Getting from here to there and back – The impact of a few transportation innovations on history

Class 3

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What We Will Cover Today

- The impact of the steam-powered vessel
  - Steamboat
  - Steamship
  - Refrigerated steam-powered vessel
- The impact of the railroad
  - Origins
  - Notes About Railroads
  - Economic Effects
  - Social Effects
  - Political Effects

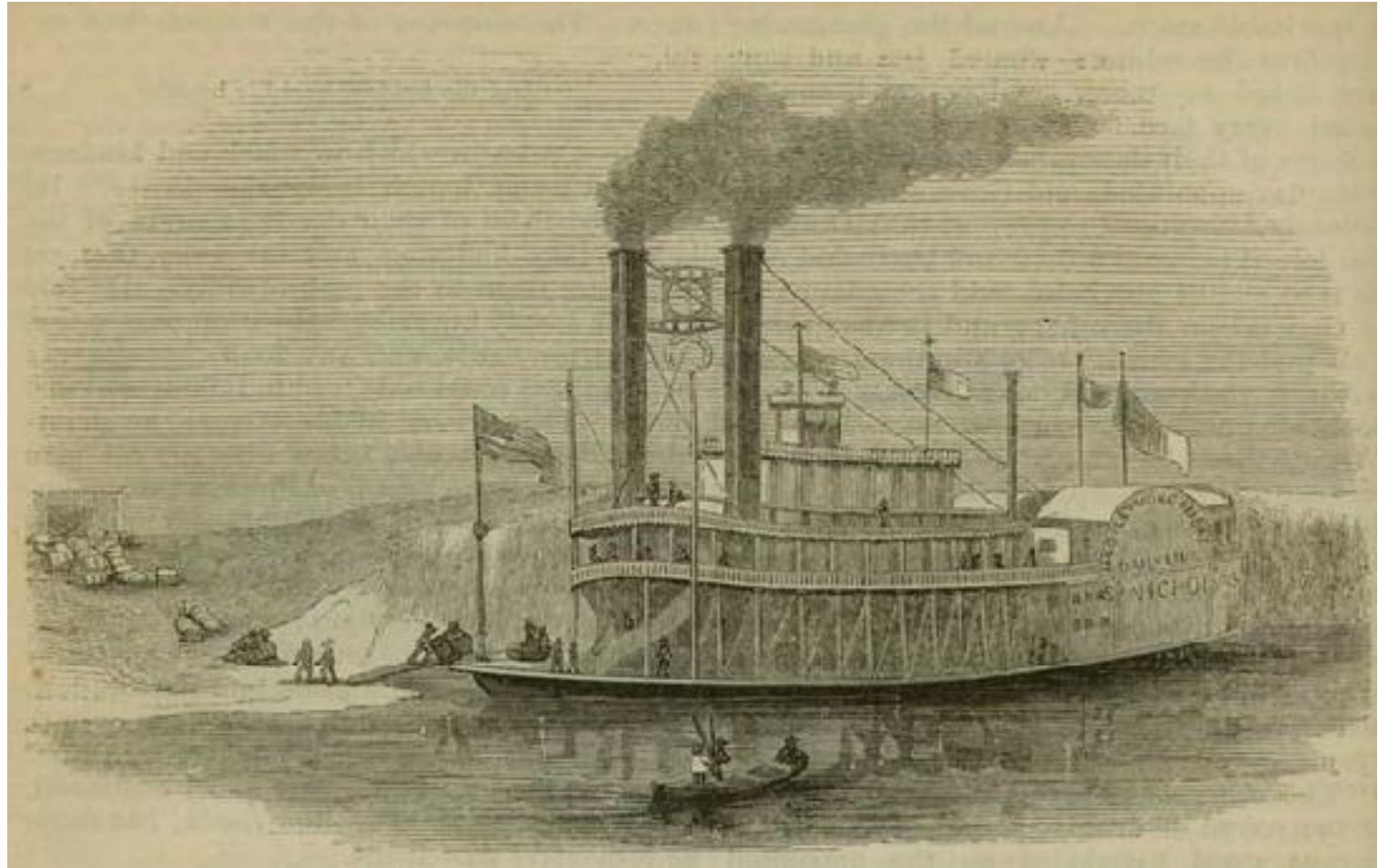# Impact of the Steamboat & Steamship

Definition

- Steamboat = a boat driven by steam power; specifically   : a shallow-draft vessel used on inland waterways
- Steamship = a : a ship propelled by steam b : an engine, machine, or vehicle operated or propelled by steam

Steamboats & Steamships

- The term steamboat is usually used to refer to smaller steam-powered boats working on lakes and rivers, particularly riverboats; steamship generally refers to larger steam-powered ships, usually ocean-going.

