TRANSPORTATION REVOLUTION OF THE 19TH CENTURY

In America during the 19th century, the invention of the steam engine dramatically improved shipping by water and created a new transportation industry—the railroad. By the end of the century, some steam locomotives began to be powered by electricity.

At the time of America's founding, most people lived their entire lives in their local communities. Local transportation was by walking, riding a horse, or riding in a wagon or carriage pulled by a horse. For distances of a few miles, freight also moved by wagons. Intercity freight was either carried in barges on inland rivers or in sailing ships on the ocean.

Inconvenient Travel

For those rare occasions when they traveled longer distances, people still walked or used a horse, typically traveling no more than 20 or 30 miles per day. Most roads were just wagon ruts, which limited wagons to about the speed of a walker—roughly three miles per hour. For food and lodging, travelers went to small inns, which were taverns with shared bedrooms that often slept three or more to a bed, including strangers. Traveling was not a pleasant experience.

There were a few stagecoach lines between some major cities that traveled about 50 miles per day depending on the quality of the roads, but they were expensive. There were also a few privately owned turnpikes (toll roads) around major Eastern cities, but they did not cover long distances.

The only organized travel was by sailing ships that carried passengers and freight over planned routes on the Great Lakes, between cities on the East Coast, and between America and Europe. A one-way trip to Europe commonly took six to 10 weeks, depending on winds and storms. Shipwrecks were a common hazard.

Among the first activities Americans undertook after the country's founding were to build better turnpikes, faster sailing ships, and canals connecting rivers and lakes. Turnpike investors started building bridges and paving roads with stones and gravel in 1793 near Philadelphia, Pennsylvania. As the turnpikes spread to major cities, stagecoach travel became much faster and safer, but the turnpikes were not profitable for investors, so road building became an activity for regional governments. Government-financed toll roads still exist today.

Improved Ship Design

Because of the long distances between coastal cities, American ship owners needed fast ships. Consequently, during the first half of the 19th century, American ship designers created two new designs for sailing ships, the schooner and the clipper ship, which were faster than the square-rigged merchant ships and could carry a reasonable load of cargo and passengers. Schooners sailed better into the wind than the square-rigged ships, so they were faster within America's coastal waters where maneuverability was important.

Clipper ships, which were developed during the 1830s, were even faster, sometimes traveling up to 20 miles per hour compared to around 8 miles per hour for the typical merchant ship. During the California gold rush in the early 1850s, clipper ships sailed between New York and San Francisco around the tip of South America in just over three months, whereas the trip on a merchant ship took on average six months.
On inland rivers, problems of navigation often presented the greatest challenge. To improve shipping, canals were built to move freight and sometimes passengers between rivers and lakes. Many canals employed horses or mules that pulled barges on tracks next to the waterway. Most canals also require locks to raise and lower water levels and allow barges to move from one elevation to another. Both canals and locks proved expensive to build, meaning that many canals companies were heavily in debt during the first several years of operation.

**The Erie Canal**

In 1793, the first canal was built to haul freight around shallow areas of the Connecticut River in Massachusetts. Canals were then built to make other Eastern rivers easier to navigate. The most significant early canal was the Erie Canal in upstate New York connecting the Hudson River with Lake Erie, which opened in 1825. With the Erie Canal, freight could move from ocean-going ships docked in New York City to barges on the Hudson River, through the canal to Lake Erie, and then on to settlements on the Great Lakes, reducing the travel time to Lake Erie from 20 days over land to 8 days on water.

The success of the Erie Canal led to a great burst of canal building in the country, including the Illinois Canal that connected Lake Michigan (and therefore New York through the Erie Canal) to the Mississippi River. By the middle of the 19th century, Americans had built over 4,000 miles of canals. However, railroads eventually replaced them because freight moved faster by railroad than by barge.

