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Karl Benz (left) / The first automobile made by Karl Benz 1885 (right) Image Credit: Unknown authorUnknown author, Public domain, via Wikimedia Commons Driven by a genius for mechanical engineering and a fascination with the budding notion of 'horseless carriages', Karl Friedrich Benz designed and developed the world's first internal combustion engine-powered automobile in 1885. It's hard to imagine a more profound contribution to the history of transport, but Benz continued to play a leading role in the motor industry throughout his restlessly innovative career. 1. Benz grew up in near poverty but developed a precocious interest in engineering Born in Karlsruhe, Germany on 25 November 1844, Karl Benz was brought up in challenging circumstances. His father, a railway engineer, died of pneumonia when he was just two years old, and his mother struggled for money throughout his childhood. But Benz's intelligence was clear from a young age, in particular his aptitude for mechanics and engineering stood out. These precocious talents allowed him to help out financially by fixing watches and clocks. He even built a darkroom where he developed photos for tourists in the Black Forest. Today on Patented, we are joined by war historian James Holland to explore where the idea of the tank came from, how they have been used through time, and what role they play in future conflicts. Listen Now 2. Despite financial difficulties Benz developed innovative engine technologies Karl Benz (in the middle) with his familyImage Credit: Unknown author, CC BY-SA 4.0 , via Wikimedia Commons After graduating from the University of Karlsruhe with a degree in mechanical engineering, Benz flitted between engineering jobs before settling in Mannheim where he established an iron foundry and sheet metal workshop with a partner, August Ritter. The business faltered, but Benz's fiancé (soon to be wife) Bertha Ringer used her dowry to buy out Ritter, who was proving to be an unreliable partner, and save the company. Despite the challenges of running a company, Benz found time to work on the development of the 'horseless carriage' he had long envisioned and invented several innovative components. 3. His breakthrough two-stroke engine followed a succession of important inventions Benz patented several components that would complement the production of his two-stroke engine and ultimately feature in his first automobile. They included the throttle, ignition, spark plugs, gear, carburettor, water radiator and clutch. He completed the engine in 1879 and received a patent for it the following year. 4. He founded a new company, Benz & Cie., in 1883 Despite his engineering breakthroughs in the late 1870s and early 1880s, Benz was frustrated by a lack of opportunities to develop his ideas. His investors were reluctant to allow him the time and resources he needed, so he founded a new company, Benz & Companie Rheinische Gasmotoren-Fabrik, or Benz & Cie, in 1883. The early success of this new company allowed Benz to further the development of his horseless carriage. 5. The pioneering Benz Patent-Motorwagen became the first commercially available automobile in 1888 Benz Patent-Motorwagen, Dresden Transport Museum. 25 May 2015Image Credit: Dmitry Eagle Orlov / Shutterstock.com With the freedom and resources to work on his 'horseless carriage', Benz quickly realised his vision and in 1885 he unveiled a ground-breaking motorised tricycle. Featuring wire wheels and rubber tyres – in contrast to the wooden wheels that were typical of carriages – and a rear-mounted engine, Benz's automobile design was crammed with novel design features. But its most significant innovation was the use of a gasoline-powered internal combustion engine. Previous self-propelled carriages had depended on heavy, inefficient steam engines. Benz's revolutionary automobile represented the advent of a more practical and realistic consumer vehicle. 6. Bertha Benz demonstrated her husband's invention with a long-distance drive Sensing the need to publicise her husband's invention, Bertha Benz who, lest we forget, financed the development of the horseless carriage with her dowry, decided to take the Patent-Motorwagen No. 3 on a long-distance road trip. On 5 August 1888, she embarked on a cross-country drive between Mannheim and Pforzheim. We explore the acceleration of transport innovation, from the steam engine to space travel.Listen Now It was the first time an internal combustion engine automobile had been driven over a significant distance. As a result it attracted plenty of attention. Bertha's historic journey, which she undertook without telling Karl or seeking permission from the authorities, proved to be an ingenious marketing ploy. 7. As Benz & Cie. grew it began to develop more affordable mass-production automobiles Towards the end of the 19th century, automobile sales began to take off and Benz was well-positioned to lead the burgeoning market. The company responded to increased demand by producing cheaper models that could be mass-produced. The four wheel, two seat Velocipede automobile, sold by Benz between 1894 and 1902, is often cited as the world's first mass-produced car. 8. Benz's innovations were rivalled by the work of another German engineer, Gottlieb Daimler Gottlieb DaimlerImage Credit: Unknown author, Public domain, via Wikimedia Commons Benz's pioneering work in the development of the internal combustion engine powered automobile was mirrored by a fellow German engineer, Gottlieb Daimler. In fact, Daimler's engine was patented five months earlier and is generally regarded as superior. But, while Benz mounted his engine in a tricycle, Daimler attached his to a bicycle. Consequently, Benz tends to be more widely credited as the inventor of the internal combustion engine-powered automobile. The rivalry between Benz and Daimler was fierce, and both men strove to outdo each other. In 1889, Daimler unveiled his Daimler Motor Carriage, which was faster and more powerful than anything Benz had created. Benz responded by creating a four-wheeled vehicle in 1892. 9. The famous Mercedes-Benz brand was established in 1926 Despite their intertwined careers and great rivalry, Benz and Daimler never met. Daimler died in 1900 but his company Daimler Motoren Gesellschaft continued to trade and remained Benz's principal rival throughout the first two decades of the 20th century. Just as they were linked by their early success, both Benz and Daimler began to struggle in the post-World War One economic depression. The two companies decided that they would stand a better chance of survival by teaming up. They consequently signed an "Agreement of Mutual Interest" in 1924. Then, on 8 June 1926, Benz & Cie. and DMG finally merged as the Daimler-Benz company. The new company's automobiles would be branded Mercedes-Benz in reference to DMG's most successful model, the Mercedes 35 hp, which was named after the designer's 11 year-old daughter, Mercédès Jelinek. 10. The iconic Mercedes-Benz SSK was released a year before Benz passed away The Mercedes-Benz brand, featuring a striking new three pointed star logo (representing Daimler's motto: "engines for land, air, and water"), quickly established itself and sales rocketed. Arguably, no car represents the new brand's impressive emergence better the Mercedes-Benz SSK. Released in 1928, the SSK was the last car Ferdinand Porsche designed for Mercedes-Benz before leaving to start his own company. It heralded the dawn of an exciting new breed of sports car. Just 31 SSKs were made, but it was fast, stylish and desirable enough to become one of the era's most iconic vehicles. It was also a powerful emblem of the progress the automobile industry had made in the 40 years since Karl Benz first unveiled his Patent-Motorwagen. The Ford Model T (foreground) and Volkswagen Beetle (background) are among the most mass-produced car models in history. Crude ideas and designs of automobiles can be traced back to ancient and medieval times.[1][2] In 1649, Hans Hautsch of Nuremberg built a clockwork-driven carriage.[1][3] In 1672, a small-scale steam-powered vehicle was created by Ferdinand Verbiest;[4] the first steam-powered automobile capable of human transportation was built by Nicolas-Joseph Cugnot in 1769.[5][6] Inventors began to branch out at the start of the 19th century, creating the de Rivaz engine, one of the first internal combustion engines,[7] and an early electric motor.[8] Samuel Brown later tested the first industrially applied internal combustion engine in 1826. Only two of these were made.[9] Development was hindered in the mid-19th century by a backlash against large vehicles, yet progress continued on some internal combustion engines. The engine evolved as engineers created two- and four-cycle combustion engines and began using gasoline. The first modern car—a practical, marketable automobile for everyday use—and the first car in series production appeared in 1886, when Carl Benz developed a gasoline-powered automobile and made several identical copies.