American Social and Cultural History, 1865 to the present

Class 2

1

What We Will Cover Today

- Two innovations that began before the Civil War but reached their zenith in the later-19th Century
  - Railroads
  - Telegraph

2

What We Will Cover Today

- New Communication innovations
  - The telephone
  - The Post Office and the mail
  - Cheap mass-circulation newspapers and magazines
  - The typewriter and changes in the American office
- Changes in the home from 1865 to electrification

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Post-Civil War Railroad

Year	1860	1865	1870	1880	1890
Mileage	30,000	35,000	53,000	93,000	164,000

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IN 1890, railroad track mileage reached 193,000 miles. By 1895, all of the current major trunk lines had been laid, with subsequent mileage consisting of feeder lines. The peak for railroad track mileage was 254,000 miles in 1920. After that, it declined.

Post-Civil War Railroad

- A Few Key Notes
  - Railroads differed from previous business enterprises
    - They were a public service enterprise that required enormous up-front outlays of capital
    - They were geographically spread-out entities that required extensive coordination to operate
    - Once built, they were expensive to run and maintain – i.e. they were not only capital-intensive but also labor-intensive
    - Their profitability required both eminent domain, limited liability, and government subsidy

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Up-front capital - The railroad s (and later the utilities and large manufacturing concerns) required the tying up of large amounts of capital for very long periods of time. Railroads (and steel mills, and electric power networks) required enormous amounts of capital and only the rare project could be expected to pay for itself in any short period of time. The life of the asset and the time needed to recover the investment through profit and depreciation often exceeded the life expectancy of the early investors and managers. Adding to the risk was the fact that if the enterprise went bankrupt, there was seldom any prospect that the costly but highly-specialized assets could be liquidated either quickly or at a reasonable price

Post-Civil War Railroad

- Some Notes
  - Post-Civil War 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 government subsidies
    - These subsidies took the form of state and municipal purchases of stock and Federal government land grants

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While a farm or local mill in the 1840s required less than $10,000 in capital, a whaling ship fully equipped for sea $25,000, and even the Lowell textile mills between $500,000 and $750,000 each, a typical 30-mile to 40-mile railroad required over $1,000,000.

Post-Civil War Railroad

- Some Notes – 2
  - Railroads were the first firms that that needed C^2 systems
  - Before the telegraph, railroads were also the fastest known means of communication as well as of transportation.
  - 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

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C^3 systems are Communications and Control systems.

Single-track RR - 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.

Post-Civil War Railroad

- Economic Impacts - 1
  - The railroad created new economic resources by making economically possible exploitation of
    - PA, WV, and KY coal deposits
    - Iron ore deposits in the Mesabi region of MN
    - Copper deposits in MT
  - The railroad created a national market for goods by destroying the transportation cost barrier that had protected local manufacturing monopolies from competition

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National market - Before the railroad, manufactured products could often be made efficiently by hand because local markets meant the demand was small. But with the dawn of the railroad age, economies of scale became possible in manufacturing, and more and more products could be produced on an industrial scale at greatly reduced prices that could be sold nationally.

Post-Civil War Railroad

- 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
  - The railroad linked different parts of the country together

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RR as consumer - Post-Civil War Railroads purchased 42% of the output of iron and steel-rolling mills. Machine tools were needed to produce steam engine locomotive components, cut telegraph poles and railroad ties, and fabricate other railroad system components.

RR occupations – These included conductor, engineer, fireman, stationmaster, RR telegrapher, etc. In 1890, the railroads employed 749,000. This increased to 1,018,000 in 1900 and 1,699,000 in 1910 before peaking at 2,076,000 in 1920. By 1970, it had declined to 577,000.

Link different sections - With the creation of the four major trunk lines between New York and Chicago in the early-1850s,the construction of the first railroad bridge over the Mississippi River in 1856, the Erie, Baltimore & Ohio, Pennsylvania, and New York Central economically linked the agricultural Midwest to the industrial Northeast and delinked the economic ties that formerly bound the Midwest to the South via the Ohio and Mississippi Rivers. After, the Civil the first transcontinental railroad linked the Midwest to the Pacific coast. Later transcontinental railroads linked the Southwest to Southern California and the Northwest to the Northern Pacific coast.

Post-Civil War Railroad

- Economic Impacts -3
  - The railroad turned some villages into 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

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Boomtowns & Ghost towns - The decision to build a railroad along one route as opposed to another was often a determinant whether a village would grow and prosper or wither on the vine. Villages with railroad stations or facilities often become growing towns and cities, as did villages that were railroad junction points where different railroads intersected. In towns and villages with railroad stations, the railroad station often became the town social center and post office. Among the towns turned into cities by the railroad were Omaha, Tulsa, Wichita, and Denver.

Stagecoach - After the Civil War, railroads became the dominant form of long-distance travel, relegating stagecoaches to local transportation. Trains were simply faster, cheaper, and more comfortable. A stage journey from St Louis to San Francisco [1750 miles] cost $200 and lasted three weeks. A train trip from Philadelphia to San Francisco {2564 miles via St Louis -- at least 2 ¼ days from Philadelphia to St Louis and no more than 4 ¾ days from St Louis to San Francisco. AMTRAK takes about 3 days to make the trip} cost $140 and lasted barely one week.

NYSE - While the New York Stock Exchange traces its origins back to 1792 (and the Buttonwood Agreement), volume until the 1830s was minimal (often below a hundred shares a day being traded). In the 1830s, volume increased so that by the mid-1830s, an average of 6,000 shares a day were traded. On June 25, 1835, volume reached a record 7,825 shares. In 1835, the listed shares being traded consisted of 38 banks, 32 insurance companies, 4 railroads, 4 canals, and 3 municipal gas companies. [a total of 81 concerns] (p64) [Gordon]

The need to issue stocks and bonds led increasingly to Wall Street and other financial centers underwriting and selling railroad securities. As a result, railroad securities became the meat and potatoes of Wall Street business. In 1835, 3 railroads were listed on the NYSE. In 1840, 10 were listed. In 1850. 38 railroads were listed. By 1861, railroad stocks and bonds accounted for 1/3rd of all securities bought and sold. In 1884, the Dow

Post-Civil War Railroad

- Economic Impacts – 4
  - 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

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Cattle drives - When the railroad reached Abilene and Dodge City, it became profitable to drive Texas longhorn cattle from ranches in Texas to the railhead for shipment to the meatpacking plants in Chicago.
Organizational model - Businesses copied the railroad/ telegraphic organizational structure and they took the notion of continuity even further. First distributors (Montgomery Ward, Sears and Roebuck, the Atlantic and Pacific Tea Company) and then manufacturers (Swift foods) began to think about how they could improve reliability and increase efficiency. They began to acquire their suppliers. Manufacturers began to visualize the production of goods in terms of continuous flow

Post-Civil War Railroad

- Social Effects - 1
  - The railroads, with their need for trains to 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
    - The railroad created standardized time and time zones