- Screw-driven steamships generally carry the ship prefix "SS" before their names, meaning 'Steam Ship', paddle steamers usually carry the prefix "PS" and steamships powered by steam turbine may be prefixed "TS" (turbine ship)

Steamboat

Steamship

R.M.S. ROYAL EDWARD.

History - 1

- The concept of the steamboat was an outgrowth of the steam engine
- The first working steamboat (with rotating paddles) by Marquis Claude de Jouffroy sailed in July 1776
- In the 1780s, James Rumsey and John Fitch both built working steamboats
- In 1802, Patrick Miller & William Symington built the *Charlotte Dundas* which towed barges along the Forth and Clyde canal to Glasgow

History - 2

- In 1803, Robert Fulton built a steamboat on the River Seine.
- In 1807, he built the *North River Steamboat* (also known as the *Clermont*) which began regular passenger service between New York City and Albany
- Fulton's success was soon followed by the use of steamboats on major U.S. rivers and also on the great lakes
  - First steamboat on the Ohio and Mississippi sailed in 1811

History - 3

- Steamboat traffic including passenger and freight business grew exponentially in the decades before the Civil War.

- First steam-powered vessel to cross the Atlantic was the hybrid steam- and sail-powered *SS Savannah* which sailed from Savannah GA to Liverpool in May-June 1819

- The first steamer to sail the Atlantic was the Dutch-owned *Curacao* which sailed from near Rotterdam to Surinam in 1827

History - 4

- The first regularly scheduled trans-Atlantic crossings by steamer began in 1838 with the *SS Great Western*

- The first East Coast (New York City) to West Coast (San Francisco) steamship service began in October 1848 via Cape Horn

- Steamers with screw propellers began replacing paddlewheel ships in the 1860s-1870s

- The first trans-Atlantic steamer built of steel began sailing in 1879

History - 5

- Steamships dominated trans-Atlantic passenger travel until the 1960s when jet airplane flights replaced steamships
  - The last scheduled liner voyage to cross the Atlantic was the *Queen Elizabeth 2* in 1986
- In 1884, Sir Charles Parsons devised the marine steam turbine engine.
  - It gradually replaced the traditional reciprocating steam engine due to the turbine's small size, low maintenance, light weight, and low vibration
  - The first steam turbine ship was the *Turbinia*, launched in 1894

Impact of the Steamboat

- Revolutionized domestic transportation by making it easy for boats to travel upstream and do so at much less cost and much greater speed than before

- Created new legal and political precedents that would have immense significance in later years
  - Supreme Court case of *Gibbons vs. Ogden*
  - Legislation that established the authority of the Federal Government to regulate an industry in the interest of public safety

Impact of the Steamboat - 2

- Subjected their passengers and cargoes in the early years to the dangers of boiler explosions, often with large-scale loss of life
  - This, in turn, led to the first Congressional regulatory legislation and the first regulatory Federal personnel
  - Also led to the precedent of Federal Government research grants

Steamboat Act of 1838

- Provisions
  - Had provisions for the prevention of collisions and the control of fires aboard ship
  - Required the inspection of hulls and the carrying of lifeboats
  - Required federal judges to appoint competent boiler inspectors who would semi-annually inspect every steamboat boiler, ascertain its soundness, certify it with a recommended working pressure, and issue a certificate of navigability
  - Made steamboat owners liable to both criminal penalties and to civil suits for damage to persons or property for a boiler explosion, with the fact of an explosion considered prima facie evidence of negligence
- Had little effect in reducing boiler explosions

Steamboat Act of 1852

- Provisions
  - Set maximum allowable working pressures (110 lbs per sq. in.)
  - Required every boiler to be tested yearly at 1 ½ times working pressure
  - Set boiler material construction standards
  - Required all steam engineers to be licensed
  - Authorized boiler inspectors to order repairs
  - Established boards of inspectors to investigate accidents and law infractions, giving them subpoena power
- Did reduce steamboat accident fatalities by about 35%

Impact of the Steamboat - 3

- Turned Cincinnati OH into a major hog meatpacking center
  - The presence of a large amount of lard led William Proctor and James Gamble to form a partnership to turn some of that lard into soap
    - This initiated an early replacement of an item previously manufactured in the household by a mass consumer product