[10][11] In 1890, Gottlieb Daimler, inventor of the high-speed liquid petroleum-fueled engine, and Wilhelm Maybach formed Daimler Motoren Gesellschaft. In 1926, the company merged with Benz & Cie. (founded by Carl Benz in 1883) to form Daimler-Benz, known for its Mercedes-Benz automobile brand. From 1886, many inventors and entrepreneurs got into the "horseless carriage" business, both in America and Europe, and inventions and innovations rapidly furthered the development and production of automobiles. Ransom E. Olds founded Oldsmobile in 1897, and introduced the Curved Dash Oldsmobile in 1901. Olds pioneered the assembly line using identical, interchangeable parts, producing thousands of Oldsmobiles by 1903. Although sources differ, approximately 19,000 Oldsmobiles were built, with the last produced in 1907. Production likely peaked from 1903 through 1905, at up to 5,000 units a year. In 1908, the Ford Motor Company further revolutionized automobile production by developing and selling its Ford Model T at a relatively modest price. From 1913, introducing an advanced moving assembly line allowed Ford to lower the Model T's price by almost 50%, making it the first mass-affordable automobile.[12] The early automobile history concentrated on searching for a reliable portable power unit to propel the vehicle. Main article: History of steam road vehicles Cugnot's steam wagon, the second (1771) version Ferdinand Verbiest, a member of a Jesuit mission in China, built a steam-powered vehicle around 1672 as a toy for the Kangxi Emperor. It was small-scale and could not carry a driver, but it was, perhaps, the first working steam-powered vehicle ('auto-mobile').[4][13] Steam-powered self-propelled vehicles large enough to transport people and cargo were devised in the late 18th century. Nicolas-Joseph Cugnot demonstrated his fardier à vapeur ("steam dray"), an experimental steam-driven artillery tractor, in 1770 and 1771. Cugnot's design proved impractical, and his invention was not developed in his native France. The center of innovation shifted to Great Britain. By 1784, William Murdoch had built a working model of a steam carriage in Redruth[14] and in 1801 Richard Trevithick was running a full-sized vehicle on the roads in Camborne. A replica of Richard Trevithick's 1801 road locomotive 'Puffing Devil' During the 19th century, attempts were made to introduce steam-powered vehicles. Innovations such as hand brakes, multispeed transmissions, and better steering developed. Some successful vehicles provided mass transit until a backlash against these large vehicles resulted in the passage of legislation such as the UK Locomotives Act 1865, which required many self-propelled vehicles on public roads to be preceded by a man on foot waving a red flag and blowing a horn. This effectively halted road auto development in the United Kingdom for most of the 19th century; inventors and engineers shifted their efforts to improvements in railway locomotives. The law was not repealed until 1896, although the need for the red flag was removed in 1878. In 1816, a professor at Prague Polytechnic, Josef Bozek, built an oil-fired steam car.[15]:27 Walter Hancock, builder and operator of London steam buses, in 1838 built a two-seated car phaeton.[15]:27 In 1867, Canadian jeweler Henry Seth Taylor demonstrated his four-wheeled "steam buggy" at the Stanstead Fair in Stanstead, Quebec and again the following year.[16] The basis of the buggy, which he began building in 1865, was a high-wheeled carriage with bracing to support a two-cylinder steam engine mounted on the floor.[17] In 1873, Frenchman Amédée Bollée built self-propelled steam road vehicles to transport groups of passengers. The first automobile suitable for use on existing wagon roads in the United States was a steam-powered vehicle invented in 1871 by Dr. J.W. Carhart, a minister of the Methodist Episcopal Church, in Racine, Wisconsin.[18] It induced the state of Wisconsin in 1875 to offer a US$10,000 (equivalent to $286,333 in 2024) award to the first to produce a substitute for the use of horses and other animals. They stipulated that the vehicle would have to maintain an average speed of more than 8 km/h (5 mph) over a 320 km (200 mi) course. The offer led to the first city-to-city automobile race in the United States, starting on 16 July 1878 in Green Bay, Wisconsin, and ending in Madison, Wisconsin, via Appleton, Oshkosh, Waupun, Watertown, Fort Atkinson, and Janesville. While seven vehicles were registered, only two started competing: the Green Bay and Oshkosh entries. The vehicle from Green Bay was faster but broke down before completing the race. The Oshkosh finished the 323 km (201 mi) course in 33 hours and 27 minutes and posted an average speed of 9.7 km/h (6 mph). In 1879, the legislature awarded half the prize.[19][20][21] Pre-WWII 1924 Doble Model E Steam-powered road vehicles, both cars and wagons, reached the peak of their development in the early 1930s with fast-steaming lightweight boilers and efficient engine designs. Internal combustion engines also developed considerably during World War I, becoming easier to operate and more reliable. The development of the high-speed diesel engine from 1930 began to replace them for wagons, accelerated in the UK by tax changes making steam wagons uneconomic overnight. Although a few designers continued to advocate steam power, no significant developments in the production of steam cars took place after Doble in 1931. Post-WWII Whether steam cars will ever be reborn in later technological eras remains to be seen. Magazines such as Light Steam Power continued to describe them into the 1980s. The 1950s saw interest in steam-turbine cars powered by small nuclear reactors[22] (this was also true of aircraft). Still, the fears about the dangers inherent in nuclear fission technology soon killed these ideas. The German Flocken Elektrowagen of 1888, perhaps the first electric car in the world[23] See also: History of the electric vehicle In 1828, Ányos Jedlik, a Hungarian who invented an early electric motor, constructed a tiny model car powered by his new motor.[8] In 1834, Vermont blacksmith Thomas Davenport, the inventor of the first American DC electric motor, installed his motor in a small model car, which he operated on a short circular electrified track.[24] In 1835, Professor Sibrandus Stratingh of Groningen, the Netherlands and his assistant Christopher Becker created a small-scale electrical car, powered by non-rechargeable primary cells.[25] In 1838, Scotsman Robert Davidson built an electric locomotive that attained a speed of 6.4 km/h (4 mph). In England, a patent was granted in 1840 for using tracks as conductors of electric current, and similar American patents were issued to Lilley and Colten in 1847. Sources point to different creations, such as the first electric car. Between 1832 and 1839 (the exact year is uncertain), Robert Anderson of Scotland invented a crude electric carriage powered by non-rechargeable primary cells. In November 1881, French inventor Gustave Trouvé demonstrated a working three-wheeled car powered by electricity at the International Exposition of Electricity.[26] English inventor Thomas Parker, who was responsible for innovations such as electrifying the London Underground, overhead tramways in Liverpool and Birmingham, and the smokeless fuel coalite, built an electric car in London in 1884, using his own specially designed high-capacity rechargeable batteries.[27] However, some others regard the Flocken Elektrowagen of 1888 by German inventor Andreas Flocken as the first actual electric car.[23] Electric cars enjoyed popularity between the late 19th century and the early 20th century when electricity was among the preferred methods for automobile propulsion. Advances in internal combustion technology, especially the electric starter, soon rendered this advantage moot; the greater range of gasoline cars, quicker refueling times, and growing petroleum infrastructure, along with the mass production of gasoline vehicles by companies such as the Ford Motor Company, which reduced prices of gasoline cars to less than half that of equivalent electric cars, led to a decline in the use of electric propulsion, effectively removing it from markets such as the US by the 1930s. Increased concerns over the environmental impact of gasoline cars, higher gasoline prices, improvements in battery technology, and the prospect of peak oil have brought about renewed interest in electric cars, which are perceived to be more environmentally friendly and cheaper to maintain and run, despite high initial costs. 1885-built Benz Patent-Motorwagen, the first modern car—a practical, marketable automobile for everyday use The second Marcus car of 1888 The lack of suitable fuels, particularly liquids, hampered early attempts at making and using internal combustion engines—therefore, some of the earliest engines used gas mixtures. In 1806, the Swiss engineer François Isaac de Rivaz built an engine powered by internal combustion of a hydrogen and oxygen mixture.[7] In 1826, Englishman Samuel Brown tested his hydrogen-fueled internal combustion engine by using it to propel a vehicle up Shooter's Hill in southeast London.[28][9] Etienne Lenoir's automobile with a hydrogen-gas-fueled one-cylinder internal combustion engine made a test drive from Paris to Joinville-le-Pont in 1860, covering some 9 km (5.6 mi) in about three hours.[29] A later version was propelled by coal gas. A Delamare-Deboutteville vehicle was patented and trialed in 1884. Nicolaus Otto and Eugen Langen had built a working engine in 1867. About 1870, in Vienna, Austria-Hungary, inventor Siegfried Marcus put a liquid-fueled internal combustion engine on a simple handcart which made him the first man to propel a vehicle using gasoline. Today, this is known as "the first Marcus car" but would be better described as a cart. His second car, built and run in 1875 according to some sources, was the first gasoline-driven car and is housed at the Vienna Technical Museum.[30][31] However, the latest research shows that it was not built until 1888/89.