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# The Evolution of the U.S. Automotive Industry

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# **The Evolution of the U.S. Automotive Industry**

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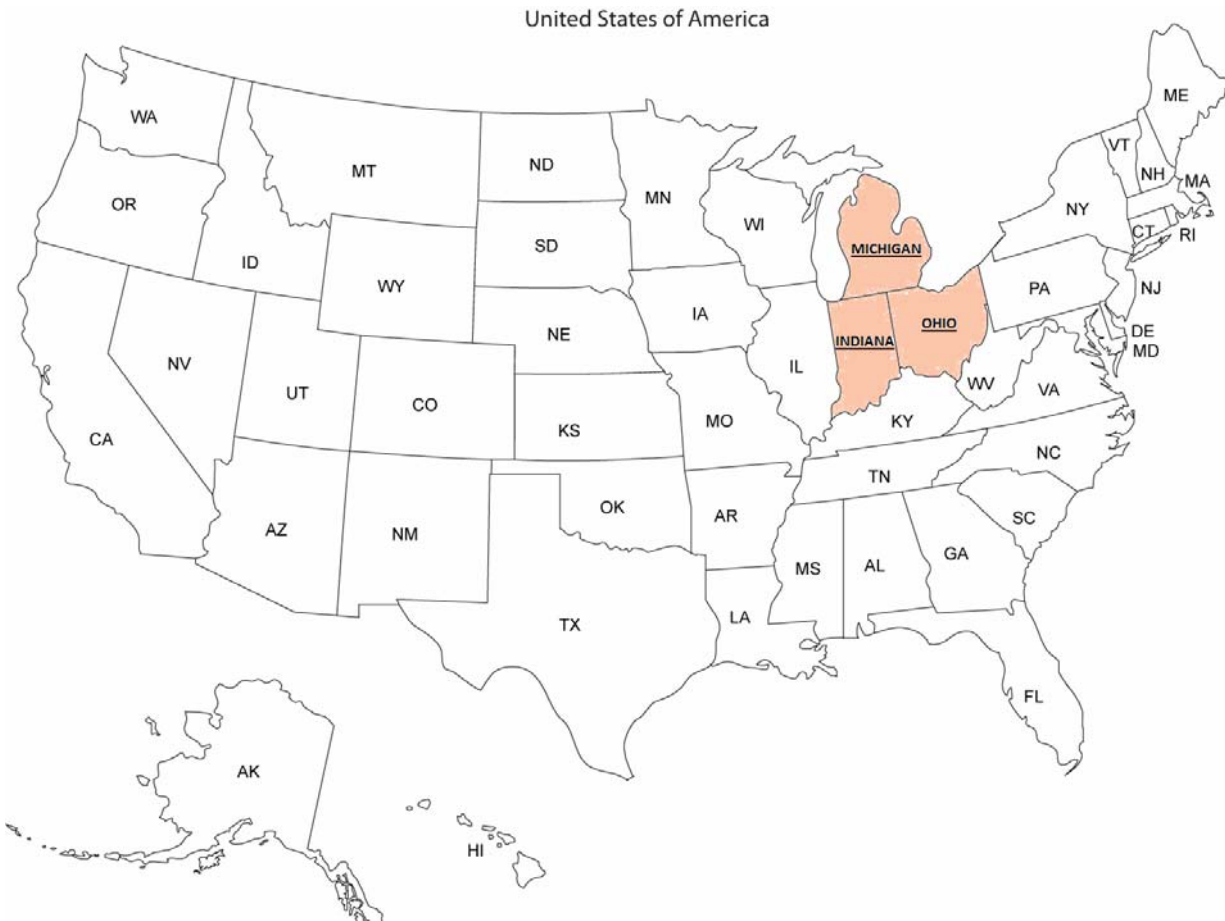
**Robert Tata, B.M.S.E., P.E.**

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## **Introduction**

The author, a licensed Professional Engineer, has also been employed in an engineering capacity by all “Big Three” automakers; GM, Ford, & Chrysler. Here he has sought to investigate the series of events that made Detroit, Michigan the automotive capital of the world. Detroit, Michigan is a place, off the beaten path, in an isolated glove-shape piece of land thrust up between two lakes, with sometimes very inclement weather. Ohio and Indiana, who were also active in the creation of the auto industry in the U.S., are in the same general area of the country as Michigan and share the same climate. How did the industry get its start in this three-state area. One would think that other parts of the country would be more conducive to the formation of such an important part of the history of this nation. Michigan, Ohio, and Indiana were not members of the original 13 states and therefore have to be considered less developed territories than the original thirteen states around the turn of the 19<sup>th</sup> century when the American gasoline powered automobile was invented. Read how the author has searched for the answers to these somewhat perplexing questions surrounding why Detroit became “The Motor City”.

# The Heart of the Auto Industry



## **The Beginning**

Sir Henry Bessemer, the man responsible for one of the major engineering achievements in the last two hundred years, was born in Charlton, Hertfordshire, England in 1813. His father Anthony, himself an engineer and inventor, was born in London but moved to Paris when he was 21 years old. There, his advances in die making and improvements to the optical microscope earned him membership in the French Academy of Science when he was only 26 years old. Because of social unrest created by the French Revolution, he returned to England where he, again, was successful in inventing dies and a process for making gold chains. He earned enough money to buy an estate in the village of Charlton where his son Henry Bessemer (1813-1898) was born.

Henry, like his father, was an engineer and inventor. He left school early to work for his father at a type-setting foundry. He moved to London with his family when he was 17 years old, where he began his career as an inventor and metallurgist. His first invention was a type setting machine which he patented. He made a fortune by using steam-powered machines to make bronze powder from which he formulated gold paint. He reduced the price of bronze powder by a fraction of what prevailed at the time from that produced in Nuremberg, Germany. In a national competition, he patented a steam driven machine to cut sugar cane into small pieces from which juice was extracted.

Henry's early inventions gave him the funds needed to pursue other interests such as metals. He proved to the British War Department that rifling or machining spiral grooves inside the barrel of a cannon would spin the projectile making it travel in a more accurate path. Henry then patented a method of making plate glass. During this time, he gained valuable experience in the use of high temperature furnaces to produce plate glass in a continuous process. It was this experience with furnaces that gained him fame in developing an economical means of transforming large quantities of iron ore found in the earth's crust into valuable engineering material steel.

Steel (and iron) are two of the most important materials used in the manufacture of automotive vehicles as they comprise two-thirds the weight of an average car. Steel is not only the most important material used in automotive vehicles, but it is used

in machines, boats, bridges, trains, and buildings that dot the skyline of our major cities. Without steel, iron would be the principle building material as it was in the days before Henry's invention, sending our way of life back two hundred years.

Iron ore is an oxide of iron that is the fourth most common element found in the earth's crust. Iron has been used since ancient times (following copper which has a lower melting temperature). Iron is obtained from its ore by smelting. Smelting is a process whereby an element (iron) is extracted from its ore by heating it in the presence of a chemical agent that removes impurities (oxides) from the ore, leaving behind a purer metal.

The chemical agent used in the smelting of iron is coke. Coke is obtained by heating coal in the absence of air. This leaves a material with high carbon content and few impurities. In the high temperature inside the blast furnace, coke reacts with the oxygen in air to form carbon monoxide. Carbon monoxide reduces iron ore to molten iron and carbon dioxide. In the highest temperature area of the blast furnace, some iron ore reacts directly with coke to also form iron and carbon dioxide.

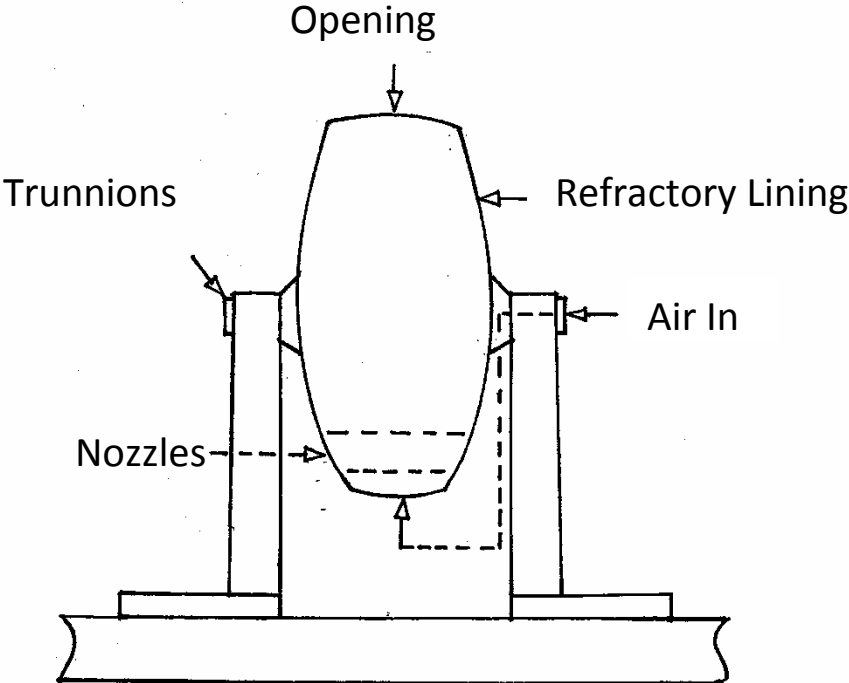
For most ores, it is necessary to use flux such as limestone and dolomite to remove other earthen impurities as slag which floats to the top and is skimmed off. The resulting material from the smelting process is called pig iron. Pig iron is iron with 4-5% carbon content, too brittle for steel. Pig iron requires further processing to reduce the carbon content to approximately .02-2.0% by weight; the range needed in the production of steel.

Henry's process, developed in the 1850s, consisted of injecting air into a pressurized chamber at the bottom of a vessel called a converter. From there, the air is driven upward into nozzles forcing it through the molten pig iron to reduce the carbon content to levels that are found in steel. He pioneered the way in which steel could be made easier, faster, and more economically, resulting in lowering its cost and making it far more affordable for worldwide industrial use such as in the automotive industry.

There are other steel making processes that have been used since Henry's process, such as injecting pure oxygen through the molten pig iron instead of air; however,

his was the first and the other methods that followed are based on the principles and capabilities that he had already established.

### Bessemer Converter



## **The Material**

Douglas Houghton (1809-1845) was born in Troy, New York. He attended Rensselaer Institute where he graduated as a physician in 1829. He was made “Assistant Professor of Chemistry and Natural History” at the institute the following year. In this position, he traveled to Detroit to deliver a number of lectures on various scientific topics. In 1831, after he was in the expedition that was sent by the federal government to explore the sources of the Mississippi River, he returned to settle in Detroit where he practiced as a physician. In 1837, he was appointed Michigan’s first State Geologist. In the early 1840s, as Michigan’s state geologist, Douglas Houghton, discovered mineral deposits in Michigan’s Upper Peninsula. In October, 1845, Houghton drowned in Lake Superior near the Eagle River during a violent storm. During his lifetime, Houghton was instrumental in attracting affluent buyers to Michigan’s Upper Peninsula to develop the natural resources.

About the same time, William Burt, a United States Deputy Surveyor, faced a problem that had plagued surveyors for some time in Michigan’s Upper Peninsula. He was assigned to plot township lines in the same area where Houghton had found what appeared to be mineral deposits. Burt discovered that his new township boundaries did not align well with pre-existing ones. In researching the problem, he discovered that the observed variations were the result of magnetic deflections in his compass caused by minerals in the ground.

In June, 1845, the Jackson Mining Company was formed in Jackson, Michigan. The company was interested in mining copper in the Michigan Upper Peninsula. A party, led by company treasurer Philo M. Everett, was sent to the Upper Peninsula with the purpose of mining copper. There they met French Canadian Louis Nolan who told them of Burt’s mineral discovery the year before. After much searching, they were finally able to find the area where Burt experienced unusual deflections of his compass needle. Searching near the town of Negaunee, Michigan, they found that an uprooted tree had raised the top soil revealing the material below. There they discovered iron ore. Everett registered a claim to the area and had samples of the ore assayed. It proved to be high quality hematite ( $\text{Fe}_2\text{O}_3$ ) with traces of manganese and chromium. It didn’t take long for the Jackson Mining Company to switch their focus from copper to iron.