Impact of the Steamboat - 4

- Fostered a demand for Federally-financed internal improvements, especially the dredging of rivers and harbors (as well as the building of roads and canals)

- This demand in turn provoked opposition from those in inland areas who would not benefit from such improvements and from those who feared the erosion of states rights

- These policy differences help define, and became a bone of contention between, the Whigs who favored such internal improvements and the Democrats who opposed them

Impact of the Steamboat -5

- Fostered a mutually beneficial and symbiotic relationship with the Post Office
  - Steamboats aided in the transport and delivery of mail; the Post Office gave lucrative mail delivery contracts to the steamboat owners
  - Provided a model for the relationships the Post Office developed with the railroads

Impact of the Steamboat - 6

- Helped start and facilitate travelling for pleasure
  - Affluent Americans begin to use the steamboat for "nuptial journeys"
  - Wealthy Southern planters begin to come North during parts of the Summer months

Impact of the Steamboat - 7

- Along with breech-loading rifles and machine guns, the steamboat allowed Europeans to penetrate into the interior of China and Southeast Asia
- Along with quinine, the steamboat allowed Europeans to penetrate into the interior of the continent of Africa
  - This allowed commercial and eventually political domination of the African hinterland. Formerly, Europeans avoided the African interior because of the likelihood of being infected with malaria

Ocean Steamers

- While steam power was an obvious advantage for boats on rivers and lakes, it was much less of an advantage on ocean-going ships because the amount of fuel that had to carry limited the amount of space available for carrying cargo
  - Thus, early steam-powered ocean vessels were hybrids, using steam to maneuver independently of the wind and sail to conserve fuel

Ocean Steamers - 2

- In 1840, Samuel Cunard [Cunard Lines] developed transatlantic commercial steamships that used coal rather than wood (which took up more space)

- Steamers made possible regularly-scheduled transoceanic trips with exact times of departure and scheduled times of arrival at a destination

Ocean Steamers - 3

- Steamers were much faster than sailing ships
  - In the 1840s, It took a westward-bound sailing ship an average 34 days to cross the Atlantic; it took a steamship only 14 days to cover the same distance
  - In 1775, it took a sailing ship 36 days to sail from New York City to London; in 1850, it took a clipper ship 14 days; in 1901, it took a steamship 8 days

Ocean Steamers - 4

- In comparison with sailing ships, Steam powered ships:
  - Could be constructed of iron/steel rather than wood
  - Could be much larger than sailing ships
  - Could carry more cargo
  - Required fewer men to operate
- As a result, shipping costs dropped, especially as the technologies of the screw propeller and marine steam turbine engine became common
  - Between 1879-1902, the cost of shipping 8 bushels of wheat from Chicago to London fell from an average 11 shillings to less than 3 shillings

Refrigerated Ships

- By the late-1870s, refrigerated ships had been developed that could transport frozen meat and fish from the U.S., Canada, Australia, and New Zealand to Europe

  - This vastly increased the amount of food that was traded. From the 1850s to 1913, food exports rose from 4 million tons per year to 40 million tons

Consequences of Steamships - 1

- Faster, cheaper, and safer transoceanic travel
  - Facilitated the large-scale emigration of Europeans to the United States, Canada, Brazil, Argentina, Australia, New Zealand, and South Africa
- Allowed an international market in wheat, rice, corn, meat, butter, wool, and other commodities to develop
  - This impacted negatively on the landed nobility and aristocracy of Russia, Germany, Poland, and Austria-Hungary

Consequences of Steamships - 2

- The economic decline of the landed aristocracies, both in absolute terms and relative to newly-emerging industrial elites, led many in these aristocracies to espouse Tory Socialism on the one hand and extreme Nationalism, Imperialism, Militarism, and Anti-Semitism on the other

Consequences of Steamships - 3

- Ended the centuries-old practice of piracy
  - Steamships were too expensive for pirates to purchase and too fast for pirate-manned sailing ships to capture
  - Only with the development of fast ocean-going motorboats and containerized cargo ships with only a handful of crew members would piracy (in areas of East Africa and Strait of Malacca

Container Ships

- Originated by trucker Malcolm McLean in order to provide a quick way to load and unload vessels
  - Cargo is loaded in large metal containers (either 20' or 40' long) at the factory or point of origin
  - Containers are then stacked by crane on the ship and off-loaded by crane onto railroad cars or trucks at the point of destination