[32] In 1883, Marcus secured a German patent for a low-voltage ignition system of the magneto type; this was his only automotive patent. During his lifetime, he was honored by some as the originator of the motorcar, but the Nazis all but erased his place in history during World War II. Because Marcus was of Jewish descent, the Nazi propaganda office ordered his work to be destroyed, his name expunged from future textbooks, and his public memorials removed.[33] John Nixon of the London Times in 1938 considered Marcus' development of the motor car to have been experimental, as opposed to Carl Benz who took the concept from experimental to production. Nixon described Marcus' cars as impractical.[34] Benz built his first automobile, the Benz Patent Motorcar, in 1885 in Mannheim. It is considered the first modern car—a practical, marketable automobile for everyday use—and the first in series production.[35] Benz was granted a patent for his automobile on 29 January 1886,[36] and began the first production of automobiles in 1888, after Bertha Benz, his wife, had proved—with the first long-distance trip in August 1888, from Mannheim to Pforzheim and back—that the horseless coach was capable of extended travel. Since 2008, a Bertha Benz Memorial Route commemorates this event.[37] Soon after, Gottlieb Daimler and Wilhelm Maybach in Stuttgart in 1889 designed a vehicle from scratch to be an automobile, rather than a horse-drawn carriage fitted with an engine. They also are usually credited with inventing the first motorcycle in 1885.[15]:26 In 1891, John William Lambert built a three-wheeler in Ohio City, Ohio, which was destroyed in a fire the same year, while Henry Nadig constructed a four-wheeler in Allentown, Pennsylvania.[15]:25 The first four-wheeled gasoline-driven automobile in the United Kingdom was built in Walthamstow by Frederick Bremer in 1892.[38] Another was made in Birmingham in 1895 by Frederick William Lanchester, who also patented the disc brake. The first electric starter was installed on an Arnold, an adaptation of the Benz Velo, built in Kent between 1895 and 1898.[15]:25 George Foote Foss of Sherbrooke, Quebec, built a single-cylinder gasoline car in 1896, which he drove for four years, ignoring city officials' warnings of arrest for his "mad antics".[16] The Selden Road-Engine The Präsident automobile The first automobile in Japan, a French Panhard-Levassor, in 1898 Fiat 4 HP, the first car model produced by Italian manufacturer Fiat in 1899 The American George B. Selden filed for a patent on 8 May 1879. His application included the engine and its use in a four-wheeled car. Selden filed a series of amendments to his application, which stretched out the legal process, resulting in a delay of 16 years before the patent was granted on 5 November 1895.[39] Selden licensed his patent to most major American automakers, collecting a fee on each car they produced and creating the Association of Licensed Automobile Manufacturers. The Ford Motor Company fought this patent in court,[40] and eventually won on appeal. Henry Ford testified that the patent did more to hinder than encourage development of autos in the United States.[41] The first automobiles were produced by Carl Benz in 1888 in Germany and, under license from Benz, in France by Emile Roger. There were numerous others, including tricycle builders Rudolf Egg, Edward Butler, and Léon Bollée.[15]:20–23 Bollée, using a 650 cc (40 cu in) engine of his own design, enabled his driver, Jamin, to average 45 km/h (28 mph) in the 1897 Paris-Tourville race.[15]:23 By 1900, mass production of automobiles had begun in France and the United States. The first company formed exclusively to build automobiles was Panhard et Levassor in France, which is also credited for introducing the first four-cylinder engine.[15]:22 Formed in 1889, Panhard was followed by Peugeot two years later. By the start of the 20th century, the automobile industry began taking off in Western Europe, especially in France, where 30,204 were produced in 1903, representing 48.8 percent of world automobile production that year.[42] Across the northern US, local mechanics experimented with various prototypes. In Iowa, for example, by 1890, Jesse O. Wells drove a steam-powered Locomobile. There were numerous experiments in electric vehicles driven by storage batteries. The first users ordered the early gasoline-powered cars, including Haynes, Mason, and Duesenberg automobiles. Blacksmiths and mechanics started operating repair and gasoline stations.[43] In Springfield, Massachusetts, brothers Charles and Frank Duryea founded the Duryea Motor Wagon Company in 1893, becoming the first American automobile manufacturing company. The Autocar Company, founded in 1897, established many innovations still in use[44] and remains the oldest operating motor vehicle manufacturer in the US. However, it was Ransom E. Olds and his Olds Motor Vehicle Company (later known as Oldsmobile) who would dominate this era with the introduction of the Oldsmobile Curved Dash. Its production line was running in 1901. The Thomas B. Jeffery Company developed the world's second mass-produced automobile, and 1,500 Ramblers were built and sold in its first year, representing one-sixth of all existing motorcars in the US at the time.[45] Within a year, Cadillac (formed from the Henry Ford Company), Winton, and Ford were also producing cars in the thousands. In South Bend, Indiana, the Studebaker brothers, having become the world's leading manufacturers of horse-drawn vehicles, made a transition to electric automobiles in 1902, and gasoline engines in 1904. They continued to build horse-drawn vehicles until 1919.[46] The first motor car in Central Europe was produced by the Austro-Hungarian company Nesselsdorfer Wagenbau (later renamed to Tatra in today's Czech Republic) in 1897, the Präsident automobile.[47] In 1898, Louis Renault had a De Dion-Bouton modified, with fixed drive shaft and differential, making "perhaps the first hot rod in history" and bringing Renault and his brothers into the car industry.[48] Innovation was rapid and rampant, with no clear standards for basic vehicle architectures, body styles, construction materials, or controls; for example, many veteran cars use a tiller, rather than a wheel for steering. During 1903, Rambler standardized on the steering wheel[49] and moved the driver's position to the left-hand side of the vehicle.[50] Chain drive was dominant over the drive shaft, and closed bodies were scarce. Drum brakes were introduced by Renault in 1902.[51]:62 The next year, Dutch designer Jacobus Spijker built the first four-wheel drive racing car;[52]:77 it never competed. It would be 1965 and the Jensen FF before four-wheel drive was used on a production car.[52]:78 On 22 July 1894 Paris–Rouen motor race, which is sometimes described as the world's first competitive motor race, took place. Within a few years, hundreds of producers across the Western world were using many technologies. Steam, electricity, and gasoline-powered automobiles competed for decades, with gasoline internal combustion engines achieving dominance by the 1910s. Dual- and even quad-engine cars were designed, and engine displacement ranged to more than 12 L (730 cu in). Many modern advances, including gas/electric hybrids, multi-valve engines, overhead camshafts, and four-wheel drive, were attempted and discarded at this time. Innovation was not limited to the vehicles themselves. Increasing numbers of cars propelled the growth of the petroleum industry,[51]:60–61 as well as the development of technology to produce gasoline (replacing kerosene and coal oil) and of improvements in heat-tolerant mineral oil lubricants (replacing vegetable and animal oils).[51]:60 There were social effects, also. Music would be made about cars, such as "In My Merry Oldsmobile" (a tradition that continues in several genres). At the same time, in 1896, William Jennings Bryan would be the first presidential candidate to campaign in a car (a donated Mueller), in Decatur, Illinois.[53]:92 Three years later, Jacob German would start a tradition for New York City cabdrivers when he sped down Lexington Avenue, at the "reckless" speed of 19 km/h (12 mph).[53]:92 Also in 1899, Akron, Ohio, adopted the first self-propelled paddy wagon.[53]:92 By 1900, the early centers of national automotive industry developed in many countries, including Belgium (home to Vincke, that copied Benz; Germain, a pseudo-Panhard; and Linon and Nagant, both based on the Gobron-Brillié),[15]:25 Switzerland (led by Fritz Henriod, Rudolf Egg, Saurer, Johann Weber, and Lorenz Popp),[15]:25 Vagnfabrik AB in Sweden, Hammel (by A. F. Hammel and H. U. Johansen at Copenhagen, in Denmark, which only built one car, ca. 1886[15]:25), Irgens (starting in Bergen, Norway, in 1883, but without success),[15]:25–26 Italy (where FIAT started in 1899), and as far afield as Australia (where Pioneer set up shop in 1898, with an already archaic paraffin-fueled center-pivot-steered wagon).[15] Meanwhile, the export trade had begun, with Koch exporting cars and trucks from Paris to Tunisia, Egypt, Iran, and the Dutch East Indies.