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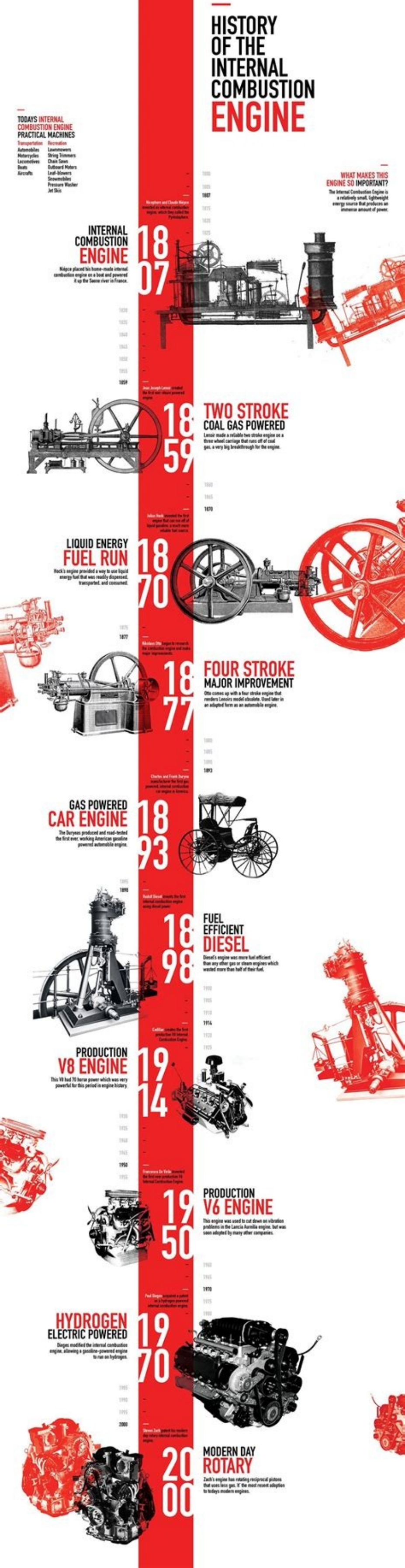

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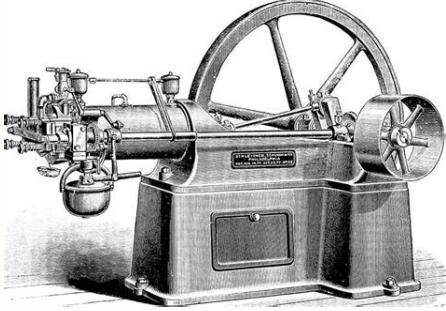
History of internal combustion engine pdf

Internal combustion engine history timeline. Brief history of internal combustion engine. History of fire engines. History of internal combustion engine.

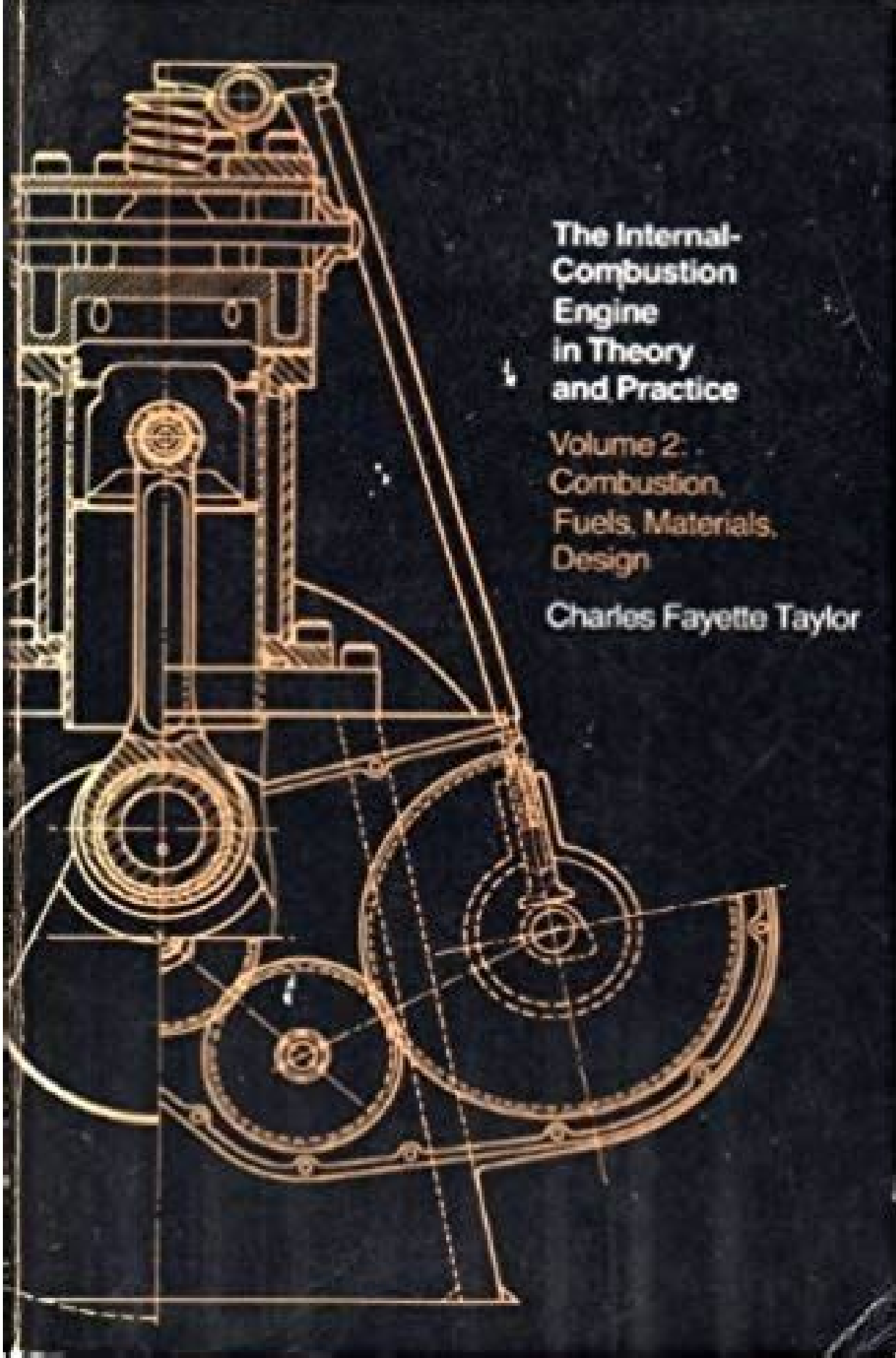
The first internal combustion engine was invented by the French engineer J.J. Etienne Lenoir in 1859. It was a gasoline engine with an ignition system. The engine was able to run continuously. There were earlier attempts to build an internal combustion engine, such as the engine built by the Dutch physicist Christian Huygens in 1680. This was a cumbersome device and did not work on gasoline as gasoline was yet to be discovered. In 1888, Nikolaus Otto built the first successful four-stroke engine. In that same year, Sir Dougald Clerk built the first two-stroke engine. In 1891, Joseph Day made changes to this engine invented by Sir Dougald Clerk, and it became commercially successful. MORE FROM REFERENCE.COM Aspect of history Internal combustion engines date back to between the 10th and 13th centuries, when the first rocket engines were invented in China. Following the first commercial steam engine (a type of external combustion engine) in 1698, various efforts were made during the 18th century to develop equivalent internal combustion engines. In 1791, the English inventor John Barber patented a gas turbine. In 1794, Thomas Mead patented a gas engine. Also in 1794, Robert Street patented an internal-combustion engine, which was also the first to use liquid fuel (petroleum) and built an engine around that time. In 1798, John Stevens designed the first American internal combustion engine. In 1807, French engineers Nicéphore and Claude Niépce ran a prototype internal combustion engine, using controlled dust explosions, the Pyréolophore. This engine powered a boat on the river in France. The same year, the Swiss engineer François Isaac de Rivaz built and patented a hydrogen and oxygen-powered internal-combustion engine. Fitted to a crude four-wheeled wagon, François Isaac de Rivaz first drove it 100 meters in 1813, thus making history as the first car-like vehicle known to have been powered by an internal-combustion engine. In 1823, Samuel Brown patented the first internal combustion engine to be applied industrially in the United States. Brown also demonstrated a boat using his engine on the Thames in 1827, and an engine-driven carriage in 1828. Father Eugenio Barsanti, an Italian engineer, together with Felice Matteucci of Florence invented the first real internal combustion engine in 1853. Their patent request was granted in London on June 12, 1854, and published in London's