Cargo Containers at Port

Container Ship

Impact of the Container Ship

- Greatly reduced the amount of labor involved in loading and unloading ships
- Led to the replacement of a large number of stevedores by a very small number of crane operators
  - By reducing loading/unloading costs, it greatly cut transportation costs

Impact of the Railroad

Beginnings of the Railroad

- The railroad had its roots in the following:
  - The knowledge that a smooth track could reduce friction
    - This allowed a horse to pull heavier weights than was possible without such a track
  - The invention of the steam engine
    - This gave rise to the steam carriage intended to run on rails
      - Richard Trevithick created the first steam engine locomotive to actually run on a track

Origin of Railroads

- The first successful commercial railroad was the Stockton and Darlington in England which opened on September 17, 1825, using a locomotive designed by George Stephenson
  - This was the first common carrier railroad
  - The gauge of this railroad was 4' 8 ½ " - the gauge on most of the colliery railroads
- August 8, 1829, the Delaware and Hudson Canal Company Railroad between Carbondale and the canal at Honesdale PA became the first U.S. railroad to have a locomotive – the *Stourbridge Lion*
  - The railroad was constructed to haul anthracite coal from the mine to the canal.
- On July 4, 1828, the B & O began construction of its first railroad line in America.
  - The chief guest on July 4, 1828 dedication was Charles Carroll – the sole surviving signer of the Declaration of Independence
  - The first 1.5 mile section opened January 7, 1830
  - This was the first railroad to provide passenger service

Immediate Impacts

- Increased Volume of Traffic
  - Before the Charleston & Hamburg RR began operating between these two locations in 1833:
    - Passenger traffic was handled by a stagecoach 3 times a week
    - In 1835, railroad passenger traffic was 30,000 passengers a year
- Increased Speed of Travel
  - In comparison with the stagecoach, the railroad cut the travel time from New York City to Chicago from 3 weeks to 2 days
  - In comparison with canal/river boats, the railroad cut travel time from Boston to Concord NH from 5 days upstream and 4 days downstream to 4 hours each way
  - It took Thomas Jefferson 10 days to travel from Monticello to Philadelphia. In 1850, it took the railroad 1 day

A Few Key Notes

- In comparison with previous business enterprises, the railroad had some unique features
  - It was a public service enterprise that required enormous up-front outlays of capital
  - It was a geographically spread-out entity that required extensive coordination to operate
  - Once built, railroads were expensive to run and maintain – i.e. they were both capital-intensive and labor-intensive enterprises
  - The profitability of railroads required both the power of eminent domain and limited liability

Some Notes - 1

- Railroads were corporations – only corporations could raise the enormous amounts of capital needed and had limited liability
- In addition to capital from stockholders and bondholders, railroads required subsidies initially from state governments and later from the Federal government
  - These subsidies took the form of state and municipal purchases of stock and Federal government land grants

Some Notes - 2

- Railroads were the first firms that that needed C^2 systems that could operate over large geographic areas.
  - Before the telegraph, railroads were also the fastest known means of communication as well as of transportation.
    - In a single track environment where trains could run into each other, the only way of conducting train operations was via a hierarchical organization run by the time table, the rulebook, and the stop watch.
  - Coordination remained a major problem until railroads adopted the telegraph.
    - The use of the telegraph for railroad dispatching began with the Erie RR in 1851

Railroad Mileage – 1850-1950

Year	1850	1860	1865	1870	1880	1890
Mileage	9,021	30,626	35,085	52,922	93,262	166,164

Year	1900	1910	1920	1930	1940	1950
Mileage	206,631	266,185	296,835	303,182	287,133	277,313

Economic Impacts - 1

- The railroad created new economic resources
  - It made economically possible the exploitation of:
    - Pennsylvania, West Virginia, and Kentucky coal deposits
    - Minnesota iron deposits
    - Montana copper deposits
  - It fostered the development of many industries and corporations
  - The railroad created a national market for goods by destroying the transportation cost barrier that had protected local manufacturing monopolies from competition

Economic Impacts - 2

- The railroad, as a consumer, created a massive demand for iron, steel, coal, lumber, steam engines, telegraphic equipment, and machine tools

- The railroad created a whole host of new occupations: conductor, engineer, fireman, stationmaster, etc.