[15]:25 Motor cars were also exported to British colonies. For example, the first was shipped to India in 1897. Throughout the veteran car era, the automobile was seen more as a novelty than a genuinely useful device. Breakdowns were frequent, fuel was difficult to obtain, roads suitable for traveling were scarce, and rapid innovation meant that a year-old car was nearly worthless. Significant breakthroughs in proving the usefulness of the automobile came with the historic long-distance drive of Bertha Benz in 1888, when she traveled more than 80 km (50 mi) from Mannheim to Pforzheim, to make people aware of the potential of the vehicles her husband, Karl Benz, manufactured, and after Horatio Nelson Jackson's successful transcontinental drive across the US in 1903 on a Winton car. Main article: Brass Era car See also: Antique car A Stanley Steamer racecar in 1903. In 1906, a similar Stanley Rocket set the world land speed record at 205.5 km/h (127.7 mph) at Daytona Beach Road Course. Model-T Ford car parked near the Geelong Art Gallery at its launch in Australia in 1915 The Brass or Edwardian period lasted from roughly 1905 through 1914 and the beginning of World War I. It is generally referred to as the Edwardian era, but in the United States, it is often known as the Brass era from the widespread use of brass in vehicles during this time. Within the 15 years that make up this era, the various experimental designs and alternate power systems would be marginalized. Although the modern touring car had been invented earlier, it was not until Panhard et Levassor's Système Panhard was widely licensed and adopted that recognizable and standardized automobiles were created. This system specified front-engine, rear-wheel drive internal combustion-engine cars with a sliding gear transmission. Traditional coach-style vehicles were rapidly abandoned, and buckboard runabouts lost favor with the introduction of tonneaus and other less-expensive touring bodies. By 1906, steam car development had advanced, and they were among the fastest road vehicles in that period.[citation needed] Throughout this era, the development of automotive technology was rapid, partly due to hundreds of small manufacturers competing to gain the world's attention. Key developments included the electric ignition system, independent suspension, and four-wheel brakes.[15]:27[51]:61 Leaf springs were widely used for suspension, though many other systems were still in use, with angle steel taking over from armored wood as the frame material of choice. Transmissions and throttle controls were widely adopted, allowing a variety of cruising speeds. However, vehicles generally still had discrete speed settings, rather than the infinitely variable system familiar in cars of later eras. Safety glass also debuted and was patented by John Crewe Wood in England in 1905.[51]:62 (It would not become standard equipment until 1926, on a Rickenbacker.)[51]:62 Between 1907 and 1912 in the United States, the high-wheel motor buggy (resembling the horse buggy of before 1900) was in its heyday, with over 75 makers including Holsman (Chicago), IHC (Chicago), and Sears (which sold via catalog); the high-wheeler would be killed by the Model T.[15]:65 In 1912, Hupp (in the US, supplied by Hale & Irwin) and BSA (in the UK) pioneered the use of all-steel bodies,[51]:63 joined in 1914 by Dodge (who produced Model T bodies).[51]:62 While it would be another two decades before all-steel bodies would be standard, the change would mean improved supplies of superior-quality wood for furniture makers.[15] The 1908 New York to Paris Race was the world's first circumnavigation by automobile. German, French, Italian, and American teams began in New York City on 12 February 1908, with three competitors ultimately reaching Paris. The US-built Thomas Flyer with George Schuster (driver) won the race covering 35,000 km (22,000 mi) in 169 days. Also in 1908, the first South American automobile was built in Peru, the Grieve.[54] In 1909, Rambler became the first car company to equip its cars with a spare tire that was mounted on a fifth wheel.[55] Some examples of cars of the period included:[citation needed] 1907 Takuri—the first entirely Japanese-made gasoline engine car produced by Komanosuke Uchiyama in April 1907. Also, in Japan, the Hatsudoki Seizo Co. Ltd. is formed, which was later renamed in 1951 as Daihatsu Kōgyō Kabushiki-gaisha. 1908–1927 Ford Model T—the era's most widely produced and available four-seater car. It used a planetary transmission and had a pedal-based control system. Ford T was proclaimed the most influential car of the 20th century in the international Car of the Century awards. 1909 Hudson Model 20—named after its rated power output and sold on its first market for US$900 (equivalent to $31,497 in 2024). 1909 Morgan Runabout—a popular cyclecar, cyclecars were sold in greater quantities than four-seater cars in this period.[56] 1910 Mercer Raceabout—regarded as one of the first sports cars, the Raceabout expressed the exuberance of the driving public, as did the similarly conceived American Underslung and Hispano-Suiza Alphonso. 1910–1920 Bugatti Type 13—a notable racing and touring model with advanced engineering and design. Similar models were Types 15, 17, 22, and 23. 1914–1917 Dattogo—a two-cylinder, 10 hp (7,500 W) "all-Japanese" car manufactured in seven units by the Kaishinsha Motor Works operated by Masujiro Hashimoto in Tokyo, while importing, assembling, and selling British cars. Kaishinsha was the first automobile manufacturing business in Japan. 1917 Mitsubishi Model A—an all hand-built car built by Japanese company Mitsubishi in limited numbers for Japanese executives. Main article: Vintage car See also: Antique car and Cars in the 1920s 1926 Bugatti Type 35 1929 Austin Seven 1929 Alfa Romeo 6C The vintage era lasted from the end of World War I (1918) until the Wall Street crash at the end of 1929. During this period, the front-engine car layout dominated, with closed bodies and standardized controls becoming the norm. In 1919, 90 percent of cars sold were open; by 1929, 90 percent were closed.[15]:7 Development of the internal combustion engine continued at a rapid pace, with multivalve and overhead camshaft engines produced at the high end, and V8, V12, and even V16 engines conceived for the ultrarich. Also in 1919, hydraulic brakes were invented by Malcolm Loughead (cofounder of Lockheed); they were adopted by Duesenberg for their 1921 Model A.[51]:62 Three years later, Hermann Rieseler of Vulcan Motor invented the first automatic transmission, which had two-speed planetary gearbox, torque converter, and lockup clutch; it never entered production.[51]:62 (It would only become an available option in 1940.)[51]:62 Just at the end of the vintage era, tempered glass (now standard equipment in side windows) was invented in France.[51]:62 In this era, the pontoon design of cars without fully articulated fenders, running boards, and other non-compact ledge elements were introduced in small series. Still, mass production of cars with these features began after World War II. American auto companies in the 1920s expected they would soon sell six million cars a year but did not do so until 1955. Numerous companies disappeared.[57] Between 1922 and 1925, the number of US passenger car builders decreased from 175 to 70. H. A. Tarantous, managing editor of "MoToR Member Society of Automotive Engineers", in a New York Times article from 1925, suggested many were unable to raise production and cope with falling prices (due to assembly line production), especially for low-priced cars. The new pyroxylin-based paints, eight-cylinder engines, four-wheel brakes, and balloon tires were the biggest trends for 1925.[58] Examples of period vehicles:[citation needed] 1922–1939 Austin 7—a widely copied vehicle serving as a template for many cars such as BMW and Nissan. 1922–1931 Lancia Lambda—an advanced car for the time, was the first to feature a load-bearing monocoque and independent front suspension.[citation needed] 1924–1929 Bugatti Type 35—one of the most successful racing cars with over 1,000 victories in five years.[citation needed] 1925–1928 Hanomag 2/10 PS—early example of pontoon styling. 1927–1931 Ford Model A (1927–1931)—after keeping the brass-era Model T in production for too long, Ford broke from the past by restarting its model series with the 1927 Model A. More than four million were produced, making it the bestselling model of the era. The Ford Model A was a prototype for beginning Soviet mass car production (GAZ A). 1930 Cadillac V-16—developed at the height of the vintage era, the V16-powered Cadillac would join Bugatti's Royale as a legendary ultraluxury car of the era. Isotta Fraschini Tipo 8A Rolls-Royce Phantom III Volkswagen Beetle The pre-war part of the classic era began with the Great Depression in 1930, and ended with the recovery after World War II, commonly placed during 1946. It was in this period that integrated fenders and fully closed bodies began to dominate sales, with the new saloon/sedan body style even incorporating a trunk or boot at the rear for storage. The old open-top runabouts, phaetons, and touring cars were largely phased out by the end of the classic era as wings, running boards, and headlights were gradually integrated with the body of the car. By the 1930s, many of the mechanical technologies used in today's automobiles had been invented,[citation needed] although some ideas were later "re-invented" and credited to others. For example, front-wheel drive was re-introduced by André Citroën with the launch of the Traction Avant in 1934. However, cars with front-wheel drive were made several years earlier in road cars produced by Alvis and Cord as well as in racing cars by Miller (and may have appeared as early as 1897). In the same vein, the independent suspension was initially developed by Amédée Bollée in 1873, but not put in production until the low-volume Mercedes-Benz 380 in 1933, and later by other automakers using the design.