In the winter of 1845, the Jackson Mining Company gathered equipment at the mine and, the company began to extract iron ore in what became an entire range of the mineral extending for miles across the northwest portion of Michigan's Upper Peninsula rather than being in this single location. The first quantities of iron ore were processed and forged on site for various industrial usages. The Jackson Mine (as it became to be called) went through several different ownerships and was closed permanently in 1924 after producing over 4 million tons of ore during its lifetime. The mine was established as a Michigan State Historic Site in 1956 and put on the National Register of Historic Places in 1971.

The Lake Superior part of the United States including areas of Michigan, Wisconsin, and Minnesota, has some of the most highly concentrated deposits of iron ore in the world. These iron ore deposits are easily accessible to Detroit and other ports via the Great Lakes; one of the world's greatest inland waterways. Mills located in cities along the Great Lakes such as Detroit, Michigan; Toledo, Lorain, and Cleveland, Ohio; South Chicago and Gary, Indiana; and, Erie and Pittsburgh, Pennsylvania, produce the steel and other components that are used in the manufacture of automobile bodies, chassis, engines, transmissions, drive train assemblies, and other important parts. It also goes into the machines that produce automotive parts; the ships, trucks, and trains that deliver automobiles and automotive parts and materials to market; and, the associated buildings including the towering skyscrapers that fill the landscape of all our U.S. large cities.

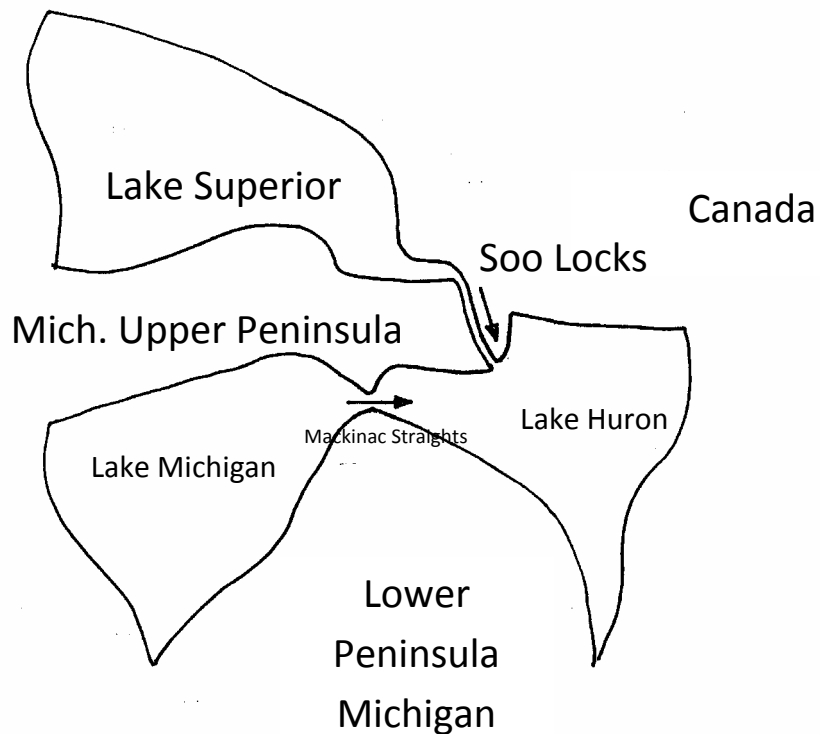
The Lake Superior area is one of the most concentrated and easily accessible areas of iron ore deposits and steel mills in the U.S., making the cost of automotive production in the Detroit area among the most competitive in the world.

Another important feature of Great Lakes ore shipping is that coal from Midwest coal mines used in the production of steel can be shipped back on return iron ore trips lowering transportation costs. In addition, the Great Lakes provide a virtual endless supply of fresh water for industrial processes and for industrial and home use in heating, cooling and associated systems.

There are six principle iron ore ranges located in the United States. Three are located in Michigan's Upper Peninsula. The first shipment of Lake Superior ore came from Michigan's Marquette Range which includes the Jackson mine. This

range is in the northwest part of Michigan's Upper Peninsula and lies between the cities of Marquette and L'Anse. The first shipment of iron ore was not made until 1852 starting in Lake Superior; down the Great Lakes waterway; and, eventually terminating in New Castle, Pennsylvania. Shipping was hampered by rapids in the St. Mary's River at Sault Ste Marie prompting the building of the Sault (Soo) Locks bypassing the rapids where the water drops 23 feet. After three years of construction, the canal was completed in 1855.

### Great Lakes Shipping Lanes

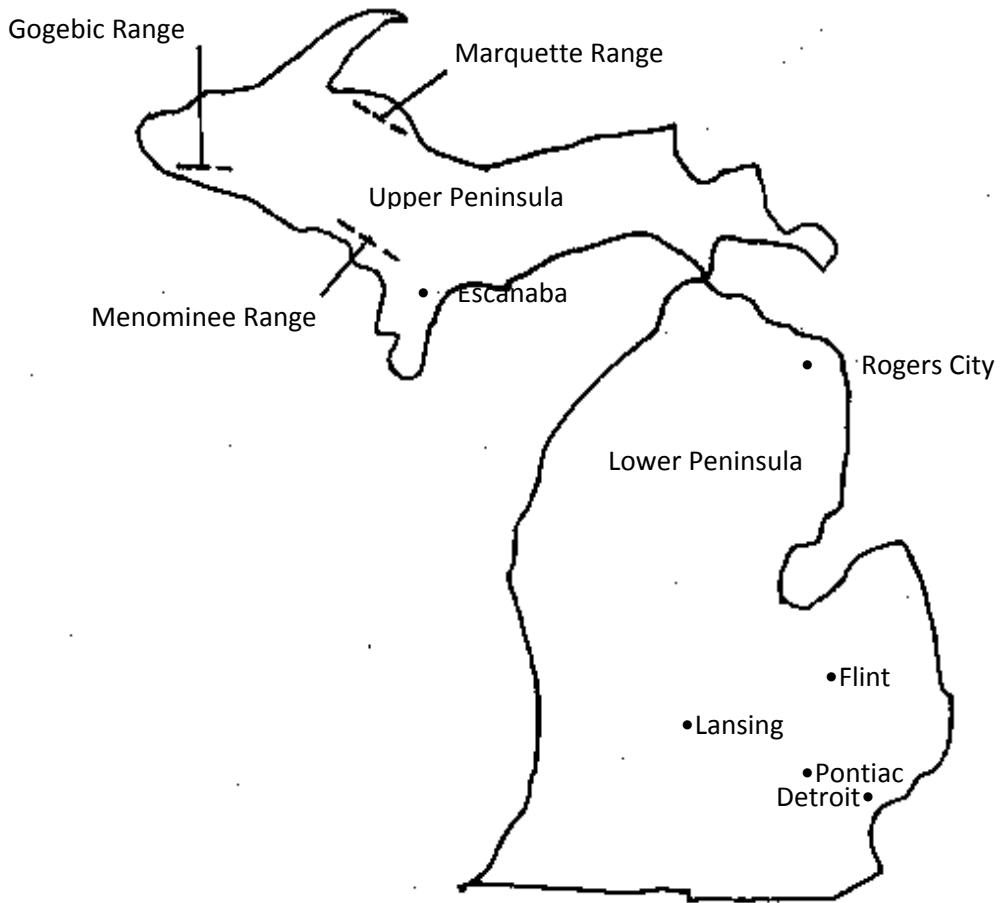


The Civil War (1861-1865) increased the need for iron as shipments increased to 120,000 tons in 1861 and continued to grow to one million tons in 1873; all before the 1890s which was the beginning of the era of automobile manufacture in Detroit. Huge quantities of the most important material used in the manufacture of automobiles were developed within the state of Michigan a short distance away from Detroit via the Great Lakes waterway even before the automobile was invented.

The second range, the Menominee Range, is south of the Marquette Range and extends into Wisconsin. Mining operations did not start until 1870. A railroad line was built linking the mines to the Lake Michigan port of Escanaba; a shorter boat route to the lower lakes than Lake Superior, and one that, instead of passing through the Soo Locks, passes through the Mackinac Strait. Iron ore shipping started in 1878. The mine reached its capacity in 1920 when it shipped almost seven million tons of ore. (Refer to the Michigan map below.)

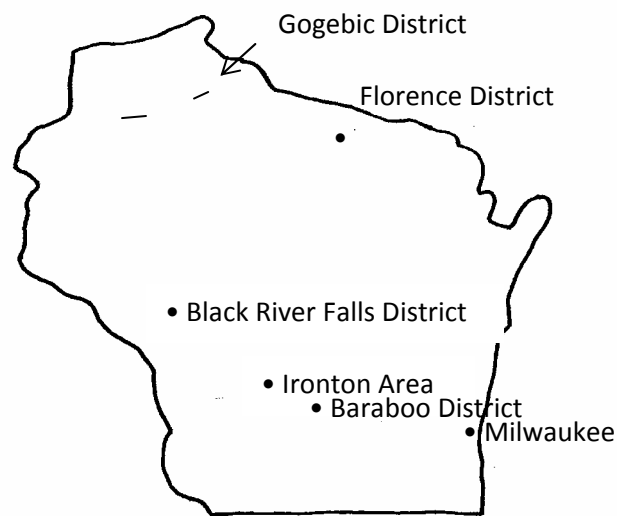
The third Michigan mining operation is the Gogebic Range. It is located on the extreme western tip of the upper peninsula of Michigan and also extends into Wisconsin. In 1884, when ore shipments started, a railroad line was completed to Milwaukee opening up alternative rail shipping lines to Detroit and other Midwestern cities in the winter when the lakes freeze over. By 1910, the range became productive shipping four million tons of ore annually. In 1920, Michigan shipped over 18 million tons of ore; however, by 1934, shipments were down to half that amount. With high grade ore becoming less plentiful, a new process, called agglomeration, was developed which converted lower grade ore into a higher grade, making it easier to handle pellets. Since 1952, Michigan mines have continued to operate with the help of this new process.

# Michigan Iron Ore Deposits



Wisconsin has iron ore mines in the northern part of the state near the Michigan border and also in the southern part of the state. The first ore was mined in the southern part of the state in the 1850's in the Black River Falls District and in the Ironton area. (Refer to the Wisconsin map below.) From the 1880s into the 1960s, high grade ore was extracted in the northern part of the state in the Gogebic and Florence districts. Mining in the southern part of the state Baraboo District was established between 1904 and 1925. The Jackson Mining Company operated the Black River Falls mine from 1969 to 1983 using the agglomeration process to pelletize low grade ore into a higher grade as was done in Michigan.

### Wisconsin Iron Ore



Wisconsin

The Vermilion Range, in northern Minnesota, is where traces of iron ore were found in the 1840s and 1850s because of surveys made during boundary disputes between the United States and Great Britain following the War of 1812. In 1865, geologist Henry Eames sent by the governor found iron ore 50-60 feet deep in the northeastern part of the state near Lake Vermilion. It wasn't until 1882 that a group of business men formed the Minnesota Iron Company to build a railroad and mine the Lake Vermilion site. In 1883, construction began on a railroad from Two Harbors on Lake Superior to the Lake Vermilion town of Tower. In 1884, work began on a site near Tower called the Soudan mine where the first shipment of 2,818 tons of ore was made in August by boat to the Ely brothers of Cleveland, Ohio. Shipments of ore increased to 307,949 tons in 1886. A railroad line was constructed from Tower to Duluth connecting to the nationwide systems of railroads in 1887. For most of the years between 1892 and 1952, there was one thousand tons of iron ore shipped annually from the Vermilion Range ranking it number three in the nation. (Refer to the Minnesota map below.)