- The railroad linked the agricultural Midwest to the industrial Northeast

Economic Impacts - 3

- The railroad turned certain villages into thriving towns and cities and others into hamlets and ghost towns

- The railroad relegated the stagecoach and wagon from a primary mode of land transport to feeder status

- The railroad fostered the development of capital markets and the New York Stock Exchange

Economic Impacts - 4

- Gave rise to the Express Company
  - Express companies transported packages from one place to another, using any available means of transportation
    - Among the express companies were Adams & Co and Wells, Fargo & Co
- Promoted the dairy industry by making milk a common drink for urban children via the milk train

Economic Impacts - 5

- The railroads initially fostered the cattle drives of the 1860s and 1870s when they built lines to Dodge City and Abilene
  - By building railroads to Texas and the northern Plains, the railroads made the cattle drives obsolete
- Railroads provided an organizational model for later mass merchandisers and manufacturers

The Cattle Drives

- After the Civil War, there was a shortage of beef in the North and plenty of cattle in Texas
  - This meant that the Texans had to drive their cattle to the railheads in Kansas
  - With the RR at Abilene and Dodge City, the cattle trail now ran west of farm settlements along the Chisholm Trail where the cattle had grass and water
- The cattle drive and the railroad gave rise to the cowboy

Social Effects - 1

- The railroads, with their need to have trains be at specific places at specific times, altered people's consciousness of time and made us slaves to the clock

  - The railroad created both timetables and a major market for watches since both railroad employees and passengers needed to know the exact time so they could catch their trains

  - The railroad created standardized time and time zones.

Social Effects - 2

- The railroad with the help of the telegraph and newspaper built a national audience for certain actors, speakers, and entertainers
  - The railroads permitted performers and speakers to tour much of the country and become famous
- The railroad, with the aid of the postage stamp, fostered the growth of the postal service

Social Effects - 3

- By building railroad stations on the outskirts of cities through which their lines passed, the railroads created the first city suburbs.
  - By 1849, commuter railroad service linked Boston with such suburbs as Brookline, Dedham, Milton, Quincy, Dorchester, Brighton, Newton, Medford, Melrose, and West Cambridge.
- The railroad, with the help of the post office, made possible a national market for books and other publications

Social Effects - 4

- The train altered the psychological experience of travel
  - Travel by train was quite different from travel by stagecoach
- The train and the refrigerated rail car diversified the American diet by enabling the transportation of perishable foods like milk, meat, and seafood
    - Crisfield MD and the Eastern Shore became major exporters first of oysters and then of soft-shell Blue Crabs

Social Effects - 6

- Gave rise to a new type of criminal – the train robber
  - Made legends of such train robbers as Jesse James and Butch Cassidy
- Train robberies declined as express companies adopted strong security measures such as:
  - Express cars that could not be entered via the train
  - Armed guards

Social Effects - 5

- Led to traffic congestion in the horse-drawn city
  - Almost every passenger journey or freight shipment began or ended with a horse-drawn vehicle or horse
  - To haul passengers and freight, the large Percherons and Clydesdales by the 1880s became familiar sights on the streets
    - One result: a lot of horse-caused pollution. Each horse produced about 12,000 lbs of manure and 400 gallons of urine per year, much of which ended up in the street

Political Effects - 1

- Precipitated the passage of the Kansas-Nebraska Act - a major step on the road to war
    - Led to the fracturing of the Democratic Party,
    - Was a major factor in the collapse of the Whig Party,
    - Led to the formation of the Republican Party
    - Led to "Bloody Kansas"

Political Effects - 2

- Linked the Upper South slave states of Delaware, Maryland, Kentucky, and Missouri economically to the North
  - This played a role in keeping these states in the Union during the Secession Crisis of 1861
- The superior railroad infrastructure of the North helped the North to win the Civil War and enabled it to prosper during the conflict
- The inferior railroad infrastructure of the South condemned it to economic collapse and eventual defeat

Political Effects - 3

- By encouraging farmers to settle on the Great Plains, the railroad:
  - Made Great Plains farmers dependent on the railroad to get their crops to market in a context where the railroad could easily exploit them
    - This led to political discontent that gave rise to Populism
    - Led to the creation of the Interstate Commerce Commission in 1887

Political Effects - 4

- The railroads' desire to cut costs in a competitive environment led the railroads, especially during economic downturns, to exploit railroad workers
  - Thus wage cuts were common
  - RR workers responded by forming unions and striking in 1877 and again in 1894

Political Effects - 5

- Led Railroads to become major players on both the Federal and state level
  - Railroads and railroad officials became major campaign contributors
  - Many presidential cabinet members were former railroad lawyers