[51]:61 In 1930, the number of auto manufacturers declined sharply as the industry consolidated and matured, thanks in part to the effects of the Great Depression. Examples of pre-war automobiles:[citation needed] 1932–1948 Ford V-8 (Model B)—introduction of the flathead V8 in mainstream vehicles 1934–1938 Tatra 77—early example of a car design that prioritized aerodynamics 1934–1940 Bugatti Type 57—a refined automobile for the wealthy 1934–1956 Citroën Traction Avant—first mass-produced front-wheel drive car, built with monocoque chassis 1936–1955 MG T series—sports cars 1938–2003 Volkswagen Beetle—a design that was produced for over 60 years with over 20 million units assembled in several countries 1936–1939 Rolls-Royce Phantom III—V12 engine 1946 GAZ-M20 Pobeda, one of the first mass-produced cars with a pontoon design 1955 Chevrolet Bel Air convertible 1959 Morris Mini-Minor 1974 Citroën DS 1982 Toyota Camry 1987 Renault Espace A significant change in automobile design since World War II was the popularity of pontoon style, in which running boards were eliminated and fenders were incorporated into the body. This style had been explored on a small handful of cars before the war, but entered the mainstream in the postwar era. Among the first postwar representatives of the style were the Soviet GAZ-M20 Pobeda (1946), British Standard Vanguard (1947), US Studebaker Champion, and Kaiser (1946), as well as the Czech Tatra T600 Tatraplan (1946) and the Italian Cisitalia 202 sports car (1947). Automobile design and production finally emerged from the military orientation and the shadow of war in 1949, the year high-compression V8 engines and modern bodies from General Motors's Oldsmobile and Cadillac brands were introduced. Hudson presented the "step-down" design with the 1948 Commodore, which placed the passenger compartment down inside the perimeter of the frame, that was one of the first new-design postwar cars made, and it featured trend-setting slab-side styling.[59] The unibody/strut-suspended 1951 Ford Consul joined the 1948 Morris Minor and 1949 Rover P4 in the automobile market in the UK. In Italy, Enzo Ferrari was beginning his 250 series, just as Lancia introduced the revolutionary V6-powered Aurelia. Throughout the 1950s, engine power and vehicle speeds rose, designs became more integrated and artful, and automobiles were marketed internationally. Alec Issigonis's Mini and Fiat's 500 diminutive cars were introduced in Europe, while the similar kei car class became popular in Japan. The Volkswagen Beetle continued production after World War II and began exports to other nations, including the US. At the same time, Nash introduced the Nash Rambler, the first successful modern compact car made in the US,[60] while the standard models produced by the "Big Three" domestic automakers grew larger, featuring increasing amounts of chrome trim, and luxury as exemplified by the Cadillac Eldorado Brougham. The markets in Europe expanded with new small-sized automobiles, as well as expensive grand tourers (GT), like the Ferrari America. The market changed in the 1960s, as the US "Big Three" automakers began facing competition from imported cars, European makers adopted advanced technologies, and Japan emerged as a car-producing nation. Japanese companies began to export some of their more popular cars in Japan internationally, such as the Toyota Corolla, Toyota Corona, Nissan Sunny, and Nissan Bluebird in the mid-1960s. The success of American Motors's compact-sized Rambler models spurred GM and Ford to introduce their own downsized cars in 1960.[61] Performance engines became a focus of marketing by US automakers, exemplified by the era's muscle cars.[62] In 1964, the Ford Mustang developed a new market segment, the pony car.[63] New models to compete with the Mustang included the Chevrolet Camaro, AMC Javelin, and Plymouth Barracuda.[64] Captive imports and badge engineering increased in the US and the UK as amalgamated groups such as the British Motor Corporation consolidated the market. BMC's space-saving and trend-setting transverse engine, front-wheel-drive, independent suspension and monocoque bodied Mini, which first appeared in 1959, was marketed under the Austin and Morris names, until Mini became a marque in its own right in 1969.[65] Competition increased, with Studebaker, a pioneering automaker, shutting down. The trend for consolidation reached Italy, where niche makers like Maserati, Ferrari, and Lancia were acquired by larger companies. By the decade's end, the number of automobile marques had been greatly reduced. Technology developments included the widespread use of independent suspensions, wider application of fuel injection, and an increasing focus on safety in automotive design. Innovations during the 1960s included NSU's Wankel engine, the gas turbine, and the turbocharger. Of these, only the last endured, pioneered by General Motors, and adopted by BMW and Saab, later seeing mass-market use during the 1980s by Chrysler. Mazda continued developing its Wankel engine despite problems in longevity, emissions, and fuel economy. Other Wankel licensees, including Mercedes-Benz and GM, never produced their designs because of engineering and manufacturing problems and the need for greater fuel economy after the 1973 oil crisis. The 1970s were turbulent years for automakers and buyers, with prominent events reshaping the industry, such as the 1973 oil crisis, stricter automobile emissions control and safety requirements, increasing exports by the Japanese and European automakers, as well as growth in inflation and the stagnant economic conditions in many nations. Smaller-sized cars grew in popularity. During the Malaise era, the US saw the establishment of the subcompact segment with the introduction of the AMC Gremlin, followed by the Chevrolet Vega and Ford Pinto.[66][67] The station wagon (estate, break, kombi, universal) body design was popular, as well as increasing sales of noncommercial all-wheel drive off-road vehicles. Toward the end of the 20th century, the US Big Three (GM, Ford, and Chrysler) partially lost their leading position. Japan became a leader in car production for a time, and cars began to be mass manufactured in new Asian, East European, and other countries. Examples of postwar cars: 1946–1958 GAZ-M20 Pobeda—Soviet car with full pontoon design 1947–1958 Standard Vanguard—British mass-market car with a complete pontoon design 1948–1971 Morris Minor—an early postwar car exported around the world 1953–1971 Chevrolet Bel Air and 1953–2002 Cadillac Eldorado Brougham—first generations were representative of tailfin design 1955–1976 Citroën DS—aerodynamic design and innovative technology, awarded third place as Car of the 20th Century 1959–2000 Mini—a radical and innovative small car that was manufactured for four decades; awarded second place as Car of the 20th Century 1960-1990 Volkswagen Brasília 1961–1975 Jaguar E-Type—a classic sports car design 1963–1989 Porsche 911—a sports car was awarded fifth place as Car of the 20th Century 1964–present Ford Mustang—the pony car that became one of the bestselling cars of the era 1966–end of the 20th century Fiat 124—an Italian car that was produced under license in many other countries including the Soviet Union 1966–1971 Subaru 1000—one of the first Japanese built sedans using a boxer engine, front wheel drive and introducing the "double offset joint" driveshaft to the front wheels 1967 NSU Ro 80—the basic wedge profile of this design was emulated in subsequent decades,[68] unlike its Wankel engine 1969 Nissan S30—Japanese sports car[69] 1966–1992 Oldsmobile Toronado—First modern-era American car with front-wheel drive as well as introduced electronic antilock braking system and airbag.[70][71] 1972–present Mercedes-Benz S-Class—Popular luxury sedan that was the first car with features such as seat belt pretensioners and an electronic stability control system 1975–present BMW 3 Series—the 3 Series has been on Car and Driver magazine's annual Ten Best list 17 times 1977–present Honda Accord saloon/sedan—a Japanese sedan that became popular in the US 1983–present Chrysler minivans—the two-box minivan design nearly pushed the station wagon out of the market 1984–present Renault Espace—first mass one-volume car of noncommercial MPV class This section needs additional citations for verification. Please help improve this article by adding citations to reliable sources in this section. Unsourced material may be challenged and removed. (June 2014) (Learn how and when to remove this message) The Toyota Corolla is the world's bestselling nameplate. A Tesla Model Y electric car, the world's best-selling electric car, and the best selling nameplate in 2023. The modern era is normally defined as the 40 years preceding the current year.[72] The modern era has been one of increasing standardization, platform sharing, and computer-aided design—to reduce costs and development time—and of increasing use of electronics for both engine management and entertainment systems.[citation needed] Some developments which began to see mass adoption in the 1970s and 1980s and continued into the modern era are the proliferation of front- and all-wheel drive, the ubiquity of fuel injection, and the rise of turbocharging. Adoption of diesel engines in passenger cars continued to rise in Europe until the mid 2010s, when both diesel and gasoline engines began to lose market share to electric cars.[73] In other markets, such as The US and Japan, diesel passenger car adoption remained stagnant or fell in this same period.[74] Most modern passenger cars are front-wheel-drive monocoque or unibody designs with transversely mounted engines.[citation needed] Body styles have changed as well in the modern era. The 1980s onwards saw the rise of the hatchback, sport utility vehicle, crossover SUV, minivan and MPV into mainstream popularity.[citation needed] The introduction of the MPV class (smaller noncommercial passenger minivans), started in the mid 1980s, among the first of which were the French Renault Espace and the Chrysler minivan versions in the US.