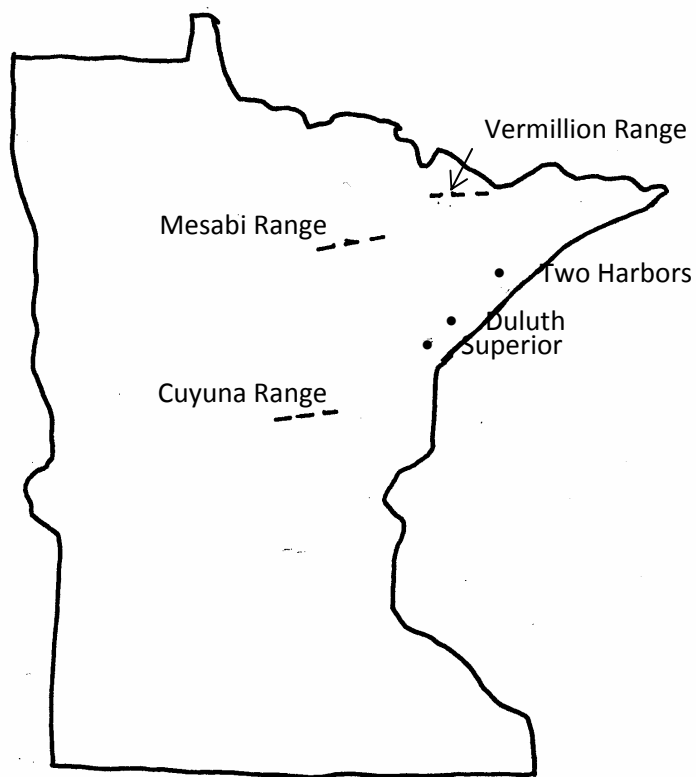
David Owen was the first to find iron ore in an expedition from 1848 to 1850 at the eastern end of the famous Mesabi Range which runs for 100 miles to Prairie River across northern Minnesota. After much speculation and excavation, and the completion of a railroad line from the eastern end of the range to Superior, just south of Duluth on Lake Superior, the first shipment of ore from the Mesabi Range was not made until 1892. After completion of a rail line to Duluth, its first shipment of ore was made in 1893. A total of 500,000 tons of ore was shipped in 1893 before a business recession hit the country. In 1896, Rockefeller, after previously buying \$500,000 worth of bonds and then putting another \$2,000,000 in the business, bought out the area mining interests of current owners Mr. Merritt and Mr. Wetmore for \$900,000 and leased all of his Lake Superior Consolidated Iron Mines property to the Carnegie Steel Company.

Mesabi Range productivity increased from 436,938 tons in 1893 to 3,888,941 tons in 1900 surpassing the Vermilion Range output in two years and ranking as the world's largest ore producer at over 4,000,000 tons per year.

In the late 1880s, Lumberman Cuyler Adams detected iron in the 68 mile long Cuyuna Range located in the central part of Minnesota. Most of the ore was not as clean as the Vermilion and Mesabi Ranges but contained 20-30% manganese

which was in short supply in the United States. Railroad links were built to the town of Superior on Lake Superior. Shipping from the mine started in 1911 building up to a record 3,714,000 tons in 1953. The manganese in the ore was of particular value during World War II because of worldwide shortages.

### Minnesota Iron Ore Ranges



Minnesota

Limestone is another important material necessary for refining iron ore into steel. As previously explained, limestone is put into blast furnaces to remove impurities. Limestone's calcium carbonate ( $\text{CaCO}_3$ ) removes sulfur; an impurity found in iron ore as calcium sulfide ( $\text{CaS}$ ). The  $\text{CaS}$  becomes part of the impurities that are removed from the steel as slag. Slag is lighter than iron, floats to the surface, and is drained off along with other lighter than iron impurities such as silica ( $\text{SiO}_2$ ), alumina ( $\text{Al}_2\text{O}_3$ ), magnesia ( $\text{MgO}$ ), and calcia ( $\text{CaO}$ ).

In 1869, the first settlers arrived in Rogers (now Rogers City), Michigan to work for the Rogers-Molitor Lumber Company. Rogers City lies on the northeastern tip of the glove-shaped Lower Peninsula of Michigan, (at the approximate location of where an index finger would be), on the shore of Lake Huron, not too far from Detroit. The area had thick virgin timberland that was ripe for harvesting. In 1908, geologist Henry Hindshaw determined that the value of a limestone field there was exceptionally high because of the high grade and purity. In 1910, the Michigan Limestone & Chemical Company was formed. By that time, most of the forests were cut down and the lumber camps were moved north into the Upper Peninsula where there was plenty of virgin timber. The limestone industry took over the area purchasing machines to extract limestone; constructing a plant to process limestone; and, building a dock to load ships on Lake Huron. The company built three lake freighters featuring state-of-the-art self-unloading features. The location made it easy to ship limestone to all ports on the Great Lakes Waterway including Detroit. The first limestone was mined and shipped in 1912. The limestone quarry became the largest in the world.

Coal is used to make coke which, as previously explained, is an important ingredient in the steel making process. In the steel making process, coke made from coal is the basic ingredient that is used as a reducing agent in the conversion of iron ore to steel. Coal is also used as a fuel to fire the steel-making furnaces. The first U.S. coal came from Midwestern states: Pennsylvania, Ohio, Indiana, Illinois, West Virginia, and Kentucky; all close to Detroit. The first coal mined in the United States came from northeastern Pennsylvania mines beginning in 1850 when it replaced wood for stoves and furnaces. Total coal mined soared from 8.4 million tons in 1850 to reaching a peak of 680 million tons in 1918. The Great Depression lowered the demand to 360 million tons in 1932. From 1950 to the year 2000,



annual coal production went from 500 tons to 1200 tons. Coal, economically shipped on iron ore carriers return routes to steel making facilities, is a valuable asset in the automobile manufacturing industry.

Rubber is a key ingredient that is used in the manufacture of automotive vehicles. The average car has hundreds of rubber components. Without rubber tires, vehicles would not be as we know them today. The ride of vehicles not having tires with the properties and durability of rubber would be much harsher. The shock absorbing characteristics and elasticity of rubber are also put to test in its use as seals and suspension system components in vehicles.

Rubber is made from “latex”. Latex comes from tapping into the bark of the “hevea” tree and is not a sap. It is thought that hevea trees produce latex to seal the tree trunk should the bark become wounded. Hevea trees, originally from Brazil, grow best in hot, moist climates where there is deep rich soil. A belt of land 700 miles north and south of the equator, all around the globe, is where hevea trees grow best. Most rubber trees grow in plantations in Southeast Asia.

Latex is a milky white liquid that has to be processed to become rubber. Only about 30-35% of latex is pure rubber; about 60-65% is water; and, the rest is largely sugar and mineral matter. One method used to process latex is to mix it with an equal amount of water and filter it to remove all impurities. An acid is added to the filtered latex which converts it to a semi-solid consistency that floats to the surface forming a dough-like mass of crude rubber. The crude rubber is fed through rollers to separate out any residual water.

The resulting sheets are hung up in a smoke room for several days to dry and to kill any mold or bacteria that might cause rotting. The dried sheets are cut into smaller pieces and plasticized or softened. This is done by feeding the sheets into machinery similar to meat grinders that compress and cold work the material into a softer form.

Charles Goodyear (1800-1860) is the man responsible for making rubber the valuable commodity that it is today. Charles was born in New Haven, Connecticut and moved to Naugatuck, Connecticut with his family when he was seven years old. He went to Philadelphia to learn the hardware business; a business that his inventor father had prospered in. His father had manufactured the first pearl

buttons made in America and also supplied metal buttons to the government during the war of 1812. His father also invented the first steel pitchfork, lightening the load of farmers as the earlier forks were constructed of much heavier and cumbersome iron.

Charles became part owner of the business in Philadelphia but, due to poor management and his inability to pay his debts, he was imprisoned in that city. Prison taught Charles how to deal with adversity, a trait that he would need to cope with during the many trials and tribulations he was to encounter later in life.

In 1834, Charles learned the plight of the rubber goods that were sold by a New York merchant. Rubber had become a very much sought after commodity in the early 1830s. Everyone had wanted something made of the gum-like substance that came from trees in the South American country of Brazil. It was soon learned that this once thought amazing substance froze hard in winter and melted in the summer. It wasn't too many years when the frenzy over rubber products ended, forcing many companies and merchants to suffer severe financial losses.

Charles took the plight of the New York merchants and other merchants to heart. At a time when everyone in the United States thought that the rubber fad was over, Charles didn't give up on the sticky substance. He returned to Philadelphia and ended up back in jail, again for the debts he couldn't pay. With rubber from his wife and her rolling pin, he started his first experiments while being incarcerated; kneading the rubber over and over again for hours but with no positive results. Out of jail, he mixed magnesia powder with the sticky rubber and gained what appeared to be promising results. He made overshoes in his kitchen with the same material; but, when summer came, they melted down into a useless blob. When neighbors complained about Charles's smelly experiments with rubber, he moved to New York and rented a small apartment where he continued his endeavors in the kitchen. When an in-law from back home came to his apartment in New York and complained that his children were starving and that rubber was dead, Charles said, "I am the man to bring it back".

A New York trade show awarded Goodyear a medal for adding drying agents quick lime and magnesia. After boiling the mixture, a product resulted that was more tolerant to temperature change than raw rubber but, still not good enough to

capture the fancy shoppers of the day. Then, by sheer accident, Charles noticed that adding nitric acid to rubber gave him the best results yet. He was loaned money by a New York businessman to go into production but the nationwide business recession of 1837 left him penniless.

Without money, Charles and his family lived in an abandoned rubber factory on Staten Island where he caught fish to feed the hungry mouths.

Goodyear got new financial backing in Boston where he received a government contract to manufacture 150 mailbags made of the nitric acid laced rubber; however, returning from a vacation with his family, he found that the summer heat had reduced the mailbags to a molten mess.

It is not sure how he did it (some say it was by sheer accident); however, Charles found that heat and sulfur make rubber the compound that it is today. Rubber was soon to attain worldwide success. Goodyear obtained a patent but it was found to be so easy to break that he spent thousands of dollars fighting infringements. When he died, Goodyear was reported to be two hundred thousand dollars in debt. The process that Goodyear invented was later called “vulcanization” after the Roman God of fire. Vulcanization increases the mechanical properties of rubber under a wide temperature range (similar to what carbon and heat does to steel) making it useable for many different industrial and domestic applications.

Frank Seiberling (1859-1955) was born in Western Star, Ohio; a short distance from the site of the company he was to found. The family moved to Akron, Ohio where Frank attended public school. At age 16 he attended Heidelberg College in Tiffin, Ohio. After spending just two years at Heidelberg, Frank went to work for his father who was in the farm machinery business. When the depression of the 1890s hit, Frank’s father lost his business and Frank found himself without a job.

Frank purchased two buildings facing each other across the Little Cuyahoga River in East Akron, Ohio. Frank borrowed the money from a relative to make the down payment on the property. Frank had no money himself but he closed the deal and was full of enthusiasm to find a business to establish. The business was rubber and the company would be named after Charles Goodyear, the inventor of the vulcanization process; the man who had died almost 40 years earlier.

The company was incorporated in 1898 and production started three months later. The first products were poker chips, horseshoe pads, bicycle tires, and carriage tires.

In 1900, Seiberling chose the winged foot symbols of the Roman God Mercury placed between the words “Good” and “Year” as the company logo; a logo that still exists today and has worldwide recognition.

Goodyear made a profit the first year; developed the first air-inflatable tire the second year; patented the tubeless tube the third year; developed aircraft pneumatic tires in 1909; became the world’s largest tire manufacturer by 1916; and exceeded 100 million dollars in sales by 1917. During the early years of the U.S. Auto Industry, Goodyear was already poised to meet Detroit’s rubber needs making the tires for the famous Ford Model T and other vehicles. Eventually, all the major rubber companies including the B.F. Goodrich Company and the Firestone Tire and Rubber Company, located in the Akron, Ohio area on the doorstep of Detroit, Michigan, came to be known as the “Rubber Capital of the World”.

Glass is another element that is important to the development of the auto industry. In 1835, the state of Ohio and the Territory of Michigan almost went to war over a strip of land along the border where Toledo, Ohio is now located. In 1836, the dispute was settled by Congress whereby Ohio was given the strip of land and Michigan was given three-quarters of the Upper Peninsula. Toledo, just one hour away from Detroit, became a big contributor to the auto industry.

Edward Drummond Libbey (1854-1925) was born in Chelsea Massachusetts. He attended public schools in Boston and later attended Boston University. In 1874, he was made part owner of the family glass business by his father in Cambridge, Massachusetts. After the death of his father, Edward became sole owner of the newly named New England Glass Company. High operational costs as well as labor problems forced Libbey to look for a new location.

