AIM: How did technological developments transform the United States?
Standards: Impact of Science and Technology on History
Main ideas: Technology transformed the United states in the first half of the 19th century fundamentally changing the way people work and live.
Technological change led to an increased demand for workers leading to increased immigration and changing population of the US.
Technological changes furthered sectional divisions and were an underlying cause of the Civil War.
Objectives: Acquire information from a chart and reading passage; group analysis; present information to class.
Materials: Cotton balls, mystery box, sewing machne, overhead
Inventions Package(Source: http://inventors.about.com/library/inventors)
Do Now: List 5 examples of new technologies developed during your life time.
Motivation: Discuss how technology is changing the world today (Electronics0.
Activities: Examine ovrhead. Areas of development (Agricultural, Transportation, Textiles). Cotton ball to thread. Groups examine chart and passages and select the most important invention. Criteria. How did it transform the US?Which technological development do you consider the most important in this period? Why?
Summary Question: In your opinion, did technological change have a greater impact at the start of the 19th century or today?

Technological change 1790-1850

Inventor	**Year**	**Achievement**
Samuel Slater	1790	Opened first U.S. factory
Eli Whitney	1793	Invented the cotton gin
Charles Newbold	1797	Invented a cast-iron plough
Eli Whitney	1798	Developed interchangeable parts
Oliver Evans	1804	Improved the steam engine
Robert Fulton	1807	Developed a steamboat
NYS Erie Canal	1817-25	Connects Hudson River with Great Lakes
Cyrus McCormick	1831	Invents harvesting reaper
John Deere	1837	Invents steel-typed plough
Charles Goodyear	1839	Invents hardened rubber
Samuel Morse	1844	Invents the telegraph
Elias Howe	1846	Invents a sewing machine

Samuel Slater (1790): On December 20, 1790, water-powered machinery for spinning and carding cotton was set in motion in Pawtucket, Rhode Island. Based on the designs of English inventor Richard Arkwright, a mill was built by Samuel Slater on the Blackstone River. The Slater mill was the first American factory to successfully produce cotton yarn with water-powered machines. Slater was a recent English immigrant who apprenticed Arkwright's partner, Jebediah Strutt. Samuel Slater had evaded British law against emigration of textile workers in order to seek his fortune in America. Considered the father of the United States textile industry, he eventually built several successful cotton mills in New England and established the town of Slatersville, Rhode Island.

Eli Whitney (1793): The inventor of the cotton gin and a pioneer in the mass production of cotton. By April 1793, Whitney had designed and constructed the cotton gin, a machine that automated the separation of cottonseed from the short-staple cotton fiber. Eli Whitney's machine could produce up to 23 kg (50 lb) of cleaned cotton daily, making southern cotton a profitable crop for the first time. Eli Whitney's machine was the first to clean short-staple cotton. His cotton engine consisted of spiked teeth mounted on a boxed revolving cylinder which, when turned by a crank, pulled the cotton fiber through small slotted openings so as to separate the seeds from the lint -- a rotating brush, operated via a belt and pulleys, removed the fibrous lint from the projecting spikes. The gins later became horse-drawn and water-powered gins and cotton production increased, along with lowered costs. Cotton soon became the number one selling textile.

Charles Newbold (1797): The first real inventor of a practicable plow was Charles Newbold, of Burlington County, New Jersey, to whom a patent for a cast-iron plow was issued in June, 1797. But the farmers would have none of it. They said it "poisoned the soil" and fostered the growth of weeds. One David Peacock received a patent in 1807, and two others later. Newbold sued Peacock for infringement and recovered damages. Pieces of Newbold's original plow are in the museum of the New York Agricultural Society at Albany.

Eli Whitney (1798): As early as 1798, Eli Whitney had turned his talents to the manufacture of firearms. He had established his shops at Whitneyville, near New Haven; and it was there that he worked out another achievement quite as important economically as the cotton gin, even though the immediate consequences were less spectacular: namely, the principle of standardization or interchangeability in manufacture. This principle is the very foundation today of all American large-scale production. The manufacturer produces separately thousands of copies of every part of a complicated machine, confident that an equal number of the complete machine will be assembled and set in motion. The owner of a motor car, a reaper, a tractor, or a sewing machine, orders, perhaps by telegraph or telephone, a broken or lost part, taking it for granted that the new part can be fitted easily and precisely into the place of the old.

Oliver Evans (1804): Pioneered the high-pressure steam engine. Evans was born in Newport, Delaware on September 13, 1755. At sixteen years old, he was apprenticed to a wheelwright, however, within two years Oliver Evans began his inventing of a new high-pressure steam engine. Evans also invented textile industries tools and milling equipment. In 1782, Oliver Evans built the first automatic mill on Red Clay Creek, Delaware. In 1789, the first U.S. patent for a steam-powered land vehicle was granted to Oliver Evans.