[citation needed] Pickup trucks have also grown in popularity, particularly in the US, and particularly as passenger cars rather than as strictly work vehicles as they were typically used in previous eras. The rising popularity of SUVs and crossovers worldwide, starting in the 1990s, has changed the face of motoring and has been blamed for the decline in sales of other body styles such as sedans, station wagons, minivans and MPVs.[75][76][77][78] The modern era has also rapidly improved fuel efficiency and engine output. Emissions of modern cars have been reduced through the use of computerized engine management systems, use of smaller engines with turbochargers, hybrid systems, more aerodynamic designs, and other technologies.[citation needed] The 2008 financial crisis cut almost a third of light vehicle sales from Chrysler, Toyota, Ford, and Nissan. It also subtracted about a fourth of Honda's sales and a seventh of sales from General Motors.[79] Since 2009, China has become the world's largest car manufacturer, producing more than Japan, the US, and Europe. Besides the increasing car production in Asia and other countries, there has been growth in transnational corporate groups, with the production of transnational automobiles sharing the same platforms and badge engineering or rebadging to suit different markets and consumer segments.[citation needed] During the 2010s, electric cars began to become available for the average consumer, and became increasingly popular in the 2020s. Some countries such as Norway and Iceland quickly replaced gasoline cars with EVs, and the charging networks in much of Europe, North America, and China rapidly expanded.[citation needed] Examples of modern cars:[citation needed] 1986–2019 Ford Taurus—a midsized front-wheel drive sedan that dominated the US market in the late 1980s 1997–present Toyota Prius—launched in the Japanese market and became a popular hybrid electric vehicle in many markets.[80] 1998–present Ford Focus—a popular hatchback and Ford's bestselling world car 2008–2012 Tesla Roadster—first highway-capable all-electric vehicle in serial production for sale in the US in the modern era. It sold about 2,500 units worldwide. 2008–2013 BYD F3DM—first highway-capable series production plugin hybrid, launched in China in December 2008, sold over 2,300 units.[81][82] 2010–present, Nissan Leaf and Chevrolet Volt—all-electric car and plugin hybrid correspondingly, launched in December 2010, were the world's top-selling mass production vehicles of their kind.[83] As of December 2015[update], global Volt sales totaled over 100,000.[84] Nissan Leaf global sales achieved the 300,000 unit milestone in January 2018, which made the Leaf the world's all-time bestselling highway-capable electric car in history at the time.[85] 2012–present, Tesla Model S—Plugin electric vehicle that was ranked the world's bestselling plugin electric vehicle in 2015.[86] It was also named car of the century by Car and Driver.[87] 2020-present Tesla Model Y—Plugin electric vehicle that was ranked the bestselling car worldwide in 2023, and, as of May 2025, is the best selling plugin electric vehicle of all time. [88][89] [90] Cars portal Automotive industry – current production and companies History of the internal combustion engine History of transport Motorcycle List of motorcycles of the 1890s Timeline of motor vehicle brands Timeline of early North American automobiles Beginnings Benz Patent Motorwagen ("patent motorcar"; 1885), a three-wheel vehicle widely regarded as the world's first production automobile Benz Velo (1894), follow-up 4-wheel model of the Benz Patent Motorwagen Early developments essential to the development of automobiles Nicolas Léonard Sadi Carnot, physics of the internal combustion engine Illuminating gas, first internal combustion engine fuel Ligroin or heavy naphtha, first liquid automotive fuel, n-hexane Car and car engine designers, chronologically by first vehicle/engine built Nicolaus Otto, developer of the first successful compressed charge gaseous fueled internal combustion engine (1860s-70s) Wilhelm Maybach, designed engines starting in the 1870s-80s; the first motorbike (1885), the second internal combustion car (1889) Gottlieb Daimler, German engineer, pioneer of internal-combustion engines and automobile development (1870s and on)

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History of the automobile on About.com:Inventors site History of Automobile Air Conditioning on NYC.net Automotive History – An ongoing photographic history of the automobile. Taking the Wheel, Manufacturers' catalogs from the first decade of American automobiles Automobiles (1915). James Slough Zerbe, New York: Cupples & Leon company. Retrieved from " Biography: Karl Benz was a German engine designer and engineer, regarded as the inventor of the first automobile powered by an internal combustion engine. While contemporaries of Benz, Gottlieb Daimler and Wilhelm Maybach were working on similar engines at the same time, it was Benz who received a patent for his work first. Subsequently Benz would go on to patent all the processes necessary to make the internal combustion engine feasible for use in an automobile. Benz along with his wife Bertha went on to found the Mercedes-Benz company to commercialize this technology. It is now one of the world's leading luxury car brands. In the mid-1880s, a man called Karl Benz changed the world forever when he created his first prototype of a three-wheeled gasoline-powered motor carriage. This motor carriage was of course the Benz Patent-Motorwagen, widely considered to be the first car ever made.In this article we are going to be covering the complete history and specifications of the Benz Patent-Motorwagen. We have also included information on other attempts to make the first automobile.The History of the Benz-Patent Motorwagen The history of the first automobile starts with the man behind it, Karl Friedrich Benz. He was born on 25 November 1844 in Mühlburg and he originally took an interest in locksmithing. However, Benz eventually followed in his father’s footsteps and turned towards studying locomotive engineering.Benz graduated from the Karlsruhe Polytechnikum (University of Karlsruhe) in 1864, and soon after began his engineering career in Mannheim designing scales for Karl Schenck. The work at Schenck wasn’t exactly engaging for the bright and inventive Benz, and he decided to move to Pforzheim to build bridges for the firm of Benckiser BrothersBertha BenzDuring his period at Benckiser, Benz met his future wife, Cäcilie Bertha Ringer. At the time, both Benz and Bertha had no idea that she would play a major role in his future inventions and the future of the automotive industry.Following their engagement, Benz teamed up with August Ritter to launch a new machine shop in Mannheim. Unfortunately, the first year of business went very badly for Benz. Ritter proved to be unreliable and the business’s tools were impounded.This prompted Bertha to borrow against her dowry so Benz could buy out Ritter’s stake in the business. Following this, the business was given the name Eisengiesserei und mechanische Werkstätte (Iron Foundry and Mechanical Workshop).Troubles continued throughout the 1870s, however, a project that Benz started in the latter part of the decade would change their lives forever. This project was of course Benz’s first two-stroke engine. After many disappointments and failures, the engine was finally finished in December 1879 and he was granted a patent for it on 28 June 1880.Karl Benz two stroke engineBenz stated, “The more it hums, the more it enchants the pressing worries away from my heart,”. The two-stroke design had been his only choice, as he had been prevented from producing a four-stroke engine due to a patent granted to Nikolaus August Otto in 1877.Around 1881, Benz took on new partners to help finance his company, Emil Bühler, a successful local photographer and Emil’s brother. Benz was responsible for producing his stationary engines, while Emil looked after the sales and marketing side of the business. Unfortunately, Emil hired a salesman by the name of Otto Schmuck, who wound up spending more money than he raised.The small company then had to hastily apply for a loan from banks in Mannheim. The first requirement of the loan was that Benz had to form a corporation. Thus in October 1882, Gasmotoren Fabrik Mannheim was created with a nine-member board of directors.While things did improve for the company, Benz was unhappy. He clashed with all of the investors over a number of different designs, with the most notable being his plans for a small engine to power a motor driven carriage. When he revealed his plans for the motor carriage, some of the investors even questioned his sanity!In 1883, Benz decided to resign from the company. He wrote, “During those days when disaster struck on the sea of life, only one person was waiting by my side. That was my wife. Fearless and courageous, she hoisted up new sails of hope.”The Benz-Patent MotorwagenBenz’s fortunes changed when his lifelong hobby of cycling brought him to a bicycle repair shop in Mannheim, where he met Max Kaspar Rose and Friedrich Wilhelm Eßlinger. The three decided to work together and they formed a new company known as Benz & Companie Rheinische Gasmotoren-Fabrik (Commonly referred to as Benz & Cie).The new company grew quickly with its primary trade being the production and sales of Benz’s stationary engine. With strong income, Benz could work on some of his old passions and projects, with the main one being a