Morning Journal under the title "Specification of Eugene Barsanti and Felix Matteucci, Obtaining Motive Power by the Explosion of Gasses". In 1860, Belgian Jean Joseph Etienne Lenoir produced a gas-fired internal combustion engine. In 1864, Nicolaus Otto patented the first commercially successful gas engine. In 1872, American George Brayton invented the first commercial liquid-fueled internal combustion engine. In 1876, Nicolaus Otto, working with Gottlieb Daimler and Wilhelm Maybach, patented the compressed charge, four-stroke cycle engine. In 1879, Karl Benz patented a reliable two-stroke gas engine. In 1892, Rudolf Diesel developed the first compressed charge, compression ignition engine. In 1954 German engineer Felix Wankel patented a "pistonless" engine using an eccentric rotary design. The first liquid-fuelled rocket was launched in 1926 by Robert Goddard. In 1939, the Heinkel He 178 became the world's first jet aircraft, followed by the first ramjet engine in 1949 and the first scramjet engine in 2004. Prior to 1850 Types of farm equipment typically powered by early engines (scale models) Before 100 AD: The fire piston is invented in Southeast Asia, and its use is concentrated in Austronesia. This device inspired the Diesel engine, which also uses compression ignition (as opposed to spark ignition).[1][2] 10th to 13th century: The fire arrow, a gunpowder-fuelled form of rocket engine, is invented in China.[3] 1678-1679: The Huygens' engine, a prototype single-cylinder gunpowder engine is built by Dutch inventor Christiaan Huygens. 1780s: An "electric pistol", which used an electric spark to ignite hydrogen gas in an enclosed vessel, is invented by Italian chemist Alessandro Volta.[4] This is possibly the first example of a spark-ignition heat engine. 1791: The principle for a gas turbine engine is described in the patent A Method for Raising Inflammable Air for the Purposes of Producing Motion and Facilitating Metallurgical Operations by British inventor John Barber. 1794: A reciprocating piston engine is built by Robert Street. This engine was fuelled by gas vapours, using the piston's intake stroke to draw in outside air, and the air/fuel mixture was ignited by an external flame.[5] Another gas engine was also patented in 1794 by Thomas Mead.[6] 1801: The concept of using compression in a two-stroke gas engine was theorised by French engineer Philippe LeBon D'Humberstein.[7] 1807: One of the first known working internal combustion engines - called the Pyréolophore - is built by French inventors Claude Niépce and Nicéphore Niépce. This single prototype engine used a series of controlled dust explosions and was used to power a boat upstream in the river Saône in France. 1807: The hydrogen-fuelled De Rivaz engine is built by Swiss engineer François Isaac de Rivaz and fitted to a wheeled carriage, possibly creating the first known automobile.