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Time Zones - In 1869, Charles Dowd proposed dividing the nation into four time zones. By the 1870s, astronomers and railmen decided that the best approach was to give up local time altogether and make railroad time the *only* time. Before 1883, railroads measured time according to the local time of their major stations. The B & O used Baltimore time on its eastern routes, Columbus time for Ohio, and Vincennes time for the West. Thus, the station at Buffalo had three clocks and Pittsburgh six, each showing a different time. Once widely separated communities were brought into the same commercial basin, such differences caused endless confusion. In 1883, William F. Allen, secretary of the General Time Convention, devised a scheme of four time zones across the country: Eastern, Central, Mountain, and Pacific. Their times were based on the mean sun time on the meridians near Philadelphia (75^{th}), Memphis (90^{th}), Denver (105^{th}) and Fresno (120^{th}). In October 1883, the railroads agreed to accept it, and they put the plan into effect on Sunday, November 18, 1883. The impact of this decision was revolutionary. As the *Indianapolis Sentinel* proclaimed in a much quoted passage: (p27} [Cashman_America in the Gilded Age]

"People will have to marry by railroad time, and die by railroad time. Ministers will be required to preach by railroad time, banks will open and close by railroad time; in fact, the Railroad Convention has taken charge of the time business, and the people may as well set about adjusting their affairs in accordance with its decree." (p27} [Cashman_America in the Gilded Age]

Post-Civil War Railroad

- 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

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National Audience - The railroad and the telegraph made modern sports possible -- i.e. professional baseball, college basketball & college football -- by permitting long-distance transportation of teams and fans, and electrical transmission of sports news to newspapers & magazines. The railroad had the same effect on sports as it did on American business: it provided both with the means to become national in scope. Teams from one section of the country could travel to compete in other sections. Local rail transport, including urban subways, also made it easier for spectators to travel to games in their home areas. Baseball teams in the early-20th century built their ballparks on street car lines. In Brooklyn, the need to avoid streetcars while walking to the games gave the local team its name: the Brooklyn Dodgers. When P.T. Barnum began to use railroads in 1881 to make the circus more mobile, it could reach a greater number of communities more quickly. Circus day became a very special occasion when people of all ages and classes gathered together to watch not merely the performance itself but every step from unloading to setting up to participation in the inevitable community cleanup that followed the circus's departure.
Postal Service – The number of stamps issued by the Post Office was 387 million in 1865. By 1880, it was 875 million. By 1890, it was 2.220 billion. By 1900, it was 3.399 billion.

Post-Civil War Railroad

- Social Effects – 3
  - The railroads created the first city suburbs.
    - Different from the later automobile suburbs
    - Railroad suburbs were small communities strung out like beads on a string separated by rural areas
  - The railroad, with the help of the post office, made possible a national market for books and other publications

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Railroad suburbs - *By 1849, commuter railroad service linked Boston with such suburbs as Brookline, Dedham, Milton, Quincy, Dorchester, Brighton, Newton, Medford, Melrose, and West Cambridge.* In the 1860s-1870s, the Pennsylvania RR decided to straighten out the meandering track between Philadelphia and Pittsburgh and bought out the farmers along the route. The RR then sold the land to land developers who created the fashionable 'main line' suburbs of Fernwood, Darby, Overbrook, Ardmore, Haverford, and Bryn Mawr. !! By 1870, Chicago had become the nation's railway hub , with the Santa Fe, the Chicago & Northwestern, the Chicago & Milwaukee, the Burlington, the Rock Island, and the Illinois Central running from Chicago and with commuter villages -- such as Evanston, Wilmette, Winnetka, Highland Park, Aurora, Hinsdale, Kenwood, Hyde Park, Morgan Park, Englewood, Blue Island, and Lake Forest -- along the RR routes

Different from later auto suburbs -The railroad suburbs of the 19th century were different from the automobile suburbs of the 20th century in several ways. First, railroad commuting fares were relatively expensive so that only businessmen or professionals could afford daily commutes. Thus, 30%-50% of the railroad suburb households consisted of businessmen who commuted at least five miles to work. The rest of the population consisted of workers whose function was to provide gardening, domestic, or other services to the commuters and their families. Second, because steam locomotives gathered speed slowly and took some distance to stop, railroad suburbs were usually discontinuous and separated by at least a mile or two (often more) of open space or greenbelt from each other. Thus, railroad suburbs were like beads on a string – the suburbs were not contiguous either to each other or to the central city. Except for the wealthy who could afford a horse and carriage and who thus could live further out, the natural limit to the spread of houses within the suburb was the walking distance to the railroad station.

Post-Civil War Railroad

- Social Effects – 4
  - The train altered the psychological experience of travel
  - 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

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Travel psychology - As historian Wolfgang Schivelbusch noted: Stagecoaches were small, holding no more than 6 to 12 passengers in relatively close quarters. They also bounced a lot, making it difficult to do anything but look at the slowly passing scenery or have conversations with fellow passengers. The faster train blurs all foreground objects, thus limiting the ability of the traveler to relate to the landscape through which he is moving. Because it is riding on rails, train rides are very smooth-riding, without the jarring bumps characteristic of stage travel. As a result, the train traveler becomes a reader of books and newspapers. Reading while traveling becomes an established custom and almost obligatory.

Diet – The railroads became the prime cause of the increasing diversity of food for the American table. Perishables such as milk, oysters, and lobsters were transported by rail to large cities in insulated icecars or packed in barrels of ice. The speed of the railroads not only augmented the diet, it served to improve the quality of the food. Beef was more tender, more tasty, and less expensive. The cattle no longer were driven to market on the hoof, and hence they developed less muscle. The cattle were fed on grain shipped via the railroad, thus improving the flavor of the meat. Finally, meat cost less because less weight was lost between pasture and market. A similar situation arose with pork. Before the railroads were built, long legs were a desirable breeding factor in part as the hog was expected to walk to market. With the advent of rail shipping, breeders began to focus on tastier meats and fatter hogs.

Post-Civil War Railroad

- Social Effects – 5
  - 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

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Telegraph

- Theoretically, Telegraphy became possible when Stephen Gray of England in 1729 discovered that electric current could be conveyed along a wire and activate some sort of receptacle at the other end
  - Variation in the number or duration of the impulses could signal different letters or numbers which could be strung together to form a message
- Practically, creating a telegraph system proved possible only when reasonably reliable and economical batteries became available

Telegraph

- What Samuel F.B. Morse and Theodore Vail accomplished was:
  - A telegraphic system that used Morse Code
  - A telegraphic receiver that could both mark the dots and dashes onto a moving strip of paper and emit sounds that an experienced telegrapher could decipher at speeds up to 40-50 words a minute

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Theodore Vail later became a moving force in the creation of Western Union.

Telegraph

- Some Notes About the Telegraph
  - Before the telegraph, the speed of information was tied to the speed of transportation. The telegraph broke that link and made possible the almost instantaneous communication of information
    - This revolutionized information-intensive industries and activities
      - News could now be reported as it occurred and instantly disseminated across a fairly wide region
      - Facilitated the operation and coordination of the railroads
      - Business transactions between merchants in different cities that formerly took days or weeks now took only minutes or hours

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Telegraph

- Some Notes About the Telegraph – 2
  - It created a lot of technological hype and technological utopianism
    - The notion that new technology equals progress and that technological innovation can solve our socio-economic-political problems largely gets its start with the telegraph and the railroad.
  - It made possible the future creation of large-scale corporate entities

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Technological utopianism -Tom Standage in *The Victorian Internet* notes: "Because of its ability to link distant peoples, the telegraph was soon being hailed as a means of solving the world's problems. It failed to do so, of course, but we have been pinning the same hope on new technologies ever since."