The local deposits of high quality Great Lakes sand; a number of main railroad lines running across the country; steamship lines; and the discovery of natural gas, made Toledo, Ohio an ideal site. With financial help from family, friends and Toledo investors, Edward moved the company west and incorporated as the Libbey

Glass Company. He had to borrow heavily to keep the company in business the first few years.

Michael J. Owens (1859-1923) was born in Mason County, West Virginia. As a teenager, he worked for a glass manufacturer in Newark, Ohio. Owens then became a plant manager in a glass company in Findlay, Ohio owned by Libbey. At that time in the United States, glass bottles were made by skilled workers blowing through tubes; a very slow and costly process. In 1904, Owens patented a machine that automatically produced glass bottles at the rate of four bottles per second revolutionizing the beverage drinking industry. He then organized the Owens Bottle Machine Company in Toledo, Ohio with help from Edward Libbey. Initially, the company manufactured bottle machines; but by 1919, bottles themselves were produced and Owens changed the name of the company to the Owens Bottle Company. Business was good and, in 1929, the company bought the Illinois Glass Company and the Owens Bottle Company now became the Owens-Illinois Glass Company; and in 1965, became just Owens-Illinois, Inc. Owens had died in 1919 leaving behind 45 patents he obtained.

Back in 1905, after helping finance the Owens Bottle Machine Company, Edward Libbey became the president of the Owens European Bottle Machine Company. He then became president of the Libbey-Owens Sheet Glass Company. Owens and Libbey helped fund Irving Colburn (1861-1917) who had patented a machine to continually produce window glass. The Libbey-Owens Sheet Glass Company was opened in 1916 supplying Detroit automotive window glass, headlight glass, and other associated products. The success of Libbey was to depend heavily on Michael J. Owens, both of whom helped Toledo become the “Glass City”.

Fuel and lube products are essential to the operation and performance of automotive vehicles. Fuel and lube products are derived from petroleum which is found in naturally occurring underground reservoirs. The first such discovery in the United States was in northwestern Pennsylvania, just east of the Ohio border.

Edwin Drake (1819-1880), born in Greenville, New York, started at an early age working for the railroad companies in the New Haven, Connecticut area where he rose to the title of conductor. When he was 38 years he took an early retirement from the railroad due to illness.

Oil was found seeping up from the ground and forming pools in an area close to Titusville, Pennsylvania. Because Drake had a chance meeting with a financier of a Pennsylvania Oil Company, he was assigned to investigate the possibility of drilling for oil in Titusville; a method of oil extraction that had not been tried before and one that was thought would draw vast quantities of the product compared to collecting it from pools on the ground as was presently done. Drake leased a sight near Titusville where pools of oil had been found and started drilling. Unfortunately, when starting to drill a hole in the ground to reach and extract oil, it back filled with water and other matter eliminating the possibility of extracting oil even if he did find it. Drake was to devise a method to eliminate the problem by driving hollow pipe into the ground and drilling inside the pipe. This would prevent the possibility of the hole backfilling. It was successful; and in 1859, oil was struck 69 feet underground. Drake was able to pump many barrels of oil a day, more than anyone else had ever thought of producing. His success prompted a rush to the scene by prospectors and it was not long before there were seventy-five wells pumping oil out of the ground using Drake's hollow pipe method; one that he never patented. The area was renamed "Oil City".

By the 1880s, the leading oil producing states were Pennsylvania, Ohio, Indiana, and Kentucky. Initially, kerosene was extracted from petroleum; and, gasoline, a byproduct, was discarded. Kerosene was burned in lamps as gasoline was too volatile and subject to exploding. In the early 1900s, electricity replaced the kerosene lamps and automobiles came on the scene making gasoline the more precious commodity. Refineries were built and, using the principle of fractional distillation, not only gasoline; but, among other things, heavy-end tar was extracted and used to pave the dirt roads of the time. Oils and greases, both critical components used to lubricate engines and other moving parts in automotive vehicles, were also formulated from the products of distillation as well as the base ingredient in paint.

John D. Rockefeller (1839-1937) was born in New York but grew up in Cleveland, Ohio. He started to work at age 16 as a clerk in a small firm. Later, at age 23, he earned enough money in the grain market to enter the oil business. His aim was to make the oil business more efficient. By 1870, he controlled the oil industry from production to refineries to distribution with his Standard Oil Company. In 1882,

Rockefeller established the Standard Oil Trust in which he controlled all of the U.S. oil activity and most of the world oil trade. The Ohio Supreme Court dissolved the Standard Oil Trust in 1892 because of its monopolistic practices. It was replaced by the Standard Oil Company of New Jersey; and in 1911, the U.S. Supreme Court ordered it to be dissolved. Rockefeller retired in 1897 and is reported to have given away \$550 million in his lifetime. The proximity of the first oil wells in the U.S. and the influence of oil tycoon John D. Rockefeller from nearby Cleveland, Ohio, were additional aides in Detroit becoming the automotive capital of the world.

## **The Cart**

Early History: Another reason for the start of the auto industry in Detroit and vicinity is the carriage manufacturing business. The Big Three auto makers had their beginnings in the carriage industry. Carriages are vehicles similar to automobiles except they are powered by horses rather than by an engine. The earliest U.S. automobile was simply a carriage with the horses replaced by a gasoline-powered engine. Some of the original automobiles in this country were referred to as “horseless carriages”.

Carriages go back to 3000BC when the Egyptians used two-wheeled versions called chariots that were pulled by horses to move about swiftly in battle. The Romans used carriages in the first century BC for long distance travel. In the 1400s, the Hungarians developed light-weight carriages, called “coaches” that had suspension systems for a smoother ride.

There were a number of carriage manufacturers in the Northeastern United States in early America as the science of carriage building, much less complex than automobile manufacture, had been developed over the ages and was easy to duplicate. Also, there were materials such as iron, wood and leather in ample supply needed to build carriages and plenty of horses available to power carriages. Business was good for Northeastern U.S. carriage makers but the loss of Southern customers, during the Civil War (1861-1865) and after, created opportunities for the carriage business to move to the Midwestern part of the country where migration and expansion to the western United States and Canada created the need for an extraordinary amount of horse-drawn vehicles, some of which were called Conestoga Wagons.

The Midwestern part of the United States is the start of the “Great Plains” – historically referred to as “the bread basket of the world”. Trees were cut down by the early settlers making wood plentiful and clearing rich soil for farming. Farmers (and lumbermen) are crafty people who are always looking for better ways to improve their trade; grow and harvest crops and bring them to market. This led to improved tools and equipment and eventually wagons and carriages to help with working the ground, planting and harvesting crops, and carrying goods and people to the market place. Because of this, the people of Michigan, Ohio, and Indiana



became great entrepreneurs and industrialist, not only in farming and the lumber industry; but, also, in the carriage, engine, and automotive fields of endeavor.

Michigan became a national leader in the carriage business in the 1890s just after the Civil War with 125 manufacturers and 7,000 workers. The main carriage manufacturers were located in seven cities: Detroit, Flint, Pontiac, Lansing, Kalamazoo, Jackson, and Grand Rapids. Michigan had the material to build carriages (iron, wood and leather), the horses to power carriages, and the people with the will to design and manufacture carriages.

William Crapo Durant (1861-1947) was the son of former Michigan governor Henry H. Crapo (1804-1869) who was a millionaire lumber baron. Durant was born in Boston, Massachusetts but grew up in Flint, Michigan. He first worked in the family lumber business and then became a salesman and the operator of one of Michigan's largest insurance companies. Impressed by the ride of a spring suspension road cart, Durant formed the forerunner of the Durant-Dort Carriage Company in Flint, Michigan in 1886. Dort was the son of a well-to-do Inkster, Michigan businessman. They sold 4000 carts the first year and expanded by acquiring smaller companies that produced both carts and parts. By 1900, they were the highest sellers of horse-drawn vehicles in the United States with sales peaking at 56,000 vehicles in 1906. They continued until 1917 when the factory was converted over to the manufacture of automobiles.

In 1904, Durant used the wealth gained from selling carriages to purchase the struggling Buick Motor Company of Flint, Michigan. Durant used his salesmanship to make Buick one of the top selling vehicle lines in America, along with perennial leaders Ford, Cadillac and Oldsmobile.

In 1907, after a failed attempt to buy the Ford Motor Company because Henry Ford wanted to be paid in cash, Durant, in 1908, using the strategy he used in the carriage business, founded the General Motors Company. After that, he acquired Cadillac, Oakland, Oldsmobile and smaller companies adding them to his Buick line of vehicles. In 1910, too many acquisitions in too little time forced Durant into bankruptcy. In 1911, Durant took control of Chevrolet and, in 1916, with the help of the Du Pont family, regained control of General Motors. He held on to General Motors until the Panic of 1920 hit causing him to lose his holdings to the Du Pont

family who wanted to protect their investment. Durant went on to form Durant Motors in 1921 which terminated in 1933 because of the 1929 stock market crash.

The Studebaker brothers started making carriages in 1852 in South Bend, Indiana which is near the Michigan and Ohio borders. The three states that went on to capture a very large share of the auto industry in this country as well as in the world. In South Bend, Studebaker manufactured a large number of carriages for settlers hastening to get to the California Gold Rush which had already begun in 1849 and also for large orders from the U.S. government prior to and during the Civil war for the Union Army. They became so dominant that half of all the carriages manufactured in the U.S. were Studebakers. By 1875, Studebaker had built the largest carriage manufacturing building in the world. They built seven different carriages ranging from the four-passenger to the twelve-passenger. In 1889, President Harrison ordered a full line of carriages for the White House. The Budweiser Clydesdales pulled impressive looking wagons built by Studebaker around 1900. Studebaker carriages were well made and could be purchased impressively adorned with colorful wheels and trim and gold-plated lamps.

As early as 1897, Studebaker started working on a motor vehicle. After first producing electric-powered vehicles, it entered into an agreement with the Garford Company of Elyria, Ohio and produced gasoline-powered vehicles from 1904 to 1911. The two separated and Garford was acquired by John North Willys in 1913.

Willys went through a number of acquisitions and financial problems including gaining and losing executive Walter Chrysler who went on to form “Big Three” member Chrysler Corporation. Willys won a government contract for a small, all-purpose vehicle called the “Jeep” which he built in his Toledo, Ohio facility. In 1953, Kaiser Motors purchased Willys and changed the name to Kaiser-Jeep Corporation. In 1970, Kaiser-Jeep was sold to American Motors. French company Renault took over operation of American Motors in 1979; and in turn, the Chrysler Corporation purchased American Motors in 1987.

In the meantime, Studebaker continued in the car business purchasing plants in Canada and Detroit. The company dropped the manufacture of horse drawn vehicles in 1919 and replaced them with trucks, buses and fire engines. Business was good until the 1930 depression hit; but by 1933, the company was profitable

again. Stiff competition from General Motors and Ford in the 1950s forced Studebaker into a merger with Packard. Conditions continued to get worse; and in 1966, all car operations ceased. Their General Products Division which built military vehicles was purchased by American Motors and still exists today as AM General.

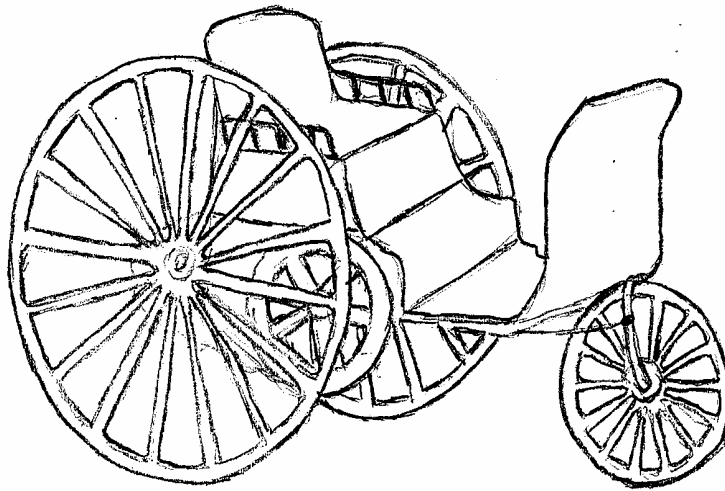
## **The Pioneers**

John William Lambert (1860-1952) is credited by historians to have designed, built and operated the first successful gasoline engine powered automotive vehicle in the United States. Lambert accomplished this feat in Ohio City, Ohio, which is close to the Indiana and Michigan borders. Lambert built and operated the vehicle in 1891. It had a single cylinder, four stroke engine mounted on a three-wheeled buggy. It reached speeds of 5 miles-per-hour.

