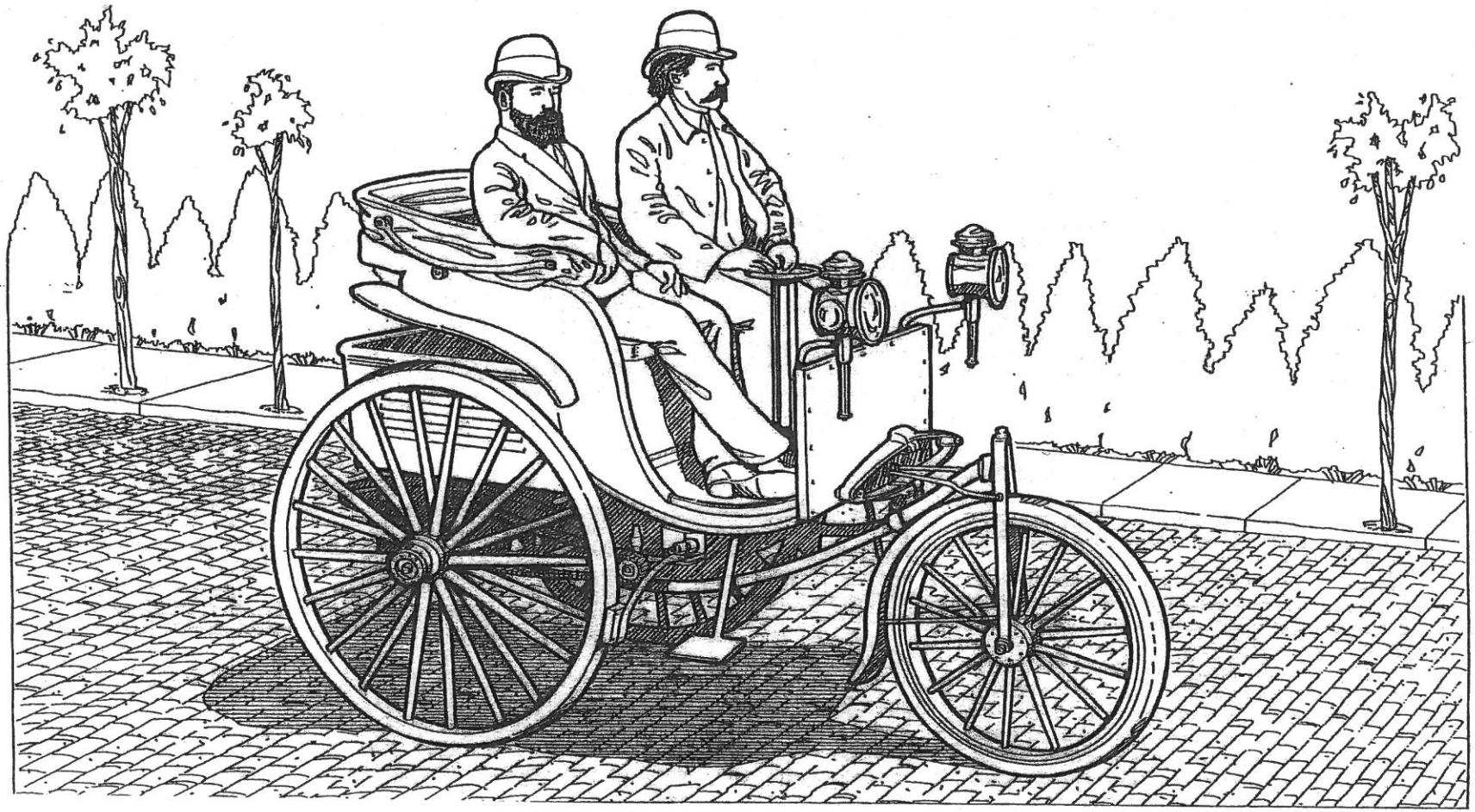
# THE AUTOMOBILE (1895) KARL BENZ

A German engineer, Karl Benz (1844–1929), is credited with being the inventor of the "horseless carriage," or motor car. In 1883 he established a factory to build small internal combustion engines in the town of Mannheim, Germany. His first motorized vehicle was the three wheeled buggy shown above. It featured a U-shaped frame with an engine that propelled the rear wheels with a chain drive. Benz successfully test drove his patent motor wagon around a cinder track near his factory in 1885. He sold the first of these vehicles in 1887 in Paris, and in 1893 he built his first four-wheeled automobile.