War - People noted that the Battle of New Orleans could have been avoided since neither the British nor American forces at New Orleans in January 1815 knew that a peace treaty had been signed at Ghent in December 1814. Others even contended that if the telegraph had existed in 1812, the War of 1812 could have been avoided (since the British Orders in Council which to some extent provoked the American declaration of war were repealed one day before the American Congress, which didn't know of the change in British policy, declared war.

Telegraph & RR made large-scale enterprises possible - Economist Mancur Olson noted that poor transportation and communication made large-scale efficient enterprises impossible for two reasons. First, they force firms to rely mainly on locally-available resources. This precludes an increase in scale since such an increase either would be impossible due to the limited quantity and availability of local resources or would force the firm to go further afield to get the resources, causing costs to rise disproportionately. Second, and more importantly, poor transportation and communication make it far more difficult to coordinate a large or geographically-extended enterprise effectively. This explains why large corporations did not emerge until well into the 19th century after the railroad/steamship and the telegraph/telephone cut resource costs and made coordination possible.

Telegraph

- Some Other Consequences
  - The combined desire for speed and the increasing costs involved in using the telegraph to get news led New York City newspapers in 1848 to create the first news wire service, the Associated Press
  - The unreliability of early telegraph lines (especially in wartime) led reporters to develop the 'inverted pyramid' style of news writing
    - The concern with essential facts led to a differentiation between news and opinion – with the latter being segregated into an editorial section or caged in quotation marks

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The unreliability of early telegraph lines and the Civil War (where lines were often cut by opposing forces) led reporters to develop the habit of compressing the most essential facts into short 'lead' paragraphs at the beginning of their dispatches so that the key facts would get through even if the complete news dispatch did not.

Telegraph

- Some Other Consequences – 2
  - To economists, it is axiomatic that markets are limited to the area in which communications is effectively instant
    - Thus, before telegraphy, markets were inherently local. After telegraphy, they became regional and then national.
      - One effect was to concentrate the trading of items such as gold, stock, bonds, and commodities in the place where most of their related financial transactions took place:
        - » New York became a center of stock and bond trading
        - » Chicago became a center of commodities trading

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Telegraph

- Some Other Consequences – 3
  - Created the first network-effect technology – the value and use of telegraphy increased as more nodes were added to the system
  - Made Western Union a major corporate entity
  - Along with the railroad, it facilitated travel and the holding of professional and business conventions
    - Telegraph allowed people to make hotel reservations
    - Allowed convention planners to coordinate convention planning with the hotels where the convention was to take place

Western Union - Before the Civil War, Western Union achieved prominence as a result of buying up bankrupt telegraph companies, its exclusive agreements with the railroads to run telegraph lines along rights-of-way , and its completion of the transcontinental telegraph in 1861 (which drove the Pony Express out of business). Before the Civil War, however, Western Union had a major competitor in the American Telegraph Corporation which had gained control of many eastern lines, including those originally owned by Morse's Magnetic Telegraph Company. The Civil War brought prosperity to Western Union since its principal trunk lines ran east-west and thus benefitted from a surge in wartime demand. In contrast, American Telegraph suffered greatly since its principal trunk lines ran north and south, so that when war broke out, its lines were cut and revenues plunged. In 1866, Western Union combined with a third firm, United States Telegraph, and the combined Western Union took over American Telegraph, gaining a nearly complete monopoly throughout the United States.

Telegraph

- Some Other Consequences – 4
  - Paved the way for such future wire-related information technologies as the telephone, the teletype machine, the stock ticker, and the fax machine
  - Along with the railroad, the telegraph made modern sports and touring theatrical companies and their related stars possible by permitting long-distance transportation of teams, troupes, and fans (and the necessarily-related coordination) and the electrical transmission of sports news and theatrical publicity to city newspapers and mass-distribution magazines

Telegraph

- Historical Notes – 1
  - 1851 – Fire alarm telegraph
  - 1858 – Wheatstone Automatic Telegraph Sender that could transmit up to 400 words a minute from pre-punched tape
    - Used for news transmission
  - 1871 – Western Union begins money transfers
  - 1871 – Signal telegraph
    - Allowed a customer to signal a central police station, firehouse, or messenger service
  - 1872 – Duplex Telegraph
  - 1884 – Quadraplex Telegraph

Wheatstone Auto Telegraph - In 1858, Charles Wheatstone patented an ***automatic telegraph sender*** that could transmit Morse Code messages at speeds up to 400 words a minute from pre-punched tape. At the receiving end, messages were printed out as dots and dashes by a standard Morse printer and then decoded into letters and numbers. While the message had to be punched onto tape beforehand, this was less skilled work than operating a Morse key; it could be done in advance; and it could be done by several keypunchers working in parallel, each punching a different paragraph with the paragraphs spliced together in proper order afterwards.!! The Wheatstone Automatic Telegraph, as it was known, entered widespread use after 1867, particularly for news transmission for which it was especially well-suited.

Duplex telegraph - In 1872, Joseph Stearns of Boston built and patented a ***duplex telegraph*** which could send messages over a single line in both directions simultaneously. This meant that telegraph companies were able to send twice as much traffic over a single wire as before.

Quadraplex telegraph - In 1884, Thomas Alva Edison invented the ***quadraplex telegraph*** which enabled single wire to carry four streams of traffic

Telegraph

- Historical Notes – 2
  - 1884 – Western Union is one of the original 11 stocks included in the first Dow Jones Average
  - 1900 – Fredrick Creed invents a way to convert Morse Code to text
  - 1913 – Western Union develops Multiplexing
  - 1914 – Western Union introduces the first charge card
  - 1920s-1930s – Telegrams experience peak popularity
  - 1925 – Teleprinter machines

In 1913 Western Union developed multiplexing, which it made possible to transmit eight messages simultaneously over a single wire (four in each direction). Teleprinter machines came into use about 1925.

Telegraph

- Historical Notes – 3
  - 1933 – Western Union introduces singing telegrams
  - 1936 – Varioplex Telegraph
  - 1938 – Facsimile
  - 1959 – TELEX
  - Jan 27, 2006 – Western Union delivers the last telegram

Varioplex, introduced in 1936, enabled a single wire to carry 72 transmissions at the same time (36 in each direction). Two years later Western Union introduced the first of its automatic facsimile devices. In 1959 Western Union inaugurated TELEX, which enables subscribers to the teleprinter service to dial each other directly.

Telephone

- Alexander Graham Bell
  - Son of a professor of elocution in London & Edinburgh who emigrated to Canada
  - Taught deaf mutes in Boston. There
    - Met Gardiner G. Hubbard, an affluent businessman and philanthropist
    - Married Hubbard's deaf daughter, Mabel
    - Became professor of vocal physiology and elocution in 1873
    - Conceived of the telephone in July 1874

Graham Bell began teaching deaf-mutes in Boston in 1871, where he met Gardiner Greene Hubbard, an affluent businessman and philanthropist. One of Hubbard's daughters, Mabel, had been deaf from scarlet fever since the age of five. She became one of Bell's pupils. He fell in love with her and they were married. Bell was very sensitive to the psychological plight of children imprisoned by their physical disability. He had an extraordinary capacity for reclaiming recalcitrant children and gained the support' of Sarah Fuller, a prominent Boston teacher of the deaf. He became interested in multiple telegraphy as a means of communication and tried to make an instrument for transmitting sound vibrations.