John Lambert was born near Mechanicsburg, Ohio, just west of Columbus. He was interested in gasoline engines at an early age and grew up to be a very mechanically minded enterprising young man who designed and built automobile engines and vehicles. After he was married, he moved to Ohio City where he and his father formed the J.W. Lambert and Company. They had a considerable number of businesses in the city including the manufacture of farm implements such as fork handles and spokes for wagons. There, John Lambert built the first U.S. automobile. It was a three wooden-wheeled vehicle incorporating his own light-weight gasoline engine design. The vehicle was chain-driven with two speeds forward and no reverse. There was a hand lever (tiller) connected to the single front wheel for steering. In 1891, he advertised the vehicle for sale as a “horseless carriage”. There were no buyers. It was eventually lost in a fire.

In 1893, Lambert moved to Anderson, Indiana where he manufactured and sold automotive vehicles. The final version had four wheels and an eight horsepower, two cylinder engine and could travel up to 20 miles per hour. Tens of thousands were built and sold through the year 1917 after which dwindling sales forced the closing of the business.

## America's First Automobile



Lambert's Horseless Carriage

Charles Edgar Duryea (1861-1938) and brother James Frank Duryea (1869-1967) were the second Americans to build a successful gasoline engine powered automobile. They did this in 1893 as opposed to John Lambert operating his gasoline engine powered automobile in 1891. The Duryea vehicle had a one cylinder, four horsepower engine. It was placed in the United States National Museum in 1920.

The Duryea Brothers were born near Canton, Illinois. They began as bicycle makers in Washington, D.C. They were to become volume producers of automobiles in Springfield, Massachusetts. Charles was the designer and Frank the builder.

The second vehicle they built won a race in Chicago in 1895. That year the Duryea Motor Wagon Company began production by assembling thirteen cars in their garage in Springfield. All thirteen were sold by the end of 1896. Due to the high cost of the vehicles and lack of sales, the company stopped production in 1917.

The two brothers went separate ways with Charles producing Duryea vehicles until 1917 and Frank helping to produce the Stevens-Duryea vehicle until 1927. There is an original 1913 Duryea vehicle at George Vanderbilt's Biltmore Estate in Asheville, North Carolina.

Elwood P. Haynes (1857-1925) was born in Portland, Indiana. He invented a number of metal alloys and is credited with designing the first American-made automobile for volume production.

Mr. Haynes began his career working in the natural gas industry where he oversaw the construction of the first major gas pipeline in the United States. It ran 150 miles from the Trenton gas field in eastern Indiana to Chicago, Illinois.

Haynes designed, built and road tested his first car in 1894 in Kokomo, Indiana. He started a company that manufactured automobiles in 1896, and by 1902, it was producing one car a day. His cars were the first designed to be powered by motor only. Previous models were, for the most part, converted horse buggies. He named his company The Haynes Automobile Company in 1905 after discontinuing a relationship with the Apperson brothers with whom he had a partnership with for the first several years of production. Haynes vehicle, called the Pioneer, was donated to the Smithsonian Institute in 1910 and is on display there.

Haynes Model L, designed in 1905, was his most popular. He expanded production and, in 1909, was producing almost two cars a day. His cars were complete with a roof, windshield, headlights and a speedometer. Production increased even further in 1910; however, in 1911, a fire destroyed the plant. It wasn't until 1913 that the company resumed production. Haynes sold nearly 6000 cars in 1922 but sales

slipped to only 1500 in 1924. Hard times had hit the country and Haynes could not compete with Ford and GM who had sales outlets throughout the United States.

Alexander Winton (1860-1932) was born in Scotland. He came to the United States in 1880 and, in 1890, became a bicycle manufacturer in Cleveland, Ohio. Winton built his first automobile in 1896; and in 1897, incorporated the Winton Motor Carriage Company. In 1898, he sold 22 vehicles. He was the U.S. largest manufacturer of automotive vehicles in 1899 selling more than one hundred vehicles making Cleveland, Ohio the first “Automotive Capital of the World”. Initially the vehicles were powered by 10 horsepower engines; but by 1904, 20 horsepower two cylinder and 24 horsepower four cylinder engines were available. In 1914, a 48 horsepower six cylinder engine was offered in upscale models. The transmissions were all two-speed. His vehicles were considered luxurious in their day with painted exteriors, leather roofs, cushion seats and headlamps. His steering gear mechanism was one of the best of the time and he reportedly gave Henry Ford a lesson on how to improve steering gear design and operation.

Winton opened up the first U.S. auto dealership in Reading, Pennsylvania and built the first auto carrier to deliver vehicles.

Winton continued to sell upscale vehicles from 1910 to the early 1920s when sales started to decline due to the economics of the time. By 1924, all production of motor vehicles had ceased. In 1930, Winton became a division of General Motors, manufacturing and selling diesel engines that went into locomotives and submarines. In 1937, his company became the Cleveland Diesel Engine Division of General Motors. It closed in 1962.

Ransom E. Olds (1864-1950) was born in Geneva, Ohio. He founded the Olds Motor Vehicle Company in Lansing, Michigan in 1897 but it was bought out and moved to Detroit, Michigan in 1899 with Olds being the Vice-President and General Manager. In 1901, Olds designed the “Curved Dash Oldsmobile” named for its rounded frontal panel, a first in the industry. It seated two people and had a single cylinder, 5 horsepower engine located in the center of the vehicle. The transmission had two speeds forward and one in reverse. The front and rear suspensions were beam axles with leaf springs. The vehicle sold for \$650 dollars. In 1901, their first year, 425 vehicles were built. Total sales for the vehicle were

19,000 units for its seven-year run. The vehicles were assembled on an assembly line with interchangeable parts making Olds the first to mass-produce vehicles; a feat that is sometimes credited to Henry Ford. The difference between the Olds assembly line and the Ford assembly line was that the Olds assembly line was stationary as cars were completely assembled in single stations with interchangeable parts while Ford resorted to moving the chassis along an assembly line from station to station. General Motors purchased the Olds Motor Works in 1908 and operated it for 96 years before dropping the line in 2004 because of a continuing decline in sales. Olds was active in Lansing, Michigan founding a bank and two machine tool companies; building a high rise office building; and becoming involved in the Hotel Olds.

David Dunbar Buick (1854-1929) was born in Scotland but moved to Detroit with his family when he was five years old. After his father died, David dropped out of school and did odd jobs to help support his mother. In 1902, with money he made with his inventions in the plumbing business, he formed the Buick Auto-Vim and Power Company. He sold engines that were used to operate farm and lumber equipment. He later reorganized his business as the Buick Manufacturing Company where he designed and operated a vehicle in 1903. The company was renamed as the Buick Motor Company and moved to Flint, Michigan where, in 1904, vehicle production was started. As a result of recurring debt, the Buick Motor Company was sold to William C. Durant in late 1904. Durant, who had become very successful in the carriage business, used his salesmanship skills to boost production. He then made Buick a part of his General Motors Company, forerunner of the General Motors Corporation, in which Buick remains a viable part of even today.



## **The Companies**

The Ford Motor Company, one of the “Big Three” U.S. automakers, was founded by Henry Ford (1863-1947) in 1903. It is an international corporation having operations all across the world in Europe, Asia, Japan, South America, Africa and the Middle East.

Ford was a brilliant, technically-minded, industrialist who created thousands of jobs in the auto industry; while, at the same time, making the automobile affordable to a large segment of the population. He did it through hard work, perseverance and ingenuity.

Henry Ford was born in Greenfield Township (now part of Wayne County), Michigan. He grew up on a farm, became a machinist, and then ran the family farm in Dearborn, Michigan. He married in 1888 and operated a lumber business in addition to running the family farm. He had one child, Edsel (1893-1943). Ford became an engineer, then Chief Engineer of the Edison Illuminating Company in 1893. In 1896, he designed and built a self-propelled vehicle he called the Quadricycle (next after unicycle, bicycle and tricycle). It was a platform with four bicycle wheels and a lever (tiller) for steering. It had a two cylinder engine that produced 4 horsepower. It was chain-driven with a top speed of 20 miles per hour. Ford sold this first vehicle for \$200 and bought it back for \$60. It is now on display in the Ford Museum in Dearborn, Michigan.

In 1898, after receiving encouragement from Thomas Edison, Ford designed and built a second vehicle. In 1899, after having success with his second vehicle, Ford left the Edison Company; and, with the financial backing of Detroit lumber magnate William Murphy, founded the Detroit Automobile Company. Ford was not satisfied with the operation of the company and resigned. It closed in January 1901.

After Ford designed and built a successful race car in October 1901, Murphy and other owners of the now defunct Detroit Automobile Company formed the Henry Ford Company in November 1901, with Ford as the Chief Engineer. In 1902, when Murphy brought in Henry Leland as a consultant, Ford left his namesake, the Henry Ford Company. With Ford gone, Murphy renamed the Henry Ford

Company, the Cadillac Automobile Company, which would later become a division of the General Motors Corporation.

After Ford built a car driven by famous racecar driver Barney Oldfield to victory in 1902, he received the backing of Alexander Malcomson, a Detroit coal dealer, and formed the partnership, Ford & Malcomson to manufacture economical automobiles. They received parts from machine shop owners John and Horace Dodge (who would later form their own car company). When they could not make payment to the Dodge brothers, they and ten others were brought in as part owners and the company was renamed as the Ford Motor Company in June 1903.

Ford gained countrywide notoriety when Barney Oldfield toured the United States with a Ford vehicle that set the land speed record of 91 miles per hour. He started manufacturing just a few vehicles a day in Detroit, Michigan with small groups of men working on each car to completion. The first car produced was the original 1903-1904 Model A (not to be confused with the more famous 1927-1931 Model A). It was a much improved descendent of Ford's original Quadricycle. There were a total of 1700 manufactured in the years 1903 and 1904. There was a two seat and a back-to-back four seat version, each with an 8 horsepower engine and two speed transmission. It had a 72 inch wheelbase (distance from the centerline of the front wheels to the centerline of the rear wheels) compared to the 49 inch wheelbase of the Quadricycle and weighed 1240 pounds compared to the 500 pound weight of the Quadricycle. It sold for \$750 which was \$150 more than its nearest competitor, the Oldsmobile Curved Dash. The vehicle was a success garnering a small profit for Ford's first successful business venture.

The Model A was sold, painted only in red. Some 1904 Model A's were sold with a more powerful engine and were labeled Model AC.

