Bridges and Tunnels

Many people who write about advances in transportation forget to mention the contributions made by bridges and tunnels. These structures are an essential part of road, canal and rail construction projects, making more direct routes possible where there are mountains, valleys and water.

Crossing the Platte River, 1839

People heading west were forced to travel miles out of their way to find a safe place to cross a river. Sometimes they waited for days or weeks for flooding water to recede. Narrow wagon wheels sank into the muddy river bottoms, and the swift, unpredictable currents took a toll in lives and property.

Illustration: Library of Congress

Wagon train moving through the mountains on their way to California, 1850

Travel through the mountains, particularly the Rocky Mountains, was also challenging and dangerous. Again, people had to travel miles out of their way to find passage. They had to move falling boulders that were in their way and be concerned about going up and down steep inclines with loaded wagons. Another worry was that they might get stranded in a snowstorm without sufficient supplies for survival.

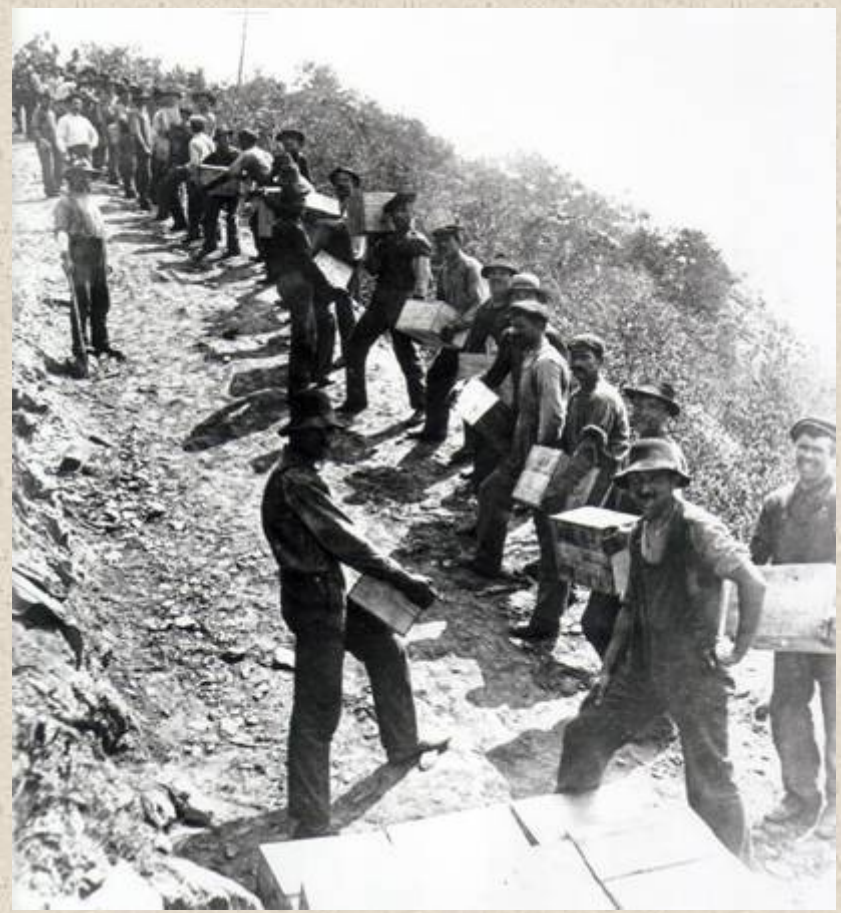
Illustration: Library of Congress

Staple Bend Tunnel, Cambria County, Pennsylvania

In the early 1800s, the only way to get across the Alleghany Mountains was to wind around them or travel over them using packhorse trails and wagon roads. The Allegheny Portage Railroad decided in 1827 to build a rail tunnel that would go through the mountains. No one had built a rail tunnel in the U.S. before! Working from both sides of the mountain with the technology of the day, hand drills, pickaxes, and black powder, it took workers six years to burrow through the 901 feet of solid rock. Work progressed at about 18 inches per day.