In 1885, the same year that Karl Benz test drove his motor car, another German engineer, Gottlieb Daimler, successfully built and drove the world's first motorcycle. It consisted of a wooden bicycle type frame with two large wheels and two small stabilizer wheels (what we would now recognize as training wheels). Daimler soon began building three and four wheeled motorized carriages in competition with Karl Benz. An intense rivalry between Daimler and Benz would last for the next 15 years as they contended for the honor of the inventor of the motor car. Eventually, Benz won out and was given credit as the originator. Ironically, their two companies merged in 1926 to form Mercedes-Benz, one of the world's largest and most prestigious auto makers.

Automobiles came into being in the United States in 1879 when a lawyer and inventor named George Seddon received a patent for his design of a motor car. Because he never actually built his vehicle, the credit for the first American made automobile is given to brothers Charles and James Duryea. They built their gasoline powered motor car in 1893.

The automobile has made such an impact on our economy and culture, that it is difficult to imagine a world without these machines. Dozens of industries were formed to support their development and widespread use, chief among these, the giant oil industry. The invention of the automobile has been the mechanism for an unprecedented era of mobility, convenience, and freedom, and their significance to world economy and culture has been immense.



## THE SEWING MACHINE (1845) ELIAS HOWE and ISAAC SINGER

During the nineteenth century two American inventors competed fiercely for the right to mass market the first sewing machines for home and industrial use. They were Elias Howe (1819–1867), who patented his design in 1845, and Isaac Singer (1811–1875), who built his machine in 1851.

Although Howe was the original inventor, he was unable to attract investors to finance mass production of his machines. He eventually moved to Great Britain where he sold his patent rights. In the meantime, Singer had improved upon Howe's original design with a machine of his own. With his partner Edward Clark, he was able to set up a factory and produce his machines in quantity. The Singer machines were very efficient and successful, and by 1860 the Singer & Clark company had become the world's largest manufacturer of sewing machines.

During this period Elias Howe had moved back to the U.S. with a lawsuit against Singer for patent infringement. In 1854 after several years in the courts, Howe won the lawsuit and was awarded royalties on all sewing machines sold in the United States. The invention transformed the world's clothing industry from individual seamstresses and tailors to mass production.

## THE INTERNAL COMBUSTION ENGINE (1860) ETIENNE LENOIR

Successor to the steam engine as the world's most widely used power source, was the internal combustion engine. It was invented in 1860 by Belgian-born engineer Etienne Lenoir (1822–1900).

Lenoir's first version was basically a modified steam engine. It worked on the principle of the two-stroke cycle of combustion. Its fuel was a flammable gaseous substance derived from coal, appropriately called "coal gas." In Lenoir's design the coal gas and air were drawn into a cylinder by the momentum of a large flywheel. When the piston within the cylinder was part way down, an electrical spark ignited the fuel-air mixture causing an explosion. The expanding gases caused by the explosion forced the piston to complete its up and down stroke, while the exhausted gases were ejected through a valve in the cylinder, and the motion of the flywheel caused the cycle to begin again. Lenoir continued to improve and develop his engine and it was eventually modified to run on liquid fuel such as turpentine, kerosene, and finally, gasoline.

The advantages of the internal combustion engine over the steam engine are its greater efficiency and a much higher power-to-weight ratio. This meant that a much lighter engine could be used to produce the same or greater power. This fact was crucial in the selection and use of the internal combustion engine by the numerous inventors of the 1880s who were tinkering with a new machine called the "horseless carriage," later to be known as the automobile.