The Model A was replaced by the 1904-1906 Model B (not to be confused with the 1932-1934 Model B). It was a two-row four-passenger touring car. For the first time, the engine was moved from under the front seat to the front of the car. It was propelled by a 24 horsepower engine and a two speed transmission. The wheelbase was 92 inches with the vehicle weighing 1700 pounds. It was priced at \$2000 and only 500 were sold. It was replaced by the Model K. The Model K was produced from 1906 to 1908 with 900 being made. It had a 6 cylinder engine and sold for

\$2800 which is a price much higher than other similar vehicles being sold at the time. Initially, most of the car parts were purchased from outside suppliers and the entire vehicle assembled by a few workers located at separate stations. In 1910, Ford started manufacturing more parts indoors and building cars on moving assembly lines. This lowered fabrication time to one car every ninety-three minutes. In a few years, Ford would lead the world in automobile production

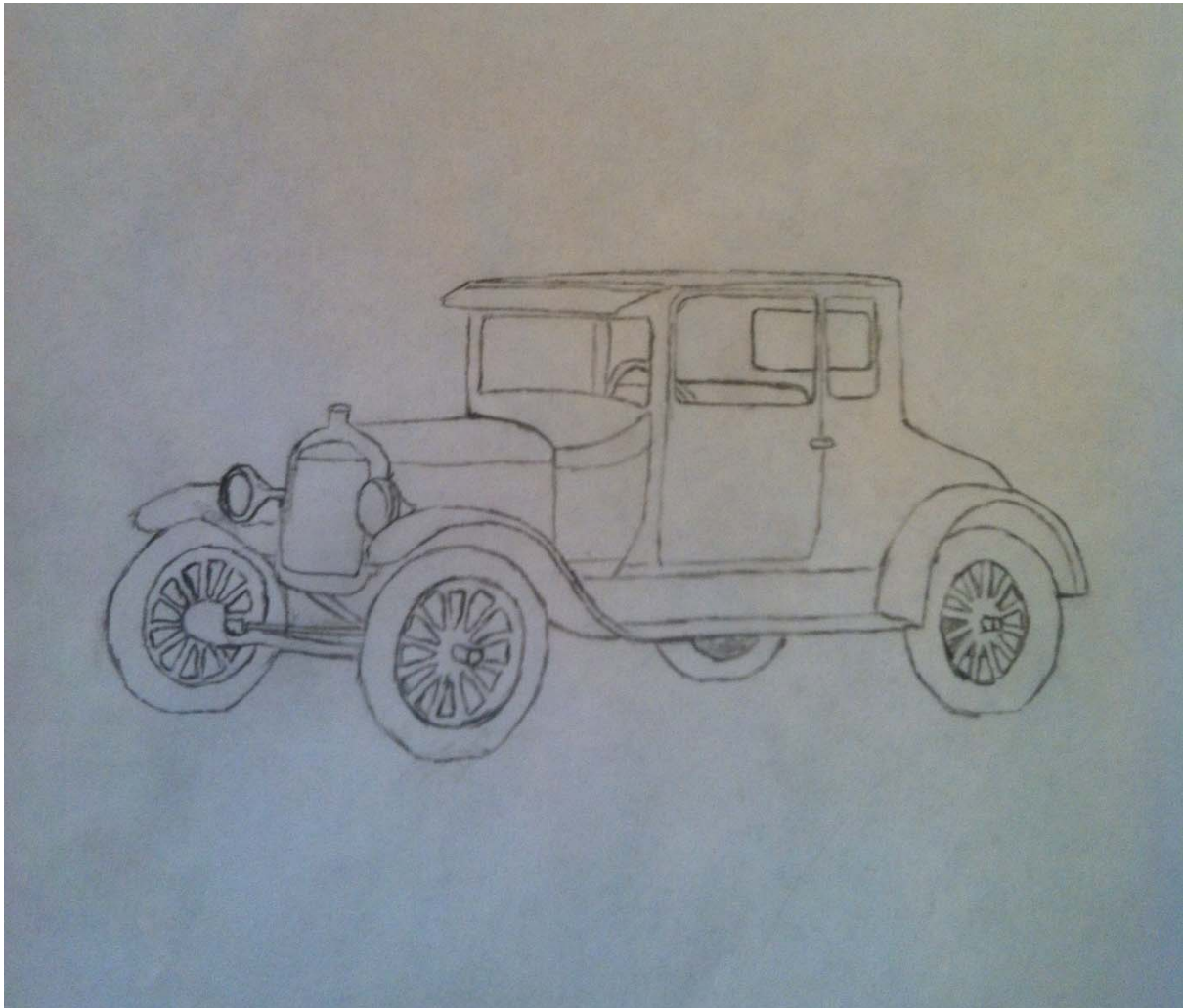
The famous Model T Ford was built from 1908 thru 1927. There were over 15 million manufactured and it made automobile travel more affordable to the average citizen. Over the 20 year span, there were fourteen different body styles offered. There were zero, one, two, three, four door models and a pickup truck offered. The wheelbase was 100 inches. The car had an inline four cylinder front mounted engine producing 20 horsepower. There were two speeds forward and one in reverse. Top speed was 40-45 miles-per-hour. It averaged 17 miles per gallon of fuel which could be gasoline, kerosene or ethanol. The suspension consisted of front and rear beam axles; each supported by a transverse-mounted inverted leaf spring. This suspension system was very effective in improving passenger comfort when riding over the many unimproved roads of the time. The use of pneumatic tires also aided in smoothing out the effects of road irregularities.

The steering wheel was moved from the center to the left side of the vehicle, an industry first. The Model T sat proportionately high and the overall appearance with its sharp exterior cab corners gave it a somewhat boxy look. Initially all T's were started with a hand crank. Later, there was an electric start offered as an option.

In 1922, during the Model T run, the Ford Company purchased the Lincoln Motor Company from Wilfred Leland. Leland was one of the investors in one of Henry Ford's earlier dissolved companies. Ironically, Leland was also the founder of the 1905 Cadillac Automobile Company purchased by General Motors in 1909. Both vehicles are luxury models offered today as competing brands by Ford and GM. (Leland named the Lincoln vehicle after his hero, Abraham Lincoln, the 16<sup>th</sup> president who served from 1860 to 1865. He named the Cadillac after Antoine Cadillac, the French explorer who founded the city of Detroit in 1701.)

Midway through the production years, half of the U.S. vehicle population was Model T's. In 1925, two million Model T's were built; more than any other vehicle line. They sold in the \$200-\$300 range; however, during this period, General Motors, offering a well-engineered and manufactured vehicle, started cutting into Ford's sales and overtaking Ford as the world's largest car manufacturer. The action by General Motors and increasing sales by other automobile makers prompted Henry Ford to replace the Model T with the Model A. The nomenclature "Model A" was chosen rather than "Model U" (the next letter in the alphabet from T) by Henry Ford who wanted it known that this vehicle was a fresh new start.

Ford Model T  
1908-1927 Coupe



The Model A was produced from 1927 thru 1931 replacing the Model T. The engine generated 40 horsepower; double that of the Model T with fuel consumption averaging 27.5 miles-per-gallon, much improved over the 17 miles-per-gallon Model T average. Top speed was 65 miles-per-hour topping that of the Model T's 40-45 miles-per-hour. The Model A came in 32 different body styles ranging from a coupe to a truck. The wheel base increased from the Model T's 100 inches to 103.5 inches. The Model A was longer and lower looking than the Model T with cleaner lines. The price ranged from \$500 for the coupe to \$1200 for the high end Tudor. There were just under 5 million Model A's built during its four year production run. Based on the average number of vehicles manufactured per year, it was a big success in its time similar to its predecessor, the Model T.

The Model B was produced from 1932 thru 1934 following Model A. The engine was an improved four cylinder design rated at 50 horsepower; ten horsepower greater than the Model A. There was also an available V8 producing 65 horsepower for a version called the Model 18. The wheel base was increased from 103.5 inches to 106 inches for the 1932 Model B and 112 inches for the 1933 and 1934 Model B's. The Model B came in seven different body styles ranging from a \$490 coupe to a \$650 convertible. Exterior body changes were made giving the vehicle a more eye appealing longer and lower look than Model A. Production quantities for the Model B were down from previous models averaging about one-half million units per year.

Following the Ford Model B, the Model 48 evolved. The Model 48 was produced from 1935 thru 1936. It was an improved version of the Model B but sold with V8 engines only. The front end was more bullet-shaped with a curved grille and more integrated fenders. Ford vehicles of this time period sold well; however, in 1936 Chevrolet out sold Ford.

Hereafter all Ford new models, instead of being designated by a model letter, have been referred to by model name and year introduced; a common practice used throughout the auto industry. Notable events are as follows:

- The 1937-1940 Ford had the same bullet-shaped front end as the Model 48 with the addition of integrated headlights rather than being mounted

externally on arms. Initial price was \$850. Sales were hurt by a national economic downturn.

- In 1939, the Mercury line was introduced filling the gap between the Ford line of vehicles and the luxury Lincoln models. Mercury sales were 65,800 the first year rising to an all-time high of 580,000 in 1978, then down to 95,195 units in 2010. The brand was discontinued in 2011.
- The 1941 model continued into 1942 when production ceased due to World War II. Production resumed in 1946 after the war. Ford continued to streamline the exterior features of the vehicle to give it a more aerodynamic look. Although electric start had been used for decades, manual start capabilities were still available for use with dead batteries. In 1946, a 100 horsepower V8 engine which was used for Mercury and trucks was made available for passenger cars.
- The 1949-1951 Ford was a new design embodying major changes to the chassis. The frame was changed to a ladder type in which two long side rails are connected by a number of strategically mounted cross members. The front and rear transverse mounted leaf springs were replaced by the more modern concept of having coil springs in the front and longitudinal leaf springs in the rear. The engines were the 90 horsepower straight six and the 100 horsepower V8. The 1952 Fords were the first to have an optional automatic transmission; soon to become standard equipment.
- The 1952-1954 vehicle featuring a curved windshield is a major advancement in vehicle styling. Engine output was raised to 115 horsepower for the six and 130 horsepower for the V8.
- The 1955-1956 model with raised front fenders and more pronounced body side molding gave the vehicle a long, sleek look. The six cylinder engine horsepower was raised to 120 horsepower and the 193 horsepower Thunderbird V8 was offered for the first time on other Ford models. The Thunderbird, a personal sports luxury car that ran from 1955 to 2005, sold well until the 1990s when the concept became passé. Ford produced over 4.4 million Thunderbirds over 50 years of production.
- The 1957-1959 Ford possessed the same sleek look as its predecessor and was longer as the wheelbase was increased to 116 inches for the Custom line and 118 inches for the Fairlanes. This was the first time Ford used a hypoid

gear in the rear drive axle to lower the drive shaft and floor of the vehicle affording more interior space.

- The 1960-1964 vehicle wheelbase was increased to 119 inches. Sleek new styling featured dual headlights fitted low alongside the grill and long sculptured sides. V8 engine horsepower was increased to 410.
- The 1965-1968 Galaxie, Ford's full sized model, featured stacked dual headlights and an all new front and rear coil suspension system that improved ride and handling.
- The 1969-1974 Galaxie was built on a new platform with a 121 inch wheelbase and with non-stacked headlights. A 360 horsepower four barrel, dual exhaust engine was offered. In 1970, Ford offered Anti-Lock Braking Systems (ABS) on Lincoln Continentals and, in 1971, they were made standard equipment. Power front disc brakes were standard in 1974.
- From 1975 to 1978 the LTD was Ford's only full size model. Engine power was downgraded to 143-202 horsepower because of the countrywide energy crisis. By 1977 all models had catalytic converters due to new exhaust gas emission standards.
- The 1979-1982 Ford LTD was downsized with the wheelbase shrinking from 121 inches to 114.3 inches because of new government gas mileage requirements. Weight of the vehicles dropped from 3800-4300 pounds to 3500-4000 pounds. The 1980 models had a 4-speed automatic transmission which increased gas mileage, a first in the industry.
- The 1983-1986 LTD was downsized even further with the wheelbase shrinking to 105.5 inches and the weight dropping to 2800-3300 pounds.
- Following the LTD was the Ford Taurus. The first generation of the Taurus ran from 1986 to 1991. It was a mid-size vehicle with Ford's first venture into front wheel drive. The overall body was egg-shaped to minimize aerodynamic loading and fuel usage. The first generation Taurus was a success with over 2 million vehicles sold through 1991. The second generation Taurus, 1992-1995, had the manual transmission and the four cylinder engine dropped. Nearly all models had automatic transmissions and V6 engines. In 1994, it was the first model of its kind to have dual front air bags. More than 1.4 million second generation vehicles were sold making it the best-selling vehicle in the U.S.

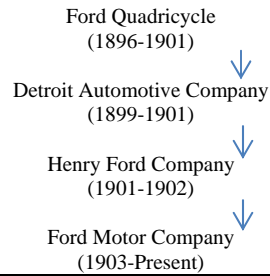
- The third generation Taurus, 1996-1999, had an oval exterior shape similar to the Ford logo. It remained the best-selling car in the U.S. until 1997 when it was outsold by Toyota.
- The fourth generation Taurus, 2000-2007, saw the exterior oval shape change to a more conventional look. It was thought that the oval design had lost its appeal. Because of a continued loss of market share, sales of fourth generation Taurus vehicles ended in 2007.
- The fifth generation Taurus 2008-2009 was a renamed Ford Five Hundred 2008 model. This was done as a result of a corporate directive not to discontinue the Taurus title because of the successes in the past giving the car good name recognition. One notable change was the incorporation of a six-speed automatic transmission developed by a joint GM-Ford venture. The SHO (Super High Output) model was powered by the twin turbo-charged EcoBoost V6 engine. Sales of the Taurus dropped dramatically starting in 2007 and continued thru 2012.
- In 2010, despite efforts to include new features such as all-wheel drive, collision warning, and blind spot monitoring, Taurus sales still continued their downward spiral from the 2006 mark of 174,803 vehicles sold. The plight of the Taurus, as well other Ford models since 2006, reflected the economic downturn of the U.S. and other world industrial countries. Ford corporate bonds were downgraded to “junk” status because of high operating costs, rising cost of gasoline, and a drop in market share due to increasing foreign competition. The company reported its highest ever annual loss of 12.6 billion dollars in 2006. This was followed by a reported loss of 14.6 billion in 2007. GM and Chrysler agreed to receive government loans while Ford opted out of the program. Ford downsized by dropping unprofitable vehicle models, streamlining production lines, and closing plants. Ford and the United Auto Workers Union reached a historic agreement on ways to cut corporate costs. The company received a profit of 2.7 billion in 2009, the first ever since 2005. In 2012, Ford’s corporate bonds were upgraded from junk status to investment grade once again. After years of decline, vehicle sales started to increase in 2010 and again in 2011. Ford’s net income was 5.7 billion in 2012.