Photos: National Park Service

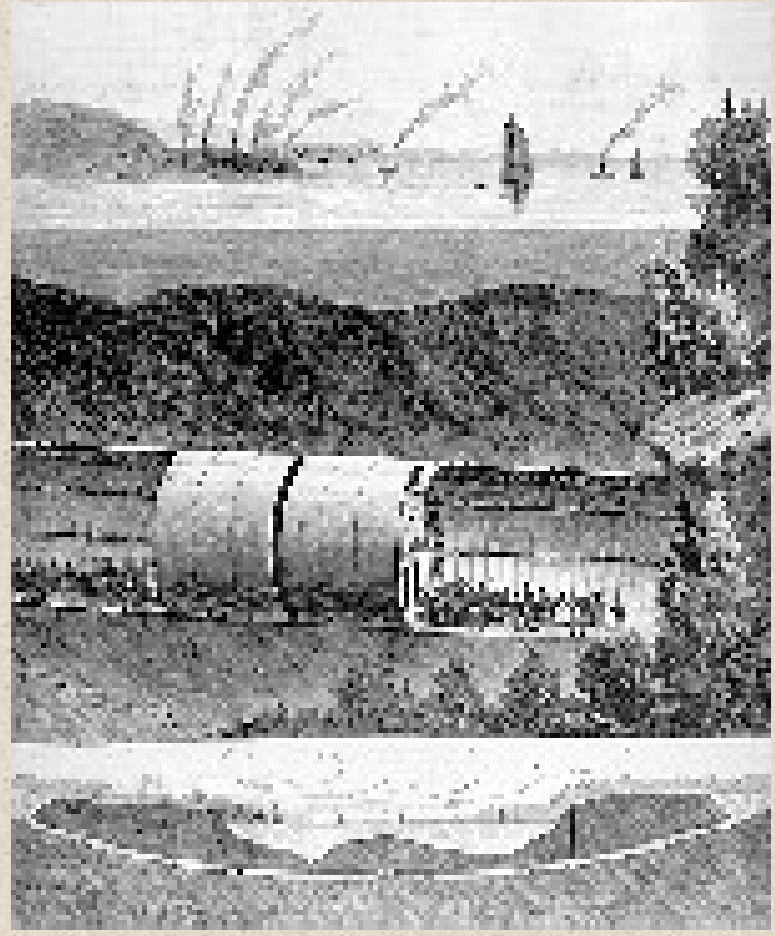
Swedish chemist and engineer, Alfred Nobel changed all of this in 1866 when he created dynamite, a safer and more manageable explosive that was stronger than black powder. About fifteen years later, Thomas English (another Englishman) patented the tunnel-boring machine that provided an alternative to digging and blasting.



Rail workers moving dynamite during construction of the Pennsylvania Railroad, 1906