Bell's considerable reputation as a teacher led Lewis Monroe, dean of the School of Oratory of the recently formed Boston University, to offer him a chair in vocal physiology and elocution in 1873. This provided him with a permanent base from which he could pursue his research. Bell was the first person to realize that the electrical transmission of the human voice was physically possible and commercially practicable.

Telephone

- Origins of the Telephone
  - Invention of the duplex and quadraplex telegraph showed:
    - A telegraph wire could be made to carry the traffic of first two and then four wires
  - Concept of the harmonic telegraph
    - Bell's experience with a stuck reed led to the realization that a wire could also transmit a voice message
  - Bell obtained a patent for the telephone on March 7, 1876

Duplex Telegraph - In 1872, Joseph Stearns of Boston built and patented a ***duplex telegraph*** which could send messages over a single line in both directions simultaneously. This meant that telegraph companies were able to send twice as much traffic over a single wire as before. (p192) [Standage]

Quadraplex telegraph - In 1884, Thomas Alva Edison invented the ***quadraplex telegraph*** which enabled single wire to carry four streams of traffic (p194) [Standage]

Harmonic telegraph - The invention of the duplex and quadraplex had shown that with the right approach, a single telegraph wire could be made to carry the traffic of first two and then four wires. Could a wire be made to carry even more traffic? Since such an invention would save telegraph companies a lot of money, many inventors devoted much time and effort to the project. !! One possible approach was a ***harmonic telegraph*** -- use of a series of reeds vibrating at different frequencies with each separate frequency sending an electrical signal that would be combined, sent down a telegraph wire, and then separated out at the other end using an identical series of reeds, each of which would respond only to the signal generated by its counterpart. By starting and stopping the vibrations of each reed to make dots and dashes, More telegraphy using a harmonic telegraph would be possible. Eventually, Western Union with its Varioplex system in 1936 enabled a single wire to carry 72 transmissions (36 in each direction) simultaneously.

The stuck reed - Bell conceived the idea of the telephone in July 1874. While he was working on a harmonic telegraph, Thomas Watson's plucking of a stuck reed caused the sound of the reed's twang to be heard. Bell realized that with a few modifications, his device could transmit any sound – including the human voice.

Telephone

- How the Telephone Worked
  - Caller would talk into vibrating plates or reeds
    - This would induce a continuous fluctuating current
    - Current would carry the exact amplitude and voice frequency along a wire
    - An electromagnet at the receiver would transform the current into pulses of magnetic force
    - These pulses would act on another set of tuned reeds to reproduce the original sound

Telephone

- Creation of the Bell Telephone system
  - Hubbard was excited by Bell's invention
    - Opposed Western Union because it was a monopoly & favored a U.S. Postal Telegraph Company
    - Organized the Bell Telephone Company in July 1878
    - Persuaded Theodore N. Vail to run the company
  - Bell Telephone won a suit against a Western Union-sponsored competitor

Western Union, threatened in its monopoly of communications, brought together a motley collection of rival claimants to dispute Bell's authorship and impugn his character. In December 1878, Western Union established a rival, the American Speaking Telephone Company, but not before the Bell Company had sued for an injunction in Massachusetts against Western Union's agent, Peter Dowd, for renting out telephone transmitters illegally. The case was first heard on January 25, 1879. Western Union claimed that Elisha Gray had first invented the telephone and that Amos Dolbear had perfected it. Bell produced a letter he had received from Gray dated March 5, 1877, acknowledging Bell's prior claim, and this crucial piece of evidence was taken as positive proof that Bell had conceived, made practical, and patented the telephone before anyone else. The Dowd case was resolved on November 10, 1879, when Western Union agreed to forfeit its telephone business and to assign all its telephone patents to the Bell Company in return for 20 percent of telephone rental receipts for seventeen years.

Telephone

- Notes about the Bell Telephone System
  - Bell Telephone would manufacture the phones & license them to local phone companies
  - This meant that Bell:
    - Could for its first 16 years dictate, via its license agreements, both common technologies and the cost of local phone service
    - Due to its technical standardization, could begin long-distance phone service
  - Bell created Bell Labs to solve the technical problems that beset long-distance service

Thus, between 1877-1893, the *Bell Telephone Company,* through its local affiliated operating companies, controlled and standardized every telephone, every telephone line, and every telephone exchange in the country. This permitted Bell in the 1880s to conclude that they could profitably connect one local operating company with another precisely because all the operating companies were using standardized technology. While there were technical problems in maintaining voice clarity over long distances, the organizational problems in connecting New York with Chicago or Los Angeles were minimal.

Telephone

- Early leaders of Bell saw the telephone as simply a "talking telegraph"
  - Assumed the telephone would be used just like the telegraph and by the same types of users
- This had three effects
  - Led independent phone companies to take advantage by providing services that Bell didn't
  - Slowed down the pace of telephone adoption
  - Brought Bell to near bankruptcy, leading to its takeover in 1907 by Morgan banking interests and the stabilization of AT&T under Theodore Vail

"Talking Telegraph" - Bell officials assumed that the telephone system would be used similarly to the way the telegraph network was used -- I.e. the primary customers and users would be businesses in urban areas. Thus rates were kept high in order to provide the most reliable and clearest voice service possible. By the end of the company's first year, 3,000 phones had been leased; by 1880 -- 60,000 phones; by 1893 (when the Bell patents expired) -- 260,000 phones. About 2/3rd of the phones were in business establishments. Most of the country's business information and transactions still traveled by mail and by telegraph because businesses normally wanted a written record of their transactions *{which mail and telegraph provided}.* What the organizers of the Bell system failed to understand was that, while in technological terms the telephone was similar to the telegraph, in social terms it was quite different. The telephone provided user-to-user communication -- with the telegraph there were always intermediaries in the form of the telegraph operators. Also, the telephone was a form of voice communication -- as such, it facilitated emotional communication which was impossible with the telegraph. In short, the Bell Company failed to understand that people would use the telephone to socialize with one another. Instead they saw such socializing as a trivialization or an abuse of the service.

Independents - The independent companies took advantage of Bell's mistake. Some offered services that Bell hadn't thought to provide: ***Dial telephones which allowed customers to contact each other without having to rely on an operator*** (who sat at a switchboard manually connecting one line to another with plugs and often relieved the boredom of her job by listening in on the conversation). ***Party lines which drastically lowered the cost of residential service*** by allowing anywhere from 2 to 10 residences to share the same telephone line and telephone number, and ***Phone service in rural areas***.