2014 Ford V6 Mustang



## Henry Ford Automotive History



Model A 1903-1904				
Model B (C,F) 1904-1906				
Model K (N,R,S) 1906-1908				
Model T 1908-1927		Lincoln 1922-Present		
Model A 1927-1931		Zephyr 1936-1942		
Model B 1932-1934		Custom 1941-1942		
Model 48 1935-1936		Continental 1941-2002		
Standard 1937-1940	Mercury 1938-2011	Sport 1949-1957		
Special 1941-1948	Monterey 1952-1974	Cosmopolitan 1949-1954		F-Series 1948-Present
Custom 1949-1951	Maurader 1963-2004	Lido 1950-1957		Generation 3 1957-1960
Mainline 1952-1954	Cougar 1967-2002	Capri 1952-1959		Generation 4 1961-1966
Fairlane 1955-1956	Montego 1968-2007	Mark Series 1956-1998	Thunderbird 1955-2005	Generation 5 1967-1972
Custom 300 1957-1959	Grand Marquis 1983-2011	Premiere 1956-1960	Generation 5 1967-1971	Generation 6 1973-1979
Fairlane 500 1960-1964	Sable 1985-2009	Versailles 1977-1980	Generation 6 1972-1976	Generation 7 1980-1986
Galaxie 1965-1974	Villager 1993-2002	LS 2000-2006	Generation 7 1977-1979	Generation 8 1987-1991
Granada 1975-1982	Mystique 1995-2000	Blackwood 2002	Generation 8 1980-1982	Generation 9 1992-1996
LTD 1965-1986	Mountaineer 1997-2010	Aviator 2003-2005	Generation 9 1983-1988	Generation 10 1997-2003
Taurus 1985-Present	Mariner 2005-2010	Zephyr 2006	Generation 10 1989-1997	Generation 11 2004-2008
	Milan 2006-2011	Town Car 1981-2011	Generation 11 2002-2005	Generation 12 2005-Present

The General Motors Corporation, like Ford, had a somewhat auspicious beginning. The company, as mentioned, was founded by William C. Durant (1861-1947) who had been the world leader in the manufacture of horse drawn carriages. His actions were as follows:

- In 1908, Durant, from Flint Michigan, merged his Buick motorcar company with his newly formed General Motors Company. That same year, Durant acquired Oldsmobile, founded by Ransom E. Olds from Lansing, Michigan.
- In 1909, Durant acquired, among others, Cadillac, Oakland (Pontiac), Elmore, and the Rapid Motor Car Company of Pontiac, Michigan (GMC). In 1910, Durant lost control of General Motors because of decreasing car sales and a high amount of debt he acquired from his many acquisitions.
- In 1911, Durant organized the Chevrolet Motor Car Company and with it purchased back the General Motors Company he lost the previous year.
- In 1916, Durant reorganized General Motors Company into the General Motors Corporation. When new car sales slumped, he lost control of General Motors for good.

Alfred P. Sloan (1875-1966) was born in New Haven, Connecticut. When he was five, the family moved to Brooklyn, New York where he attended public schools. He graduated from the Massachusetts Institute of Technology earning a degree in electrical engineering. After college he went to work for the Hyatt Company in New Jersey as a draftsman. The company made billiard balls, and in less than ten years, he rose in the ranks to become the president of Hyatt. Under Sloan's leadership, the company started manufacturing steel roller bearings for the auto industry where he dealt with many auto executives including Henry Ford.

The United Motors Corporation, founded by William Durant in 1916, was a conglomerate of companies specializing in the production of automotive components. Among them are the following: Sloan's Hyatt Roller Bearing Company, New Departure Ball Bearing Company, Remy Electric Company, Dayton Engineering Laboratories, and the Harrison Radiator Company. Durant, as he did in the carriage business, wanted to control not only the end product, but the parts, components and assemblies that went into the final product.

Durant appointed Alfred Sloan an executive of United Motors. Sloan organized United Motors Service as part of United Motors to sell and provide service on all United Motors products. Two years later, United Motors merged with General Motors and concentrated on providing parts and services to General Motors only. Sloan became a G.M. Vice-President and, in 1923, President of the same company. General Motors thrived under Sloan and went on to become the world's largest corporation. One of Sloan's greatest contributions was to make the five car divisions operate as separate entities. He was Chairman when he retired in 1956. In 1960, United Motors was renamed United Delco and, in 1974, United Delco merged with AC Sparkplug to become AC Delco. Sloan dedicated both time and financial aid to the Sloan-Kettering Institute for Cancer Research.

Buick was General Motors' first car division. Buick is the oldest auto manufacturer in the U.S. It was founded in 1899 and incorporated in 1903 in Detroit, Michigan by Scottish born David Dunbar Buick (1854-1929). Later that year, the company was purchased by James H. Whiting who moved it to his hometown Flint, Michigan. In 1904, the company was taken over by William C. Durant who incorporated it into the General Motors Corporation in 1908.

The first 37 Buick production units were built in 1904. They had Buick's patented overhead valve, two cylinder engine, flat mounted in the center of the vehicle. The wheelbase was 87 inches compared to the Ford Model T which was 100 inches. The early Buicks were a success and became the highest volume car producer in the U.S. This enabled Durant to make other auto company acquisitions and create the General Motors Company, forerunner of today's General Motors Corporation.

In 1937, Buicks had synchromesh transmission and vacuum-actuated spark advance, industry firsts; and, in 1939, Buick was the first company to incorporate turn signals on their vehicles.

Since 2005, GM paired Buick with GMC to create Buick-GMC dealerships in the absence of Pontiac; however, in 2009 during GM's emergence from Chapter 11, Buick was designated a "core brand". In a 2009 J.D. Powers Study, Buick was named the most dependable brand in the U.S. In 2012, Buick offered GM's "eAssist" technology on two models increasing gas mileage by as much as 38%.

Oldsmobile was acquired by Durant in 1908, the same year that he merged his Buick car company with his new General Motors Company. Olds was founded by Ransom E. Olds (1864-1950) in 1897 in Lansing, Michigan, sold two years later, and then moved to Detroit, Michigan. The Oldsmobile brand was discontinued in 2004 during GM's emersion from bankruptcy.

Oldsmobile produced 425 cars in 1901, more than any other company. It remained the number one producer in the U.S. for several years. Oldsmobiles are credited with being the first cars built on an assembly line with interchangeable parts. The last of the original Olds model was sold in 1907, one year before GM purchased the company. Olds was installed in the middle of GM's vehicle price structure between Pontiac and Buick and remained there until its demise.

In 1937, Olds was the first to offer a 4-speed semi-automatic transmission. In 1940, Olds was the first to offer a fully automatic transmission. In 1949, Olds offered their "Rocket Engine", an overhead valve V8 with more power than any other V8 engine of its kind. In 1962, Olds introduced the first modern front wheel drive vehicle manufactured in the U.S., the Toronado, and the first turbocharged engine in the U.S.

In 1976, the Olds Cutlass became the top selling vehicle in the U.S. and the Olds division rose just behind Chevrolet and Ford in total vehicle production. In 1977, the demand for Oldsmobiles was so great that some Olds V8 engines were replaced by Chevrolet V8 engines. This created great dissatisfaction with loyal Oldsmobile customers and a public relations disaster for General Motors. In 1978, Olds released a V8 diesel engine for use in passenger cars; however, design and quality problems caused the discontinued use of diesel engines for passenger cars by all GM divisions in the mid-1980s. By 1990, Oldsmobile vehicle sales decreased significantly because of gains from other GM divisions and foreign imports. Despite efforts to create new models, Olds could not recover and this division of General Motors was ended in 2004.

Cadillac was the third automotive division to be acquired by Durant's General Motors. Cadillac was formed from one of Henry Ford's earlier dissolved companies in 1902 by Henry Leland (1843-1932). Ironically, the first Cadillac vehicles were patterned after Henry Ford's early Model T. General Motors

purchased Cadillac in 1909. Traditionally, Cadillac's have been large, elegantly styled, and luxuriously furnished vehicles with state-of-the-art features. It became the high-priced luxury line in the GM family of automobiles.

In 1949, Cadillac set a sales record of 100,000 vehicles and, in 1966, another record 192,000 vehicles were sold. In 1968, still another record of over 200,000 vehicles were sold. Cadillac launched the front wheel drive Eldorado in 1967 and, in 1970, Cadillac sales exceeded all of Chrysler sales. Cadillac garnered record sales in 1973 and again in the late 1970s. With GM's five automotive divisions now down to three, Cadillac is preparing to develop a full line of vehicles for the future.

Oakland was acquired by General Motors in 1909. It had been the Oakland Motor Car Company operating in Pontiac, Michigan from 1907 to 1909. Oakland was intended to be fitted between lower based Chevrolet and higher based Oldsmobile in the General Motors structured level of pricing. In 1926, Pontiac was introduced in the same price range and outsold Oakland. As a result, Oakland was discontinued in 1931 and replaced by Pontiac.

Pontiac was incorporated in 1899 and started producing automobiles in 1907. Pontiac and Oakland were merged in 1908 and purchased by General Motors in 1909. The GM vehicles originally produced were Oakland but, in 1926, GM decided to market Pontiac as a companion brand. Pontiac soon outsold Oakland resulting in Oakland's removal from the General Motor's lineup by 1933. Pontiac's vehicles were emphasized as being low end high performance vehicles, but because of financial problems, GM restructured in 2010 dropping Pontiac.

Elmore of Clyde, Ohio produced automobiles starting in 1893. It was purchased by General Motors in 1909 during one of William Durant's General Motor's buying sprees. In 1910, after Durant was forced out of General Motors because of slumping sales and high debt, Elmore was eliminated from their line of vehicles.

Chevrolet was founded by Louis Chevrolet (1878-1941) and former GM founder William Durant in 1911 and then acquired by General Motors in 1918. Chevrolet was originally aligned to be GM's lowest cost vehicle division; however, it has grown to sell a wide range of vehicles ranging from compact size to light trucks.

Chevrolet, Ford, and Plymouth were known as the three lowest priced cars in the 1930s and 1940s. The Corvette, a two-passenger personal sports car with a fiberglass body was introduced in 1953 and still undergoes major redesigns and releases; the latest of which receiving much fanfare in 2013. In 1957, Chevrolet produced Corvettes with fuel-injected engines and Corvairs with rear air-cooled engines. Ten percent of all cars in 1963 were Chevrolets. In 2012, Chevrolet was reported to have accounted for 74% of all General Motors sales.

GMC Division of General Motors started as the Rapid Motor Vehicle Company in Pontiac, Michigan in 1902. Rapid built trucks and specialized passenger vehicles. They were purchased by GM becoming one of Durant's many acquisitions of 1909. Rapid became the GMC Truck division which today is known simply as GMC, a division of GM. Today, GMC manufactures light duty trucks, medium duty trucks, vans, and sports utility vehicles. Some GMC lines have been very similar to Chevrolet lines; although, recently there have been efforts to distance the two brands.