During the early 1800s, American inventors developed new concepts for providing power to machines, including those for transportation—steam engines, which provided radical new approaches for moving people and goods within the country and around the world. Ships and railroads were the first to gain from the new technology.

Both for the Industrial Revolution and for transportation, the development of a practical steam engine was the pivotal invention of the 19th century. A steam engine boils water in a boiler heated by a firebox that burns coal, oil, or natural gas to produce steam, with coal the most common fuel. The steam is either injected into a piston or into a turbine to produce power to move the vehicle.

The first commercially successful application of steam to power American ships was for inland river steamboats. In 1807, using a steam engine he purchased in England, Robert Fulton demonstrated his concept for a steam-driven riverboat on the Hudson River between New York City and Albany, New York—a distance of 130 miles. His steamboat proved an immediate success, so he built more boats and operated scheduled service on the Hudson. In 1811, Fulton demonstrated another steamboat running from Pittsburgh, Pennsylvania on the Ohio River to New Orleans, Louisiana on the Mississippi River. It also was an immediate success and launched a new era of steamboat travel. Soon, all of the navigable rivers in America had steamboats.

**Steamships and American Rivers**

The steamboat was the first unique American invention to open up the Midwest and the Prairie States to settlement. Wherever large rivers flowed, towns grew into cities by offering outfitting equipment and wagon trains for the hordes of settlers going further west to establish a new life. The cities were also collection points for shipping the products of the newly settled West back to the East. In particular, St. Louis and Kansas City, Missouri owe their early success to the steamboats.

Starting in 1838, steam engines began powering ocean-going ships. Although earlier ships used steam engines as auxiliary power, the first ocean-going ships to use steam exclusively were the British ships Sirius and the Great Western, which left England within a few days of each other and arrived in New York City in under 20 days. Both
ships burned coal to make steam. Even though the two trial runs were impressive, steamships were slow to replace sailing ships, partially because of the added expense of coal. Because of reliability problems, most early steamships still carried masts and sails just in case.

When steam power was first applied to land transportation in England during 1825, a new form of travel was created—the railroad. Previous to this development, horses had pulled wagons on wooden rails in a few American cities. The rails offered a smoother ride and more passengers for each horse than travel by wagons, but the cost of building and maintaining the roadbeds and taking care of the horses was high. The country needed a mechanical power source that could pull much larger loads at a lower cost, and a steam-driven locomotive met that need.

Steam locomotives spread to America in 1830 when the South Carolina Canal and Railroad Company started commercial service over 6 miles of track. Also in 1830, the Baltimore and Ohio Railroad (B&O) started building a railroad to connect Baltimore, Maryland on the East Coast with the Ohio River in the Midwest. The B&O became the first permanent railroad in the country.

**Railroads during the Civil War**

From these two demonstrations, railroads spread rapidly throughout the eastern part of the country. By the 1850s, most towns had railroad passenger and freight service, and a few lines had spread west and reached the Mississippi River. During the Civil War, railroads were crucial for both sides to supply their armies and move troops, although the North enjoyed a tremendous advantage in this arena with far more track available to aid the war effort. Construction to repair track damage after the war ended modernized many of the railroads, giving them the means to grow rapidly.

During the Civil War, Congress funded a project to build a transcontinental railroad by providing construction funds and a land grant of one square mile of land for each two miles of track that railroads built. The idea had been batted around among legislators for years, but sectional disagreements as to whether the track should be laid on a Northern route or a Southern one delayed any significant progress on the project. Early in the war, Northern politicians seized the chance presented by Southerners' secession from the U.S. government to appropriate funds to build the transcontinental line along a Northern route.

Construction started in earnest in 1866 with the Union Pacific Railroad building west from Omaha, Nebraska and the Central Pacific Railroad, later known as the Southern Pacific Railroad, building east from Sacramento, California. In 1869, the railroads met at Promontory Point in Utah, and the country was united by the first continuous railroad line.