Telephone Adoption – Initially, Bell and Vail focused their advertising on trying to create a need for the phone, publicizing the existence of the phone, telling people how to use it, and encouraging courteous conversation while on the phone. From 1900 to the 1927, Bell directed its advertising primarily to businessmen – telling them that phone service impressed customers, saved time, facilitated planning, and allowed businessmen to keep in touch with their offices while out of the office. A secondary focus was on home management – housewives could call doctors, schools, grocers, coal dealers, etc to facilitate the conduct of household-related business – and conveying messages of importance. It was not until the mid-1920s that Bell's advertising recognized that the telephone was made for socializing – calling friends and relatives to chat and even then the focus was on invitations, calling home while on a business trip, and conveying news of a safe arrival. The combination of a misconstrued medium, misdirected advertising, and high phone rates slowed down the pace of public adoption of the telephone. As late as 1920, only 35% of all households had phones and it wasn't until 1950 that over half of all American households (61.8%) had them, with near-universal adoption (90.5%) of the phone not occurring until 1970.

Near Bankruptcy - In 1907, the Boston investors that had dominated Bell lost control of the company to the Morgan banking interests, as a consequence of soaring debt, multiple stock offerings, and declining profit that resulted from the competition with independent phone companies after Bell's patents had expired. AT&T's new president, Theodore N. Vail, had a goal of 'one system, one policy, universal service.' Telephone service 'should be universal, interdependent, and intercommunicating, affording opportunity for any subscriber of any exchange to communicate with any other subscriber of any other exchange.' This meant creating an integrated telephone network throughout the country. In pursuit of this end, Vail had both a political and a business strategy. Instead of rejecting any role for government, he was willing to accept

Telephone

- Bell/ATT Timeline - 1
  - 1878 - First commercial switchboard established in New Haven, CT
  - 1880 – Local telephone companies reorganized as the American Bell Telephone Company
  - 1880 – First telephone numbers
  - 1880 – First pay telephone
  - 1885 – Name changed to American Telephone & Telegraph Company
  - 1893 – With the expiration of Bell's patents, independent phone companies enter the business
    - By 1902, there were 9,000 such companies

1880 saw the institution of telephone numbers -- the first telephone directories had no numbers, only names; but a measles epidemic in Lowell MA led to the idea of assigning each subscriber a telephone number to make it easier for substitute telephone operators to take over. 1880 also saw the installation of the first pay telephone. By 1902, there were 81,000 pay phones. (p124) [Ierley]

First transcontinental telephone - Using the first practical electrical amplifiers, developed by AT&T's Harold Arnold, AT&T opens the first transcontinental telephone line. The new line connects the network that AT&T had been building out in every direction from New York since 1885 with a separate network that had been constructed by AT&T's Pacific Telephone subsidiary on the West Coast.

Telephone

- Bell/ATT Timeline -– 2
  - 1915 – First transcontinental telephone call
  - 1919 – First rotary dial telephone
  - 1922 - AT&T opens WEAF, the first commercial radio station in New York.
  - 1925 - AT&T establishes Bell Telephone Laboratories Inc. as its research and development subsidiary.
  - 1927 - AT&T begins transatlantic telephone service
  - 1934 – AT&T inaugurates trans-pacific phone service

Bell Labs – In 1937, Clinton Davisson of Bell Telephone Laboratories won the Nobel Prize in Physics for experimental confirmation of the wave nature of the electron. He became the first of seven Nobel Prize winners produced by AT&T.

First transcontinental telephone - Using the first practical electrical amplifiers, developed by AT&T's Harold Arnold, AT&T opens the first transcontinental telephone line. The new line connects the network that AT&T had been building out in every direction from New York since 1885 with a separate network that had been constructed by AT&T's Pacific Telephone subsidiary on the West Coast.

WEAF - AT&T left radio broadcasting in 1926, retaining the networking facilities used to send programs to stations across the country

Transatlantic service - The conversations crossed the Atlantic via radio. The initial capacity is 1 call at a time, at a cost of $75 for the first three minutes. In terms of constant 1990 prices, the cost of the call was $245 in 1930, $50 in 1960, 35 cents in 1999.

Telephone

- Bell/ATT Timeline -– 3
  - – 1941 – First non-experimental laying of coaxial cable
  - – 1946 – Beginning of mobile phone service
  - – 1947 - Bell Labs invents the transistor
  - – 1951 - First customer dialing of long-distance calls
  - – 1956 - First transatlantic telephone cable
  - – 1962 - First telephone satellite - Telstar

Coaxial cable - The first non-experimental installation of coaxial cable in the network is placed in service between Minneapolis, Minn., and Stevens Point, Wis. The type of coaxial cable installed was invented at AT&T in 1929 and is the first broadband transmission medium.

Mobile phone service - AT&T begins offering mobile telephone service. With a single antenna serving a region, no more than 12 to 20 simultaneous calls could be made in an entire metropolitan area

Transistor - AT&T Bell Telephone Laboratories scientists John Bardeen, Walter Brattain, and William Shockley invent the transistor, the first solid state amplifier or switch, and lay the foundation for modern electronics. The three shared the Nobel Prize in Physics in 1956 for the achievement.

Long-distance calls - AT&T introduces customer-dialing of long distance calls, initially in Englewood, NJ. The national rollout takes place over the second half of the 1950s. Until this innovation, all long distance calls required operator assistance.

Transatlantic cable - AT&T opens for service TAT-1, the first trans-Atlantic telephone cable. The initial capacity is 36 calls at a time at a price per call of $12 for the first three minutes. Since trans-Atlantic service opened in 1927, calls had traveled across the ocean via radio waves. But cables provide much higher signal quality, avoid atmospheric interference and offer greater capacity and security.

Telstar – Telstar transmits the first live television across the Atlantic

Telephone

- Bell/ATT Timeline -– 4
  - – 1963 – First touchtone phone
  - – 1968 - AT&T introduces 911 as a nationwide emergency number
  - – 1970 - First customer dialing of international telephone calls
  - – 1971 - Researchers at Bell Labs create the Unix computer operating system
  - – 1977 – Installation of the first fiber optic cable

Touchtone phone – With touchtone service, a keypad replaces the familiar telephone dial, initially in Greensburg and Carnegie, Pennsylvania.
International calls – First service was between New York City and London

Telephone

- Bell/ATT Timeline -– 5
  - – 1983 – AT&T opens the first commercial cellular telephone service in Chicago
  - – 1984 - Dissolution of AT&T and creation of the Baby Bells
  - – 1988 - First transatlantic fiber optic cable
  - – 1996 - Telecommunications Act of 1996

1984 - In 1982, AT&T and the Justice Department agreed on tentative terms for settlement of anti-trust suit filed against AT&T in 1974. AT&T agrees to divest itself of its local telephone operations. On January 1, 1984, the Bell System ceases to exist. In its place are seven Regional Bell Operating Companies – the Baby Bells - and a new AT&T that retains its long distance telephone, manufacturing, and research and development operations. This marks the beginning of competition, first in the long-distance telephone market and later in the telephone market generally. One consequence was a reduction in long-distance phone rates.
Transatlantic fiber optic - AT&T lays and opens TAT-8, the first fiber optic submarine telephone cable across the Atlantic. It has a capacity equivalent to 40,000 calls, ten times that of the last copper cable. (Today's cables have capacities equivalent to over 1,000,000 calls).
1991
Phone competition - President Bill Clinton signs the Telecommunications Act of 1996 into law. It is the first rewriting of the nation's communications laws since 1934. The bill's purpose is to promote competition between local telephone companies, long distance telephone companies and cable companies by establishing procedures for the elimination of legal and regulatory barriers between these industries.