### 2012 Chevrolet Camaro



The Chrysler Corporation: Walter P. Chrysler (1875-1940) was born in Wamego, Kansas and raised in Ellis, Kansas where he became a machinist and railroad mechanic. He roamed the West using his railroad knowledge to become a general master mechanic. His automotive career started when, in 1911, he received a phone call from a General Motors executive who offered him a position as works manager of the Buick Motor Company in Flint, Michigan. He rose to the rank of president of Buick and then resigned in 1919 because of differences with William Durant who had made Buick a part of his General Motors Corporation. Chrysler was then hired by bankers to run the ailing Willys-Overland Motor Company in Toledo, Ohio for one million dollars a year; what was thought of at the time as being a huge amount. Chrysler left Willys in 1921 after not being able to take over ownership of the company from John Willys.

The Maxwell Company started business in Tarrytown, New York in 1904. After a fire destroyed their factory in Tarrytown in 1907, they moved to Detroit, Michigan and opened up plants in New Castle, Indiana and Dayton, Ohio. The company rose to become one of the big three with Buick and Ford. Maxwell became deeply in debt following the 1920 recession of World War I. In 1921, Walter Chrysler, after leaving Willys, took over controlling interest of Maxwell. Chrysler formed the Chrysler Corporation in 1925 phasing out Maxwell in favor of the newly formed Plymouth and DeSoto names. In 1928, Chrysler bought out the Dodge Brothers company. The Dodge Brothers built engines for Ford earning John Dodge (1864-1920) a position as Ford Vice-President. He left Ford in 1913 and the brothers started their own Dodge Brothers Company in 1914, building both trucks and cars. After the purchase, the Chrysler car lineup became, starting at the low end, Plymouth, Dodge and DeSoto. The vehicles produced were well engineered for their day and included many advanced features such as a pressurized engine lubrication system, four-wheel hydraulic brakes, and a flat tire retaining road wheel. The company vaulted into second place in auto sales in the U.S. from 1936 to 1949. Chrysler retired from business in 1936 and died in 1940.

In 1955, Chrysler remade its Imperial model which was a high end Chrysler into a line of its own to compete with Lincoln and Cadillac. The Valiant was introduced in 1960 as a separate brand and DeSoto was eliminated in 1961. The Chrysler lineup from the 1940s through the 1970s was now Valiant, Plymouth, Dodge,



DeSoto, Chrysler and Imperial except for DeSoto being eliminated as mentioned above.

Chrysler purchased American Motors in 1987 and established the Jeep-Eagle division. In 2001, after Chrysler had merged with Daimler-Benz in 1998, the Plymouth line was dropped. The merger didn't go well for Chrysler as their vehicles did not sell as well as GM and Ford resulting in a loss of 1.5 billion in 2006. Daimler separated from Chrysler in 2007 and, in 2009, Chrysler filed for bankruptcy. With the help of the U.S. and Canadian governments, Chrysler emerged from bankruptcy in May, 2011; and in July 2011, Fiat bought Chrysler.

American Motors Corporation (AMC) was formed by the 1954 merger of the Nash-Kelvinator Corporation and Hudson Motor Car Company to compete against the larger Big Three car corporations. That same year, AMC President George W. Mason (1891-1954) died unexpectedly leaving George W. Romney (1907-1995) to manage the company. Romney discontinued the Nash and Hudson brands and concentrated on the smaller Rambler line to battle the Big Three.

American Motors experienced losses in 1956 and 1957 but recovered in 1958 when the Rambler became the country's third best-selling car. In 1970, American Motors bought the Kaiser Jeep Corporation utility vehicle line. Since then, the company has dealt with one standard vehicle line and one Jeep line. In 1983, France's Renault took controlling interest in American Motors, and in 1987, Chrysler acquired American Motors from Renault.

## 2013 Chrysler 200 Convertible Hard Top



*(After viewing the Ford, GM and Chrysler automobile photos above, it can be seen that government legislation has driven vehicle design and styling to the point where many of the Big Three vehicles are very similar in size and shape.)*

## Summary

It can be understood from this course that there are a number of elements that converged on the Midwestern part of the United States leading to the crowning of Detroit, Michigan as the “Automotive Capital of the World”. The main factors can be summed up into three groups: abundant resources, Great Lakes, and entrepreneurial people.

Abundant Resources: Detroit is situated in the midst of the Great Lakes; one of the largest fresh waterways in the world. In the three Great Lakes states area of Michigan, Wisconsin and Minnesota, lies one of the world’s greatest concentrations of iron ore. Iron ore processed to create iron and steel make up two-thirds the weight of an average vehicle. The great concentration of iron ore; the ease of shipping this heavy bulky material via the Great Lakes; and the proximity to Detroit and other Midwestern ports, all give Detroit distinct advantages over other industrial sites, both domestic and foreign.

Large quantities of limestone are needed in the processing of iron ore to remove sulfur, an impurity found in the mineral ore. As with the Great Lakes area possessing the world’s largest concentration of iron ore, the world’s largest limestone quarry was found in Michigan’s Lower Peninsula’s Lake Huron coast, just a short distance from Detroit. The location of the mine on a Lake Huron port also makes shipping limestone to steel mills located all along the Great Lakes and the Midwestern part of the United States an easy venture.

Coal, another important raw material in the processing of steel, was first found in the Midwestern states of Pennsylvania, Ohio, Indiana, Illinois, West Virginia and Kentucky; all within easy shipping distance to the steel mills, as there were many railroad lines crisscrossing the United States through the Midwestern coal states.

Rubber comes from latex which is collected by slitting the bark of the “hevea” tree. The hevea tree was first found in Brazil but, a large number of these trees are grown around the world in countries on or close to the equator. It took American Charles Goodyear many agonizing years of experimenting to invent rubber as we know it today, but it was Frank Seiberling who made Akron, Ohio, just a stone’s throw from Detroit, the “Rubber Capital of the World”.

Glass is another important raw material needed for the production of automobiles. Because of the abundance of fine Great Lakes sand, natural gas, and land and water transportation facilities, Toledo, Ohio, just one hour from Detroit, became known as the “Glass City”.

Famous People: The early people involved in the auto industry were not only successful business men, but were farmers (and lumbermen) who were always looking for better ways to improve their livelihood. One has to believe that, in the back of every farmer’s mind, the idea of replacing the horse-and-plow and the horse-and-buggy with a horseless self-powered vehicle is like a dream come true.

John William Lambert, as previously mentioned, designed, built and operated the first gas-powered vehicle in the United States. Lambert was born on a farm in central Ohio. He built and operated the vehicle in 1891, in northwest Ohio, in a town close to the Michigan and Indiana borders where he and his father owned and operated a farm implement business. Lambert then moved to Anderson, Indiana where he manufactured and sold tens of thousands of vehicles through the year 1917. John Lambert embodied the principals of the typical Midwestern automobile pioneer. He was in the farm business, mechanically inclined, and fascinated with gasoline engines and gas powered vehicles.

The Duryea Brothers, Frank and Charles, were born in Canton, Illinois and, in 1893, if historical records are correct, they are credited with building and operating the second American gas powered vehicle. Charles was the engineer and Frank built, tested and raced their first vehicle. They did this in 1893, two years after Lambert’s feat. This vehicle was donated to the United States National Museum. They went on to build and manufacture automobiles in Springfield, Massachusetts until 1917. They are one of the few renowned American automotive pioneers not to fit in the mold of those having roots or having operated in the three state area. Elwood P. Haynes was not a farmer, but a brilliant engineer from Indiana who is the inventor of several metal alloys and is also credited with building the first United States natural gas pipeline which ran from Indiana to Chicago. In 1894, three years after Lambert, Haynes designed, built and operated his first gas-powered vehicle in Kokomo, Indiana, located in the northern part of the state. He built tens of thousands of cars through the year 1924 at which time hard times hit the market forcing him to end production.

Alexander Winton was born in Scotland and, in 1890, became a bicycle manufacturer in Cleveland, Ohio. He built his first car in 1896, five years behind Lambert. Winton went on to manufacture more than 100 vehicles in 1899 making Cleveland, Ohio the “Automotive Capital of the World”. Winton continued to produce upscale vehicles until 1924 when he ended production. He had a fascination for engines and his “Winton Engine Company” became a division of General Motors in 1930 building diesel engines for submarines and locomotives.

Ransom E. Olds was born in Geneva, Ohio. His father was a farmer and a businessman. His family moved to Cleveland, and then to Lansing, Michigan where, in 1897, Ransom founded the Olds Motor Vehicle Company. The company was moved to Detroit in 1901 where 19,000 Curved Dash models were sold over a seven year period. During this time, he displayed his genius in becoming the first auto manufacturer to mass produce vehicles on an assembly line using interchangeable parts. Shortly thereafter, he was acquired by Durant’s General Motors Company.

David Dunbar Buick was born in Scotland. His family moved to Detroit where, after the loss of his father, he worked on a farm to provide for his family. He became a machinist for the James Flower Machine Shop; the same company that employed Henry Ford as a machinist. After a stint in the plumbing business where he received many patents, Buick sold the business and invested his money in forming the Buick Auto-Vim and Power Company, selling engines for the farming and lumber industries. He built and operated his first car in 1903 with his own design engine which was state-of-the-art for its time. Buick was instrumental in forming the Buick Motor Company in Flint, Michigan, which was purchased by William Durant who later made it the first acquisition of his own General Motors Company, forerunner of the General Motors Corporation.

William Durant worked in the lumber business, the insurance business, and then became the largest carriage maker in the United States. Still not satisfied, he formed the General Motors Corporation as it is known today, lost the company because of finances, regained it back, and then lost it forever. General Motors may not have been the company it is today if it were not for Durant’s energy, enthusiasm and salesmanship.

Alfred P. Sloan became president of the Hyatt Roller Bearing Company making components for the car companies. In 1916, Durant purchased the company along with other automotive supply companies to form the United Motors Corporation. Durant made Sloan an executive of the newly formed United Motors Corporation which then merged with General Motors. Sloan was made a General Motors Vice President and, in 1923, was elected GMC's President. Sloan took the foundation that Durant had laid and built it up to become the world's largest corporation for many decades to come.

The Dodge Brothers, John and Horace, grew up in Niles, Michigan where they learned to be machinists in their father's shop. John was four years older than Horace and a better machinist, while Horace was the better leader. In 1886, after the family moved to Detroit, Michigan, the brothers went into the bicycle manufacturing business. In 1902, Ransom Olds, who became impressed with the Dodge Brothers mechanical abilities, hired the two to make transmissions for his Curved Dash vehicle. The Dodge brothers then got a call from Henry Ford and ended up making every machined part of his famous Model T vehicle. The Ford Motor Company prospered under this relationship earning both parties handsome profits. Based on their experience with Ford, the brothers quit the company and formed their own car company. The first Dodge vehicle rolled off the assembly line in 1914. After the two brothers died, the company was sold to Walter P. Chrysler in 1928. There are eight different Dodge models offered by Chrysler today.

Walter P. Chrysler was born in Kansas and became a railroad "general master mechanic". In 1911, he became works manager of the Buick Motor Company. In 1919 he resigned because of differences with William Durant who had made Buick a part of his General Motors Company. Chrysler then was hired to run the ailing Willys-Overland Company in Toledo, Ohio. In 1921, Chrysler took over controlling interest of Maxwell who, after being a member of the "Big Three" with Buick and Ford, fell on hard times. He formed the Chrysler Corporation in 1925; took over the Dodge Brothers Company in 1928; and, from 1936 to 1949, moved the company up to second place in U.S. auto sales. Walter Chrysler was a wise and dynamic leader, rising up from being a railroad mechanic to becoming founder of one of the United States "Big Three" automakers.

Henry Ford: It is the opinion of the author that Henry Ford is the most influential person in making Detroit the “Automotive Capital of the World”. Ford came from a farming family and began as a farmer and as a lumberman. He was basically a self-taught, mechanically minded individual, who was among the first individuals to build an automobile. In the case of Ford, his dream was even bigger; he built a company that provided thousands of jobs building automobiles that were affordable to a great portion of the population. Not to forget his roots as a farmer and lumberman, he also built pick-up trucks, tractors and other farm machinery. Ford, who was not blessed with a large amount of money, did not have an easy start in the automotive business. After failing with automotive companies in 1901 and 1902, he was finally successful in forming the Ford Motor Company in 1903 which still endures today despite serious competition from the other two members of the Big Three (General Motors and Chrysler) and also foreign companies who have invaded the U.S. capturing a significant amount of the domestic vehicle sales.

In conclusion, famous people, abundance of resources, and Great Lakes, all converged on Detroit, Michigan to make it the “Automotive Capital of the World”.