Robert Fulton (1807): American inventor Robert Fulton successfully built and operated a submarine (in France) in 1801, before turning his talents to the steamboat. Robert Fulton was accredited with turning the steamboat into a commercial success. On August 7, 1807, Robert Fulton's Clermont went from New York City to Albany making history with a 150-mile trip taking 32 hours at an average speed of about 5 miles-per-hour. In 1811, the "New Orleans" was built at Pittsburgh, designed by Robert Fulton and Robert Livingston. The New Orleans had a passenger and freight route on the lower Mississippi River. By 1814, Robert Fulton together with Edward Livingston (the brother of Robert Livingston), were offering regular steamboat and freight service between New Orleans, Louisiana and Natchez, Mississippi. Their boats traveled at the rates of eight miles per hour downstream and three miles per hour upstream.

Erie Canal (1817-1825):
During the late eighteenth and early nineteenth centuries, the new nation known as the United States of America began to develop plans to improve transportation into the interior and beyond the great physical barrier of the Appalachian Mountains. A major goal was to link Lake Erie and the other Great Lakes with the Atlantic Coast through a canal. On July 4, 1817, construction of the Erie Canal began in Rome, New York. The first segment of the canal would proceed east from Rome to the Hudson River. Thousands of British, German, and Irish immigrants provided the muscle for the canal. On October 25, 1825, the entire length of the Erie Canal was complete. The canal consisted of 85 locks to manage a 500 foot (150 meter) rise in elevation from the Hudson River to Buffalo. The canal was 363 miles long, 40 feet wide, and 4 feet deep.

Cyrus McCormick (1831): Cyrus McCormick of Virginia was responsible for liberating farm workers from hours of back-breaking labor by introducing the farmers to his newly invented mechanical reaper in July, 1831. By 1847, Cyrus McCormick began the mass manufacture of his reaper in a Chicago factory. The first reapers cut the standing grain and, with a revolving reel, swept it onto a platform from which it was raked off into piles by a man walking alongside. It could harvest more grain than five men using the earlier cradles. The next innovation, patented in 1858, was a self-raking reaper with an endless canvas belt that delivered the cut grain to two men who riding on the end of the platform, bundled it.

John Deere (1837): John Deere was an Illinois blacksmith and manufacturer. Early in his career, Deere and an associate designed a series of farm plows. In 1837, on his own, John Deere designed the first cast steel plow that greatly assisted the Great Plains farmers. The large plows made for cutting the tough prairie ground were called "grasshopper plows." The plow was made of wrought iron and had a steel share that could cut through sticky soil without clogging. By 1855, John Deere's factory was selling over 10,000 steel plows a year. In 1868, John Deere's business was incorporated as Deere & Company, which is still in existence today. John Deere became a millionaire selling his steel plows.

Charles Goodyear (1839): Natural rubber was harvested from the sap that oozed from the bark of a tree. The name "rubber" comes from the use of the natural substance as a pencil eraser that could “rub out” pencil marks and is the reason that it was then re-named “rubber.” Besides pencil erasers, rubber was used for many other products, however, they did not stand up to extreme temperatures and become brittle in winter. During the 1830's, many inventors tried to develop a

rubber product that would last year-round. In 1837, Charles Goodyear received his first patent (US patent #240) for a process that made rubber an easier product to work with. In 1843, Charles Goodyear discovered that if you removed the sulphur from rubber then heated it, it would retain its elasticity. This process called vulcanization made rubber waterproof and winter-proof and opened the door for a enormous market for rubber goods.

Sameul Morse (1844): While a professor of arts and design at New York University in 1835, Samuel Morse proved that signals could be transmitted by wire. He used pulses of current to deflect an electromagnet, which moved a marker to produce written codes on a strip of paper - the invention of Morse Code. The following year, the device was modified to emboss the paper with dots and dashes. He gave a public demonstration in 1838, but it was not until five years later that Congress (reflecting public apathy) funded $30,000 to construct an experimental telegraph line from Washington to Baltimore, a distance of 40 miles. Six years later, members of Congress witnessed the sending and receiving of messages over part of the telegraph line. Before the line had reached Baltimore, the Whig party held its national convention there, and on May 1, 1844, nominated Henry Clay. This news was hand-carried to Annapolis Junction (between Washington and Baltimore) where Morse's partner, Alfred Vail, wired it to the Capitol. This was the first news dispatched by electric telegraph. The message, "What hath God wrought?" sent later by "Morse Code" from the old Supreme Court chamber in the United States Capitol to his partner in Baltimore, officially opened the completed line of May 24, 1844.

Elias Howe (1846): Elias Howe was the inventor of the first American-patented sewing machine. Elias Howe was born in Spencer, Massachusetts on July 9, 1819. After he lost his factory job in the Panic of 1837, Howe moved from Spencer to Boston, where he found work in a machinist's shop. It was here that Elias Howe began tinkering with the idea of inventing a mechanical sewing machine. Eight years later, Elias Howe demonstrated his machine to the public. At 250 stitches a minute, his lockstitch mechanism outstitched the output of five hand sewers with a reputation for speed. Elias Howe patented his lockstitch sewing machine on September 10, 1846 in New Hartford, Connecticut. For the next nine years Elias Howe struggled, first to enlist interest in his machine, then to protect his patent from imitators. His lockstitch mechanism was adopted by others who were developing innovations of their own.