The transcontinental railroad crossed more than 2,300 miles of mostly undeveloped land that the railroads wanted to populate in order to generate additional business. They initiated an extensive advertising program in the poorer areas of Europe, focusing in particular on Scandinavia, Ireland, and Italy, to bring immigrants to the empty land at very little cost. The immigrant movement that resulted generated the largest population boom in American history as millions poured into the country to claim free land along the railroad route, helping to settle the Prairie States and the West in the process.

The congressional land grant that encouraged the building of the transcontinental railroad continued to be available to other Western railroad builders, resulting in six more railroads being built across the continent. By the end of the 19th century, people and freight could go almost anywhere in the country by train. Fruits and vegetables went from the farms to the cities, manufactured goods from cities to the farming areas. Even hogs, cattle, and oranges traveled long distances to reach new
markets. The addition of sleeping and dining cars provided by such companies as the Pullman Palace Car Company allowed people to travel in comfort and sometimes even in luxury.

**Railroads and the Industrial Revolution**

It was the new industries spawned by the Industrial Revolution that gained the most from the railroads, however. Trains hauled everything for them: coal to fuel their electric power generation needs, steel and concrete to build their factories, raw materials to create their products, mass transit to bring their workers to work, freight cars to ship their products to market, and even trains to haul their waste to disposal sites. Without railroads, the Industrial Revolution would have fizzled, and America would still be an agrarian country.

Despite these advances, the never-ending need for more capital to fund the growth of the railroads created excessive strains on America's financial markets, which in the financial panics of 1873 and 1893 led to railroad bankruptcies. Financial tycoons like Cornelius Vanderbilt, J.P. Morgan, and James J. Hill purchased the failing railroads and consolidated them with healthy railroads, building strong regional carriers that lasted through much of the 20th century, also accumulating massive financial wealth for themselves in the process.

By the end of the 19th century, electric power generation capacity had grown to the point that some railroads began to electrify their passenger lines by replacing steam engines with electric locomotives. Where inexpensive electricity was available, electric engines offered faster, less labor dependent, and environmentally cleaner transportation. Steam locomotives not only polluted by burning coal that had to be mined and moved to where the engine used it, they produced heavy clouds of black soot and fumes as well. Even engines that burned oil produced dirty smoke when running.

By 1900, electricity offered an environmentally preferred solution for transporting commuters between home and work, reducing air pollution in the larger cities. Mass transit, or public transportation as it is also called, grew tremendously with the conversion to electricity, providing not only trains, but streetcars, elevated and subway systems, and interurban systems to support outlying communities of major metropolitan areas.

Even with the success of electric trains on high-traffic routes, railroads continued to develop larger and faster steam locomotives to haul longer trains. In 1890, however, Rudolf Diesel developed the diesel engine, which allowed railroads to couple diesel-electric locomotives to an electric generator to provide power for traction motors of the same type that electric locomotives used. Within ten years, diesel engines had replaced steam engines on all but the smallest railroad. The inherently high labor costs for operating and maintaining steam engines made the diesel-electric locomotive a better engine for trains.

The development of new approaches for transportation in the 20th century, most notably automobiles and airplanes, restructured the transportation roles played by canals, ships, and trains. With faster and more accommodating modes of travel available, most people opted to ride airplanes or drive themselves rather than ride trains. Basically, the passenger portion of the railroad business disappeared, although railroads continue to carry enormous amounts of freight.

Airplanes also eventually replaced ships as the preferred means of oceanic travel, although ocean liners continued to run prosperous passenger services until the mid 20th century, offering luxury accommodations for the wealthy and more barebones accommodations for everyone else. Many immigrants continued to arrive in America by ship until well into the 20th century. Once again, though, tremendous quantities of freight are still moved overseas by ship.

**Jim Marshall**

**Further Reading**

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Robert Fulton's steamboat, the *Clermont*: Library of Congress

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**MLA Citation**


Entry ID: 263277