horseless carriage design.However, he had one small problem. His current range of engines were too big and heavy for the self-powered carriage design. A solution to this problem was provided by a local fire in Mannheim. The fire had started when a bowl of benzene that was used to clean work gloves was ignited by a spark.Benz believed that the highly volatile fluid could be used to power an engine, as long as its explosion could be controlled. He decided to put his mind to the problem and soon came up with the trembler coil system. This advanced new coil system used a spark plug, which he designed himself.Unbeknownst to Benz, others were working on a similar project. Daimler and Maybach had come to the same conclusions as the inventor and they were working on building a motor carriage as well. Interestingly, neither of them new of the other’s existence.Benz gave a great deal of thought to the layout of the self-powered wagon. He considered both four and three-wheeled designs, and ultimately decided to go with a tricycle configuration as it was lighter and overall more manoeuvrable.Steering was carried out by a toothed rack that pivoted the unsprung front wheel. Fully elliptic springs were used at the back along with a beam axle and chain drive on both sides.Instead of manufacturing the wheels from wood like on most carriages of the time, Benz decided it would be better to use steel spoked wheels with solid rubber tyres that were inspired by those on bicycles.A four-stroke 954 cc single cylinder engine was placed horizontally at the rear of the three-wheeler with an enormous flywheel just underneath it. The engine produced just 2/3 of a horsepower (500 watts) at 250 rpm, however, later tests by the University of Mannheim showed it to be capable of 0.9 horsepower (670 watts) at 400 rpm.The Motorwagen also featured a simple belt drive system that acted as a single-speed transmission and evaporative cooling was used rather than a radiator. Body panels were manufactured from wood, while the frame was crafted out of steel tubing.The initial trial of the Motorwagen was in the autumn (fall), however, things didn’t exactly go according to plan. On the initial start the Motorwagen stalled and then when it was restarted the drive chain snapped.Undeterred, Benz made several improvements to his creation and he was ready for another test a couple of weeks later. This time he had Bertha by his side and the engine was started by one of his assistants.After engaging the chain drive, Benz proceeded to drive the Motorwagen straight into the brick wall of his workshop, making this not only the first but also the shortest road test in history.For his next tests, Benz found a bit more space. At this point he still had not created a fuel tank for his Motorwagen. To solve this problem, he enlisted the help of his son Eugene who ran alongside the Motorwagen with a can of fuel during the tests.With the initial tests out of the way, Benz applied for a patent for his Motorwagen, which he received on 29 January 1886 (Patent DRP-37435: “automobile fuelled by gas”). Benz was granted the patent as his design was regarded as the first automobile entirely designed in a way to produce its own power.While the patent for his Motorwagen was approved, Benz was still hesitant to begin production of his invention. His testing had been limited to the road and area surrounding his workshop, and he was unsure how the Motorwagen would deal with longer distance trips. The answer to this question was not answered by Karl Benz himself, but his wife Bertha.Bertha Benz’s Historic Long-Distance DriveIn August 1888 Bertha decided that it would be a good idea to “test drive” the second Motorwagen prototype on a long-distance journey from Mannheim to her hometown of Pforzheim, a distance of more than 80 km (50 miles).Bertha took her two sons, Eugene and Richard with her and she left a note for her husband informing him of her plans. The three left at dawn passing through Heidelberg and Wiesloch before arriving at their destination. When Bertha and her sons arrived, her farther was extremely happy. She wrote, “Father was so happy, we had finally achieved our goal,”.The trip was a mostly uneventful affair apart from the fact that nobody had seen a motor-powered carriage before, which meant that large crowds formed wherever they went. The also made a quick stop at Heidelberg for lunch and then at Wiesloch to fill the radiator and purchase some fuel (benzene). This would make the Weisloch pharmacy the first filling station in the world, a fact that they still pride themselves on today.While the whole trip went surprisingly smoothly, Bertha did encounter a couple of problems with the Motorwagen along the way. The first problem was a clogged fuel line, which she tackled with her hairpin. The ignition wire then short-circuited, so she had to make an insulator out of one of her garters. The third and final problem was the brake block, which she had fitted with a new piece of leather in Bauschlott.Bertha and her two sons arrived in Pforzheim just as the sun was setting. In doing so, they had completed the very first long-distance trip in a motor car. The trip not only proved to Karl Benz that his invention was usable, but also to his sceptics and those who believed that the automobile had no future.Without Bertha and her sons daring drive, Messrs. Benz & Cie (what the company would later become known as) would not have grown into the largest automobile manufacturer of the time. The drive changed the way the world viewed automobiles and it is arguable one of the most important historical moments in the history of the car.Following Bertha’s historic drive, Benz produced a third improved version of the Motorwagen. As per his wife’s suggestion, he added a low gear for hills as during their journey they had to push the automobile up every steep incline.This new model also came with a slightly more powerful 2 hp (1.5kW) engine that could reach a maximum speed of 16 km/h (10 mph). In comparison, the Model 2 Motorwagen had a 1.5 hp (1.1 kW) engine.By the end of 1888, Benz’s third generation Motorwagen was ready and on the road. However, competition from the traditional horse and buggy proved to be higher than Benz expected.Part of the problem with the Motorwagen was that it needed fuel. The benzene fuel for the car was not readily available in most places and at this point fuel stations had not yet been conceived. Horses on the other hand required hay and other forms of food/water, which were plentiful.To try and ramp up sales, Benz displayed the Model 3 Patent Motorwagen at the Munich Engineering Exposition in 1888. He offered test drives to anyone interested in the car. This strategy caught the attention of the press. One newspaper wrote, “Seldom, if ever, have passersby in the streets of our city seen a more starting sight.”Another publication stated “…without any sign of steam or other visible means of propulsion, human or otherwise, the vehicle proceeded on its way without difficulty…It was followed by a great crowd of breathless pedestrians.”Karl Benz was given a gold medal for his Motorwagen at the exposition, however, the recognition did not translate into sales. One year later, Benz’s first sales agent, French importer Emile Roger, displayed the Motorwagen at the Paris version of the Exposition. Despite this, sales continued to be little more than a trickle.By 1892 things were starting to look up for Benz. He had sold almost a dozen Motorwagens and several more were on order. The models produced from 1886 to 1889 were powered by a single-cylinder engine with capacities ranging from 1045 cc to 1990 cc. With an increase in displacement came an increase in power, with later models producing as much as 3 hp at 500 rpm.In 1893 Karl Benz developed and patented the double-pivot steering system. This was a massive leap forward for the inventor and solved one of the automobile’s most serious issues. The steering system was first used on the 3 horsepower, four-wheeled Victoria that was introduced in 1893. The model was a big hit when it launched with 85 units being sold in 1893 alone.Another model known as the Velo was introduced for the next year and it became known as the world’s first true production car. Benz’s company produced around 1,200 units of the Velo during its production run and it would be entered in the world’s first automobile race, the 1894 Paris to Rouen.Benz & Cie would go on to become the biggest automobile manufacturer in the world. By 1889 they were producing over 572 cars and had as many as 430 staff. Tough times came during the 1920s when rapid inflation hit the German economy hard.The company had to merge with Daimler Motoren Gesellschaft (DMG), becoming known as Daimler Benz. Follow this, the first Mercedes-Benz brand name vehicle was produced, and the rest is history as they say.Karl Benz’s Main CompetitorsBenz’s main competitor in Germany was Daimler Motoren Gesellschaft (DMG). Founded by Gottlieb Daimler and Wilhelm Maybach, it was first based in Cannstatt and then later in Stuttgart-Untertürkheim, and then finally in Berlin (although other factories were scattered around Germany).DMG was developing their own version of the automobile around the same time as Benz. However, while they would beat Karl Benz in creating the world’s first four-stroke engine, they would not sell a vehicle until August 1892.In 1890, Émile Levassor and Armand Peugeot of France began producing vehicles with Daimler engines. This would make them one of the first companies/groups to produce a vehicle.One year after the launch of their first car Auguste Doriot and his Peugeot colleague Louis Rigoulot completed the longest trip by a