Telephone

- Telephone vs Telegraph
  - Telephone permitted voice communication as opposed to Morse Code
  - Telephone communication was synchronous and dialogic whereas the telegraph was asynchronous
  - Telegraph left a written record – the telegram – whereas the telephone did not
  - Telegraph required an intermediary – the telegraph operator – while the telephone within a local exchange did not

Telephone

- Effects of the Telephone
  - It replaced the telegraph in the performance of many of its functions, particular its coordination and communication functions
  - Its technical problems led to the creation of Bell Labs – from which many innovations and discoveries flowed
  - Its linking of different exchanges created the first virtually universal network
    - A network that no longer required people to be at a fixed point to access the communication system

Replacing the telegraph - Thus, the phone replaced the telegraph in placing business orders, making hotel reservations, arranging theatrical and sports performances, making travel reservations, and scheduling events and performances.

Bell Labs – Among the innovations coming out of Bell Labs were the transistor, fiber optics, and the discovery of the background radiation left over from the Big Bank at the beginning of the universe.

Network – While the telegraph system had network effects, its network was limited. It linked railroad stations, business establishments, newspapers, and government offices; but it did not reach into private homes. Any telegram to a person at home had to be delivered by a messenger to the home. The phone not only linked the establishments formerly linked by the telegraph, but also reached into the home.

Telephone

- Effects of the Telephone – 2
  - Telephone poles and wires changed the suburban and rural landscape
  - Made obsolete the Victorian practice of card leaving
    - Led to people calling before coming over for a visit
  - Led to large-scale solicitation by businesses and charities who started calling people at home

Card leaving - During its American vogue, 1870 to 1910, card leaving became an avenue for entering society, of designating changes in status or address, of issuing invitations and responding to them, of presenting sentiments of happiness or condolence, and, in general !! of carrying on all the communications associated with middle class social life. Done almost exclusively by women in the afternoon, calling and card leaving entailed complicated social arithmetic. Since husbands did not normally accompany their wives, the wife left her husband's card where she visited. If the lady of the house was "at home," the visitor left two of her husband's cards on the card receiver, one for the lady of the house and one for the lady's husband. She did not leave her card, since she had seen the lady. If, however, the visitor called but the lady of the house was "not at home," she left three cards on the receiver, one of her own (etiquette books prescribed that a lady should leave only *one* card for a lady) and two of her husband's. The contents of a family's card receiver were sorted and evaluated. Decisions then had to be made as to how to respond—to pay an actual visit or only a surrogate one by way of a card (a call for a call or only a card for a card). Mark Twain, writing in *The Gilded Age,* lampooned the intricacy of these social rituals by commenting: "The annual visits are made and returned with peaceful regularity and bland satisfaction, although it is not necessary that the two ladies shall actually see each other oftener than once every few years. Their cards preserve the intimacy and keep the acquaintanceship intact."

Typewriter – In the words of Marshall McLuhan in *Understanding Media*, "It was the telephone, paradoxically, that sped the commercial adoption of the typewriter. The phrase "Send me a memo on that," repeated into millions of phones daily, helped to create the huge expansion of the typist function. C. Northcote Parkinson's law that "work expands so as to fill the time available for its completion" is precisely the zany dynamic provided by the telephone. In no time at all, the telephone expanded the work to be done on the typewriter to huge dimensions. Pyramids of paperwork rise on the basis of a small telephone network inside a single business.

Telephone

- Effects of the Telephone - 3
  - Sped the commercial adoption of the typewriter
    - The need to create memos or records of phone conversations helped increase the need for typists
  - Fosters sociable conversation, gossip, and chit-chat
    - Thus teen-age girls are the biggest users of the phone
  - Fostered the development of subsequent communication technologies

Subsequent technologies – The telephone helped inspire Edison to invent the phonograph. In 1877, after Thomas Edison had perfected a better transmitter for Bell's telephone, Edison worried that the high cost of telephones might limit their use. Thus, Edison sought a device on which a person could record a spoken message and then take the record to a central station which it could be transmitted to an addressee over a telephone. The instrument that Edison designed consisted of a rotating, grooved metal cylinder around which a piece of tin foil was wrapped to record and play back the sounds. In December 1877, Edison recorded and played back "Mary Has a Little Lamb." Edison quickly patented the device and formed the Edison Speaking Phonograph Company to manufacture and exhibit the instrument around the country. Later communication technologies inclueded fiber optics, communication satellites, and cell phones

Post Office & Mail

- Before the Civil War, delivering mail was by far the largest activity of the Federal Government
- It employed more people than the peacetime armed forces and more than the rest of the civilian bureaucracy
- Small communities demanded and got post offices because mail was not delivered to homes and had to be picked up at the post office

Post Office & Mail

- Post office fostered transportation improvements
  - Contracts for carrying mail went to stagecoach lines, steamboats, and the railroads
- Early mail consisted mostly of printed material, overwhelmingly newspapers
  - Letter writing did not start to become popular until the 1850s

Domestic letters carried by the Post Office increased from 27 million in 1840 to 162 million in 1860. Per capita correspondence rose from 1.61 letters in 1840 to 5.15 in 1860. Whereas in the 1840s, the overwhelming bulk of mail consisted of newspapers (which were circulated to subscribers via the mails), by 1860 people started writing letters to each other. The fact that the mail was now going by rail instead of stagecoach or horseback made mail both cheaper and more certain of reaching its intended recipient.

Post Office & Mail

- Key Dates in Post Office History
  - 1847- Congress adopts adhesive postage stamps for mail
  - 1850 – Standard size envelopes
  - 1851 – Congress cut the postage rate to 3 cents (prepaid) per oz
  - 1853 – Stamped Envelopes
  - 1855 – Congress makes postage stamps mandatory

Postage stamps - Prior to the issuance of the first stamps, letters accepted by postmasters for dispatch were marked "Paid" by means of pen and ink or hand stamps of various designs. Such letters usually contained the town post mark and date of mailing.

Envelopes - Stamped envelopes were first issued in June 1853 under an act of August 31, 1852

Printed stamped envelopes were first issued in the spring of 1865. Prior to the envelope, letters were simply folded and sealed with wax.

Post Office & Mail

- Key Dated in Post Office History – 2
  - 1863 – Free home delivery in large northern cities
  - 1873 – Postcards
  - 1874 – Post Office began charging publications by the pound rather than the piece, with newspapers paying 2 cents per lb & magazines 3 cents per lb
  - 1885 – Congress cut the above second-class rates to 1 cent per lb

Free Home Delivery – Before 1863, everyone picked up their mail at the Post Office or paid a postman 2 cents a letter for home delivery. In 1863, free home delivery was instituted in all urban areas with a population over 20,000. In 1883, free home delivery was expanded to towns of over 10,000.

Effects of Rate Reductions – The above reductions made magazines far cheaper than advertising circulars as a mailed marketing vehicle. This caused magazines to take off as advertisers began to advertise massively in magazines and this, combined with the lower postal rates, allowed magazine publishers to provide an ever-increasing number of readers with low-cost subscriptions.