## THE TYPEWRITER (1868) CHRISTOPHER L. SHOLES

The "automatic writing machine," or typewriter, was invented by Christopher L. Sholes (1819–1890). He had already patented an "automatic numbering machine" in 1864. In conjunction with his partner, Carlos Glidden, they introduced this new writing machine in 1868.

In its basic principle of operation, his device used letter keys connected to type bars which struck an ink soaked ribbon, imprinting the letters onto paper. Because the keys and their type bars tended to jam, he invented a keyboard arrangement according to their frequency of use, rather than alphabetically. This system is still the standard arrangement on modern computer keyboards.

For the next five years Sholes modified his original machine with a number of improvements. In 1873 he sold his patent rights to the Remington Arms Company. The Remington name became synonymous with the commercial manufacture of typewriters. In 1883, American writer Mark Twain bought a Remington typewriter, and became the first writer to create an entire manuscript using this new writing tool. Although it was not an intended consequence, one of the most significant results of the typewriter was to bring large numbers of women into the work place as typists. The reasonably good wages paid to a typist allowed many women emancipation from strictly traditional roles.

## Box camera (1900)

lenses and more sensitive chemicals, and by inventing the present day system of creating a negative image first and then producing a positive print from that.

American inventor George Eastman (1854–1932) took the next step forward in photography by making it available to the public when he introduced flexible celluloid roll film and the "Kodak" box camera in 1888. This much simpler system replaced the cumbersome metal and glass plates previously used. Eastman's improvement was simple, a reliable and inexpensive box camera that came already loaded with 100 exposures of his roll film. When all the exposures were made, the entire camera was returned to the Kodak factory in Rochester, New York, where it was developed, printed, and the camera reloaded. Eastman's concept of one step photography was marketed with the slogan, "You press the button, we do the rest," and set the standard for the new photographic industry. Eastman also preceded Henry Ford in the concept of mass production by setting up assembly lines to manufacture his cameras and film. He also worked with Thomas Edison to develop a celluloid based roll film for Edison's "kinetograph" moving picture camera. Eastman Kodak, as it eventually became known, further expanded the photographic market with the introduction of the "Brownie" camera for children in 1900.

George Eastman and his "Kodak" camera and film brought the popular hobby of photography to the world at large and in doing so created an international, multi-billion dollar industry. His enterprise also transformed the sleepy mill town of Rochester, New York, into a major technical and industrial city known worldwide as a center for optics and imaging science.

## TELEPHONE (1876) ALEXANDER GRAHAM BELL

"Mr. Watson come here, I need you!" These were the words of inventor Alexander Graham Bell (1847–1922) to his assistant Thomas Watson, the first words ever transmitted by the telephone. Certainly one of the most important technical developments of the modern era, the telephone has become a universal convenience and necessity.

Its inventor was born in Edinburgh, Scotland, the son of a well-known teacher of the deaf. Young Alexander also became a teacher and advocate for the hearing impaired. In 1870 he moved to America and opened a school to train teachers to work with the deaf. Because of his interest and knowledge of acoustics, the science of sound, Bell began to experiment on a device to transmit sound over long distances using electricity. His invention was based on the principle that the sound vibrations of the human voice could be converted into specific electrical impulses by a transmitter, sent over an electrical wire, and reconverted back to the same sound vibrations by a receiver at the other end of the wire. The mechanism used to accomplish this was a skin membrane or diaphragm, much like a drumhead, with a vibrating piece of iron at its center. The voice of the speaker would cause the membrane and the iron to vibrate. These would be converted to electrical impulses by an electromagnet, and cause a similar device at the other end to vibrate with the pattern of the speaker's voice, creating audible and understandable speech. Alexander Graham Bell patented his telephone invention in 1876, creating a new era of communication. Bell's invention was widely accepted around the world, and by 1900 the telephone was a common business and household device.

Bell had a number of other inventions to his credit, among them the graphophone, a device to record sound, and a hydrofoil boat that captured the world water speed record in 1918. Along with his scientific research, Bell's work with the deaf continued to be an important factor in his life. With the royalty money from his inventions, he founded the Alexander Graham Bell Association for the Deaf.