gasoline-powered vehicle when their self-designed and built Daimler powered Peugeot Type 3 completed 2,100 km (1,300 miles) from Valentigney to Paris and Brest and back again.While the first automobile design in the United States would be created in 1877 by George Seldon, it would take until 1893 for the first running car to be produced. The first public run of the Duryea Motor Wagon took place on 21 September 1893, on Taylor Street in Metro Center Springfield.In Britain, there had been a number of attempts during the 19th century to build steam automobiles with Thomas Rickett even attempting a production run in 1860. The first gasoline-powered motor vehicle was produced in 1894 by Santler from Malvern, however, this was just a one off.The first production vehicles in Britain came from the Daimler Company, a company founded by Harry J. Lawson in 1896, after he purchased the rights to use the name of the engines.Other Attempts at Self-Powered VehiclesBelow you can find some of the other self-powered vehicle attempts that came before the Benz Patent-Motorwagen.Ferdinand Verbiest’s Steam-Powered Vehicle (1672)The first recorded steam-powered vehicle was designed and possibly built by Ferdinand Verbiest, a Flemish member of a Jesuit mission in China around 1672. It was created as a toy for the Chinese Emperor at the time and was just 65 cm in length. Due to its small size it was not intended to carry a driver or passengers. It is not known if the model was successfully built or run.Nicholas-Joseph Cugnot’s Steam Powered Tricycle (1769)This steam-powered tricycle was built in about 1769 and is widely regarded as the first full-scale, self-propelled mechanical vehicle. Cugnot also produced two steam tractors for the French Army, however, his inventions were plagued by water supply and steam pressure problems.Richard Trevithick’s Puffing Devil (1801)In 1801, Richard Trevithick created and displayed his Puffing Devil road locomotive. The Puffing Devil is believed to be the first true steam-powered road vehicle. Unfortunately, despite his ingenuity, Trevithick’s vehicle was unable to maintain steam pressure for long periods of time and was essentially useless for getting from A to B.Gustave Trouvé’s Electric Powered Car (1881)In November 1881, French inventor Gustave Trouvé displayed the first working car powered by electricity at the International Exposition of Electricity in Paris. To create his three-wheeled electric car, Trouvé improved the efficiency of a small electric motor from Siemens and combined it with the recently developed rechargeable battery.While the electric tricycle was successfully patented on April 19, Trouvé failed to get a patent for the design. Following this he decided to apply his knowledge to marine propulsion.History of the Motorwagen VideoIf you like this article make sure you check out our video version below. The Benz Patent Motor Car Number 1 (Benz Patent-Motorwagen) is the first automobile with a combustion engine built by Carl Benz. The patent for this tricycle vehicle was filed by Benz on January 29, 1886 and granted DRP No. 37435 on November 2, 1886. On July 3, 1886, Benz conducted the first public test drive with the one-off in Mannheim. It is considered the world’s first practical motor vehicle and thus marks the birth of the modern automobile. Reconstruction of Benz Patent-Motorwagen, view of the drive – (photo by Maxl | CC BY-SA 4.0) Benz made his crucial mobility experiences on a cranked velocipede (pedal crank bicycle) and then built a light motorized velocipede for private transport instead of a road locomotive that he initially considered for collective transport. His patent motor car is still reminiscent of bicycles and carriages. The heart of the car was a single-cylinder four-stroke engine with a displacement of 0.954 liters. Some details can still be found on engines today: crankshafts with counterweights, electric ignition and water cooling. “A number of tours of 250 tours per minute seemed sufficient, even a lot, and I was able to determine that this engine gave about 2/3 horsepower.” Carl Benz. Later measurements showed 0.75 HP (551 W) at 400 / min. The engine, which at that time weighed around 110 kilograms, had a cylinder with an open crankcase, an inlet slide valve controlled by an eccentric rod, and an outlet poppet valve, actuated via cam, bumper and rocker arm. It was lubricated over drip oilers. Benz designed the large flywheel to be installed horizontally in the chassis because he feared that if the vehicle was positioned vertically, the steering and stability of the vehicle would be impaired in tight bends due to the gyro effect. Traction sheave – (photo by LSDSL | CC BY-SA 2.0 DE) A surface carburetor developed by Benz processed the mixture and at the same time contained a petrol reserve of 4.5 liters. Although it was not petrol in the sense of petrol, but a light petrol called ligroin, which was available in pharmacies. The composition of the gasoline-air mixture could be corrected with a sleeve slide valve, which more or less covered the holes for the additional intake pipe and thus regulated the power output. In the vehicle, this slide was easily accessible below the driver’s seat. Benz devoted several attempts to the ignition until he found a solution that was adapted to the low power of the battery current at the time. He transformed the current to a higher voltage using a spark inductor developed by Heinrich Daniel Rühmkorff. The spark plug was also developed in-house. Later examinations showed that the material of their electrodes largely corresponded to the commercially available spark plugs of the 1930s. Patent motor car number 1 – (photo by DaimlerChrysler AG | CC BY-SA 3.0) The cooling of the internal combustion engine was a particular problem because it could not simply be connected to a cooling water line like a stationary engine. Benz went for simple evaporative cooling (evaporative cooling), which proved to be effective and sufficient with the low output. In Let the engine was courageous turning the flywheel. The fact that the fuel supply in the carburetor was not long enough did not bother Benz in the patent motor car. After all, driving the vehicle over 100 kilometers required around 10 liters of Ligroin, which was still considered dangerous at the time. The frame was bent from steel tubes and welded. Since the car should have rear-wheel drive, i.e. it was pushed from behind, the problem of steering arose, which had to be constructed differently than with a towed car. The turntable steering, which is otherwise customary for carriages, was out of the question, and after his two-wheel experience, Benz decided on a lightly built three-wheeler, a three-wheeled velocipede (see patent text). The front wheel hung in an unsprung fork and was steered by a rack connected to a crank. (It wasn’t until 1893 that Benz used a steering knuckle). The three wire spoke wheels with solid rubber tiresBenz manufactured it himself, only the rims were “third-party” from the Adler bicycle factory in Frankfurt. The front wheel ran in a ball bearing, as was customary in bicycle construction at the time, the rear wheels in white metal bushings. The car was driven with a chain to the left and right of the countershaft via the rear wheels, which in turn were connected to the frame via a rigid axle and full elliptical springs. On the countershaft there was a drive pulley with integrated differential, next to it an idle pulley. The belt transmission thus only had one forward gear and no reverse gear. The flat belt between the camshaft driven by bevel gears and the countershaft also acted as a clutch thanks to the idler pulley. The flat belt was moved from the loose to the fixed pulley to start with a belt fork. As with steam engines, the engine torque was regulated by adjusting the control of the intake valve below the driver’s seat. The reservoir for the cooling water was enthroned above the engine. The brakes were applied using a hand lever that acted on the countershaft pulley. There was no foot brake yet. The seat was mounted directly on the frame on curved springs in front of the engine and covered with quilted leather. A low, leather-covered railing in the back and on the sides gave firm support. Reconstruction of the original Benz Patent Motor Car No. 1 in the German Museum Munich – (photo by Maxl | CC BY-SA 4.0) The chains gave cause for concern: the bicycle chains were still defective, mostly too soft, and therefore stretched a lot, jumping out of the gears or tearing. But since there were no better ones, Benz had to be content with the existing material. The first test drives took place in the factory courtyard in 1885 for reasons of secrecy and ended at the factory wall. The first “excursion” on the open road – at night – only took a few minutes. The car stopped after a hundred meters. However, the range was gradually improved in numerous tests. Patent motor car number 1 – (photo by DaimlerChrysler AG | CC BY-SA 3.0) On January 29, 1886, the vehicle was finally registered for a patent with the Reichspatentamt under number 37435. At the first public and documented exit on July 3, 1886 on the ring road in Mannheim, Benz ‘son Eugen walked alongside with a bottle of gasoline “to refill when the gasoline runs out”. The first “Benz” drove through the city on September 16, 1888 in Munich. The car remained a one-off, as did its direct successor, the number 2 patent motor car. It was first converted into a four-wheel car and later butchered. It was reconstructed in 1903. This Benz Patent Motor-Wagen No. 1 is today in the traffic center of the German Museum in Munich.

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