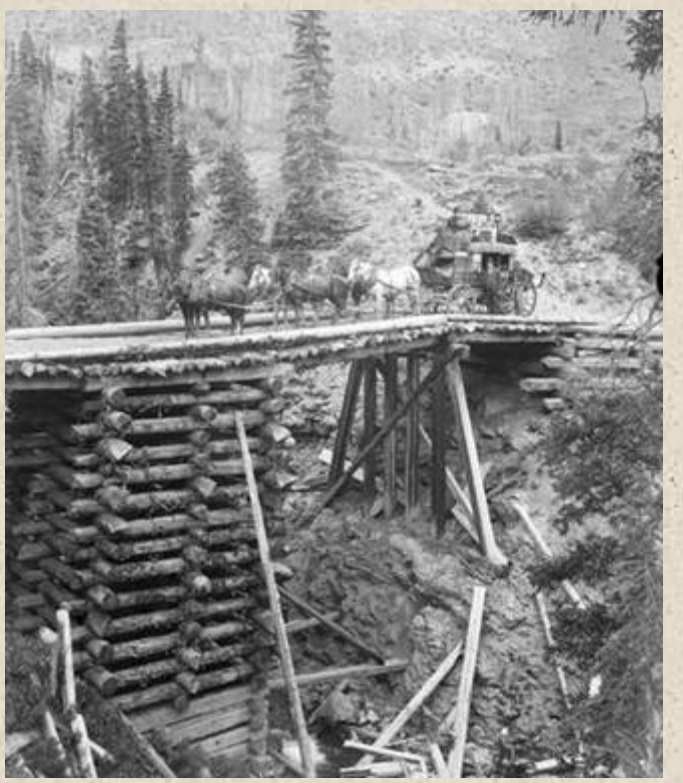
Photos: Railroad Museum of Pennsylvania

Earlier in the century, Englishman Isambard Kingdom Brunel invented a cast-iron shield that made it possible for miners to dig tunnels through another obstacle, soft earth and water.
This and other new technologies made it possible to build the St. Claire River Tunnel, the first rail tunnel in the world built under water. The St. Claire River Tunnel which opened in 1891 connects Canada with the U.S., encouraging and supporting trade between the neighboring countries. Before the tunnel, rail traffic from the Plains states had to detour south of the Great Lakes or rely on ferry transfer of cargo.



Construction of the St. Claire Tunnel between Michigan and Canada

Photos: Michigan State Historic Preservation Office

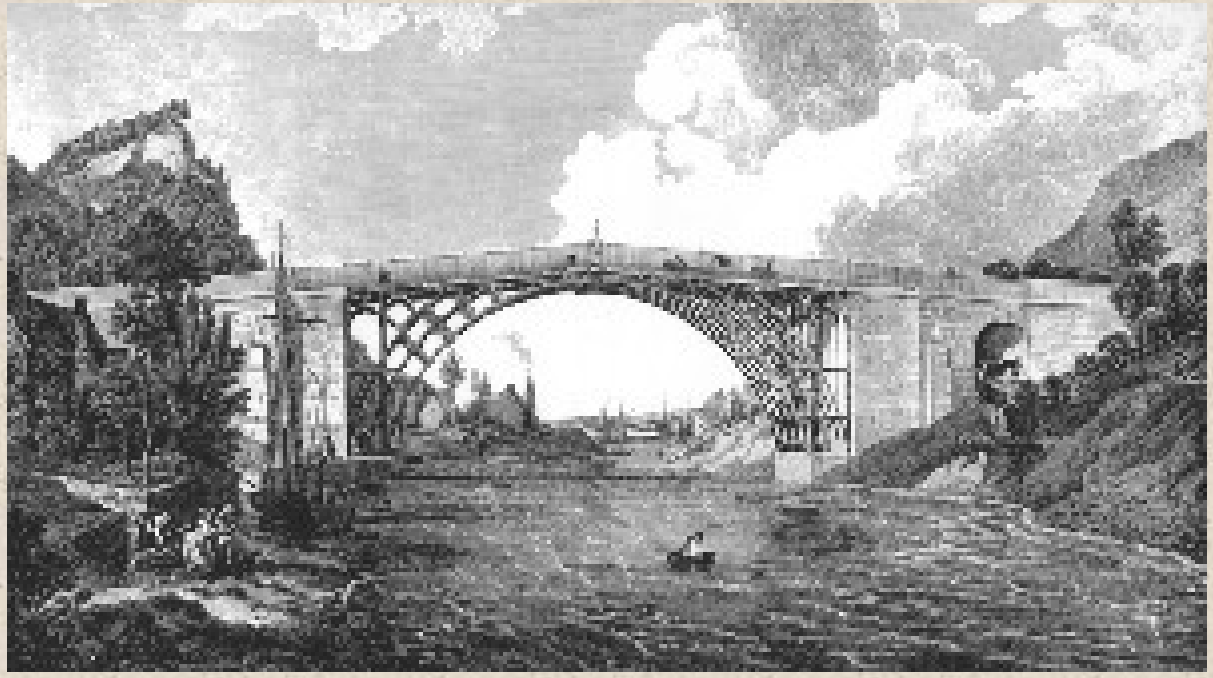


Maroon Creek Bridge, CO 1890
(Wood Timbers)

Ashuelot River Bridge, Keene, NH 1890
(Stone Arch)