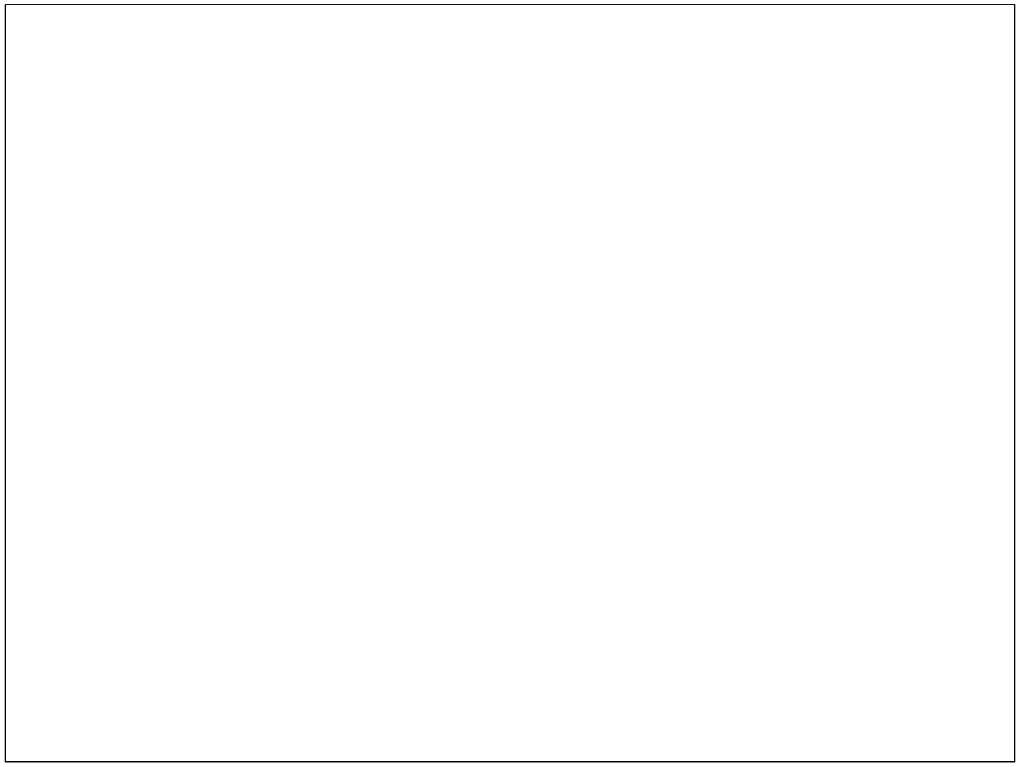
Post Office & Mail

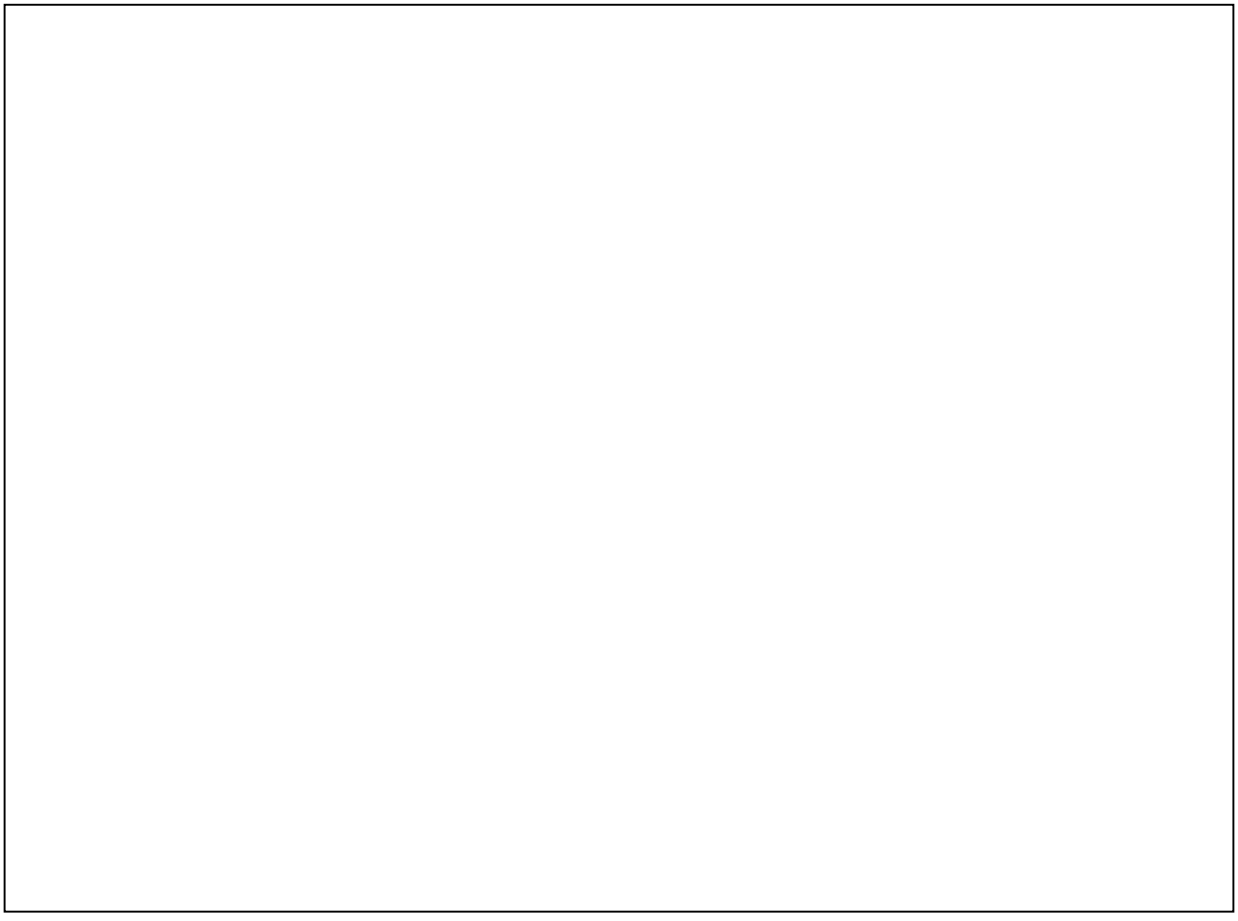
- Key Dates in Post Office History -3
  - 1896 – Special Delivery
  - 1897 – Rural Free Delivery
  - 1911 – Parcel Post
  - 1917 – Air Mail Delivery

RFD - Before RFD, rural citizens had the most limited of horizons. One would have to often travel miles to town to pick up the latest newspaper or learn the latest news at the depot's telegraph office. During muddy seasons, when dirt roads were impassible, school and church attendance fell off dramatically. With RFD, rural residents could now receive Sears Roebuck catalogs, magazines, and newspapers, thus broadening their horizons. But if the roads were unfit for travel (as they often were), the postal carriers were allowed to stay home. "Creating an entitlement, then frustrating its delivery, caused a predictable response" -- the introduction of legislation in Congress to build postal roads. It was, however, the automobile that pushed the good roads movement to critical mass.

