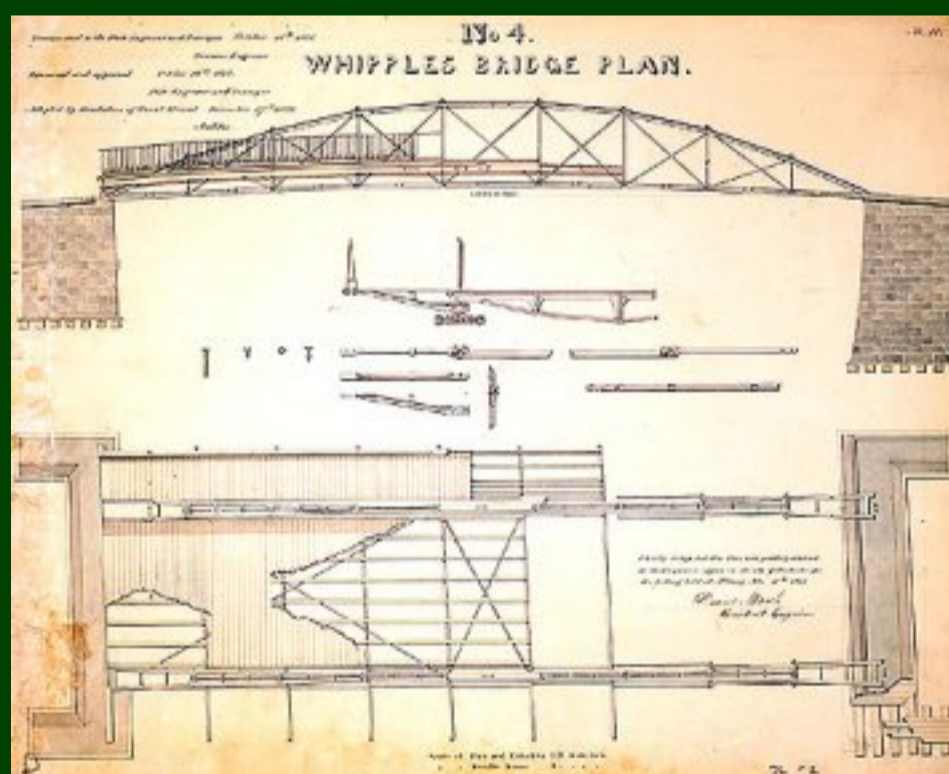
BLACK RIVER CANAL WHIPPLE BRIDGE

Squire Whipple (1804 - 1888) *"Father of the Iron Bridge"*

Born in Worcester County, Massachusetts, in 1804, Squire Whipple worked in his father's cotton factory, where he developed a fondness for mechanics. After graduating from Union College (Schenectady, NY) in 1830, Whipple worked as a surveyor on the Blatimore and Ohio Railrod. The growth of railroads required bridges that were capable of bearing heavy loads. Turning his attention to the problem, Whipple designed the bowstring iron-truss bridge in 1840 and patented the design the following year. This design became the standard for bridges on the Erie Canal and elsewhere. Despite his patent, Whipple no received financial compensation for his invention. In 1840, Whipple also built the first model of a scale for weighing canal-boats, and later, he built the first weigh-lock scale on the Erie Canal.

Over the next ten years, Whipple built several bridges on the Erie Canal and the New York and Erie railroad. One of these was a 146-foot span iron railroad bridge near Watervliet built in 1853. In 1872, he obtained a patent for a lift drawbridge, and subsequently built the first one over the Erie Canal at Utica. Whipple iron bridges have have been highly prized for their compressive and tensile strength. Whipple's used mathematical equations to predict the thickness and shape of the metal components that a bridge needed to support a given weight. His mathematics eliminated guesswork and allowed engineers to use much thinner pieces of metal in bridge construction. With reduced costs and increased reliability, iron came to replace wood as the principal load-bearing material for bridges.

Whipple was elected an honorary member of the American Society of Civil Engineers in 1868. He wrote two books: *The Way to Happiness* (Utica, 1847) and a *Treatise on Bridge-Building* (1847; enlarged ed., New York, 1873). Whipple died in Albany in 1888.



Whipple Patent Bridge

These drawings show the major elements of Whipple's bowstring truss bridge. As the top diagram indicates, cast-iron arches form a bow over the deck. This bow is held together by a "bowstring" stretching across the bottom--much as an archer's bow is. This tension eliminates the need for buttresses at the ends and for strong piers anchored in the ground. The bridge simply rests on its supports. The bowstring itself is composed of a series of interlocking links. Diagonal struts attach the bowstring to the bow and pull it up against vertical tie rods to form a rigid grid. The bowstring supports the decking, and the struts transfer the load to the arch above. The iron arches are not joined at the top and do not depend on the roadbed for strength. As the bottom diagram indicates, The arches are wide at their base and narrow at the top, preventing the arches from tipping sideways.

- [Home](#)
- [Black River Canal History](#)
- [Black River Canal Chronology](#)
- [Boat Plans](#)
- [Whipple Bridge](#)
- [Photo Gallery](#)
- [Black River Canal Today](#)
- [Membership](#)
- [Links](#)