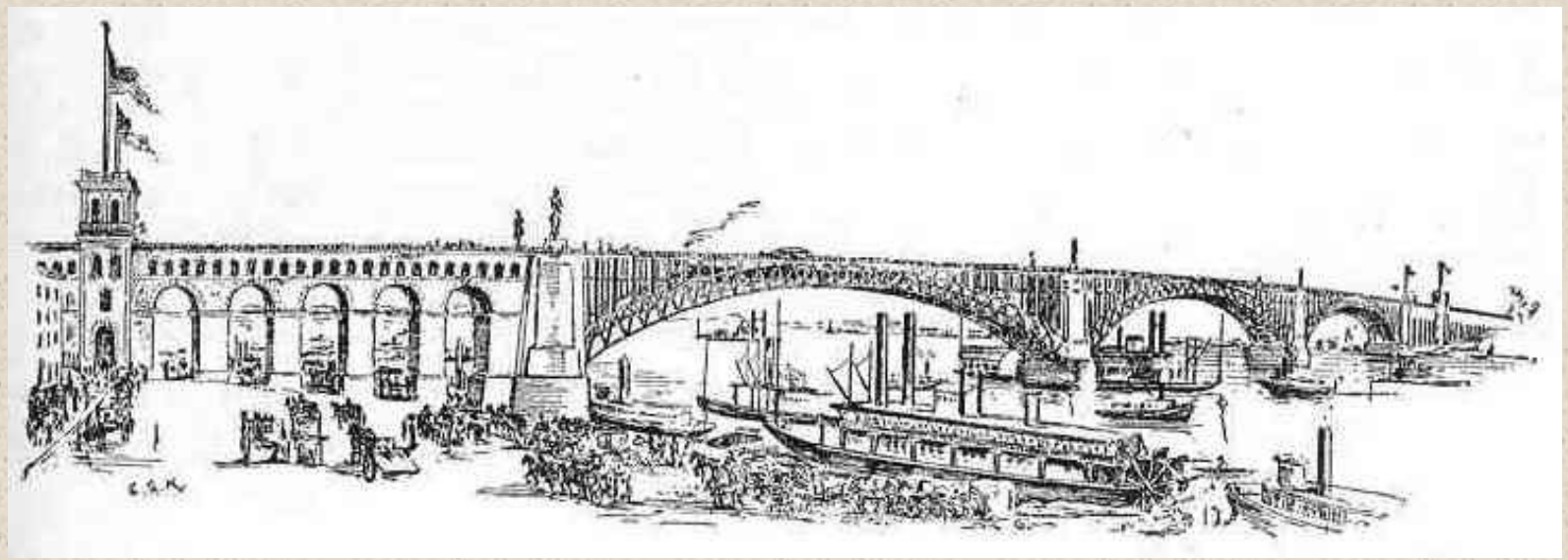
Early bridges in the U.S. designed to carry heavy loads were made of wood or stone. Most bridges were built of wood because it was cheap and easily available. The problem with wood was that it was subject to decay. Stone was the preferred building material because it was practically maintenance-free, it could last for centuries, and strength was rarely an issue. In the new nation, however, money and people with masonry skills were scarce making stone bridges very rare.

Photos: 1) Western History/Genealogy Dept., Denver Public Library and 2) Library of Congress



Darby's Iron Bridge

In 1779, Abraham Darby (III) built an iron bridge in England. Darby's bridge was the beginning of a revolution in how bridges are constructed. Iron, followed in the second half of the 19th century by steel and concrete, made it possible to build longer and stronger bridges. The new bridges were more durable than wood yet not as expensive as stone. Bridges could be built relatively quickly. This was especially important when building new rail lines over long distances in a short period of time.



Eads Bridge, St. Louis, Missouri

The first use of cast steel in a major bridge project was the construction of the Eads Bridge. The bridge was one of the first bridges over the Mississippi River. The city of St. Louis costructed it in an attempt to maintain dominance as a regional commercial hub. Completed in 1874, the Eads Bridge consisted of 3 steel arches. With an overall length of 6,442 feet, it was the longest arch bridge in the world at the time. It is still in use today.

Illustration: Beginner's American History, by D. H. Montgomery