Parcel Post – With parcel post, the Post Office went into the logistics business. Thus, after parcel post, the Post Office was involved with both communications and logistics. These two functions have not always meshed well and the logistics function – the shipping of packages – unlike mail, was always subject to competition – initially from railway express, later from trucking concerns, and now from FedEx, UPS, and DHL. The combination of parcel post and rural free delivery made Sears, Roebuck and its famed catalog an American retailing institution.

Air Mail Delivery – Air Mail delivery was an economic boon to the fledgling airlines. In the 1920s and 1930s, when the public was rightfully wary about flying due to safety concerns, it was contracts for airborne delivery of mail that helped keep the airlines financially viable.





Typewriter

- Invented by Christopher Sholes
  - Christopher Sholes:
    - Developed a workable typewriter in 1867,
    - Drew in some co-inventors to improve the device
    - Found a manufacturer in small-arms maker Remington
  - 1874 – First Remington typewriter
  - 1876 - Exhibited at the 1876 Centennial Exposition in Philadelphia
  - 1878 - Remington Model 2 typewriter – the manual typewriter as we remember it

Christopher Sholes - Christopher L. Sholes, a Milwaukee newspaperman, poet, and part-time inventor, was the main creator of this machine. The Sholes & Glidden typed only in capital letters, and it introduced the QWERTY keyboard, which is very much with us today. The keyboard was probably designed to separate frequently-used pairs of typebars so that the typebars would not clash and get stuck at the printing point. The S&G was a decorative machine, boasting painted flowers and decals. It looked rather like a sewing machine, as it was manufactured by the sewing machine department of the Remington arms company. The initial Sholes-Glidden-Soule design was inelegant. Users could not see their work as they typed. Typebars clashed frequently, having to be untangled. *{The need to prevent tangling of type bars led to the relatively inefficient QWERTY keyboard}* . Initially, the machine was limited to a single typeface. !! Nevertheless, the Sholes design triumphed for two major reasons. First, it could be steadily improved. Second, Sholes' associate, James Densmore found both a market for the typewriter in court reporters and a manufacturer -- the Remington Arms Company -- that was both looking for a product to manufacture and which had expert mechanics who were experienced in the advanced machine shop practice developed at the national armories.

Model 2 typewriter – Unlike the Model 1, the Model 2 allowed the typist to see what he/she typed. It It had a carriage return lever on the machine itself and a shift mechanism to allow for printing both capital and lower case letters. By 1882, typewriter sales reached 2,300 a year; by 1892 -- 25,000 a year. By 1886, Remington and other typewriter manufacturers were selling 50,000 typewriters a year. By 1895, the Federal Government had 1,990 typewriters in use -- 80% Remington models

Typewriter

- Initially marketed to authors, lawyers, clergymen, and court reporters
  - Court reporters were the first major adopters of the typewriter
- Businessmen saw its commercial potential to speed up correspondence
  - The typewriter found large-scale popularity in the business office, then spread to government, and finally to individual authors and students

Business use of typewriter - As Frank H. Palmer noted in 1892, "With one of these machines, a businessman can dictate with ease, and his clerk can neatly print, 60 business letters in a day. It has been demonstrated by many tests that the typewriter, as compared with the pen, saves 40 minutes an hour, or five hours and 20 minutes in a business day. If 'time is money,' it is easy to calculate what kind of bargain one makes in purchasing one of these labor-saving machines."

Authors & students - The typewriter found its initial niche in the business office. It later spread to government offices and then to individual writers and students -- both of whom found that publishing houses and professors found it easier to read (and thus favored) typewritten as opposed to handwritten manuscripts. The typewriter remained an office fixture until the emergence of the personal computer/the computer printer/word processing software at which point it became relegated to the storeroom or unused desk for which it was used only to fill in forms and type in labels. When form-filling and labeling software became common, the typewriter vanished.

Typewriter

- Effects of the Typewriter
  - Created a demand for typists and stenographers
    - Feminized the clerical work force
      - Impacted upon female fashion
      - This opened up a new niche for women, but also confined them to a subservient status
  - Led people to start composing documents on the typewriter

Women in the clerical work force - Since women were considered to have more nimble fingers and bertter memories than men, the typewriter opened up the formerly all-male office to women secretaries, stenographers, and clerk-typists. In 1870, 4.5% of clerks and stenographers were female. In 1930, 91.8% of typists and stenographers were female.
Female fashion – In the words of Marshall McLuhan, “The uniform ranks of fashionable female typists made possible a revolution in the garment industry What she wore, every farmer's daughter wanted to wear, for the typist was a popular figure of enterprise and skill. She was a style-maker who was also eager to follow styles.” This was especially the case after Charles Gibson produced his famous illustrations of the Gibson Girls whose “ready-to-wear” clothes (which consisted of a blouse, called a shirt-waist and a skirt which were purchased separately) other women wanted to wear.
Female subservience – G.K. Chesterton pointed out both the new niche and the fact of female subservience in his famous comment - "women refused to be dictated to and went out and became stenographers."

Typewriter

- Effects of the Typewriter – 2
  - Revolutionized the Office
    - Produced text that was more legible than handwriting
    - With carbon paper, produced multiple copies of the same document
      - Revolutionized office filing
      - Multiplied the quantity of office records
      - Created the typewritten form
    - Changed the furniture of the office
    - Divided correspondence into official (typed) and personal (handwritten)

The typewriter along with carbon paper revolutionized the office and office filing. It had the advantage of producing text that was more legible than almost all forms of handwriting and could, with carbon paper, produce multiple copies of the same document.

Office filing - Instead of incoming correspondence bound with red tape and copy or letter press books of outgoing correspondence, the typewriter made possible case files that combined all documents relating to a particular case, transaction, event, or person in which original incoming documents and carbon copies of outgoing documents were all interfiled -- case files that were easily retrievable by resort to typed index cards. Prior to the case file or project file, the typical office would have a file of incoming correspondence that was usually filed chronologically or alphabetically and a separate file of hand-copied or letterpress copies of outgoing correspondence together with an index book that listed the name & date of all incoming correspondence and the number or date of the related outgoing correspondence. In addition, the typewriter could easily be used to type data into forms to create uniform-type data for many types of transactions.

Records – One consequence of the typewriter and the case file was the proliferation of records, especially as carbon copies of outgoing correspondence were often circulated to higher levels or other offices dealing with the same subject. To take the Federal Government as an example, the Federal Government from 1774 to 1861 accumulated 100,000 cubic feet of records. From 1861 to 1916, it accumulated 1, 600,000 cubic feet of records.

Office furniture - To accommodate the typewriter, office furniture was changed -- the roll top desk with its pigeonholes gave way to the tabletop desk with underlying drawers. Along with the telephone (women were considered to have more pleasant voices and thus considered to be ideal telephone answerers and screeners), the typewriter opened up the formerly all-male office to women secretaries, stenographers, and clerk-typists. It also led to a division of correspondence into business or official (which was typed) and personal (which was still handwritten. Combined with the telegraph and later the telephone in the form of the teletypewriter and later the fax machine, it speeded up communication of messages