[8] This prototype engine used spark-ignition (as per the 1780s Alessandro Volta design above). 1823: The concept of a gas vacuum engine is patented by British engineer Samuel Brown. One of Brown's engines was used to pump water at a canal in London from 1830 to 1836. 1824: The Carnot cycle - a thermodynamic theory for heat engines - is published in a research paper by French physicist Nicolas Léonard Sadi Carnot. 1826: A patent for the principle of a "gas or vapor engine" is granted to American inventor Samuel Morey.[9] The patent includes the first known design for a carburetor. 1833: A patent for a double-acting gas Lemuel Wellman Wright, UK patent no. 6525, table-type gas engine. Double-acting gas engine, first record of water-jacketed cylinder.[10] 1838: A patent for the principal of a double-acting gas engine is granted to British inventor William Barnett. This is the first known design to propose in-cylinder compression and the use of a water jacket for cooling.[11] 1850-1880 1853 Barsanti-Matteucci engine (scale model) 1860s Otto-Langen atmospheric engine 1853-1857: A patent for the principal of the free-piston Barsanti-Matteucci engine is granted to Italian mathematician Eugenio Barsanti and engineer Felice Matteucci. The design was intended to provide power by the vacuum in the combustion chamber pulling the piston downwards, following the explosion of a gas fuel within the combustion chamber.[12][13] 1860: Belgian-French[14] engineer Jean Joseph Etienne Lenoir invented an atmospheric (non-compression) gas engine, using a layout similar to a horizontal double acting steam engine.[15] The design's patent was titled Moteur à air dilaté par combustion des gaz. Allegedly, in 1860, several of these engines were built and used commercially in Paris.[16]:p15 By 1867, about 280 units of the Lenoir engine had been built. Friedrich Sass considers the Lenoir engine to be the first functional internal combustion engine.[16]:p11 1861: The principle for the four-stroke engine is described by French engineer Alphonse Beau de Rochas in the essay titled Nouvelles recherches sur les conditions pratiques de l'utilisation de la chaleur et en général de la force motrice. Avec application au chemin de fer et à la navigation. De Rochas applied for a patent, however it was declared invalid two years later.[16]:p56-58 1862: A prototype four-stroke engine, created from a modified Lenoir engine, is built by German engineers Nicolaus Otto and Michael Zols. The engine was only able to run for a few minutes before it self-destructed.[16]:p23[17] 1864-1875: The first petrol-powered automobile - a prototype handcart - is built by German inventor Siegfried Marcus.[16]:p79[18][19] 1864: The first commercially successful internal combustion engine - a gas-fuelled atmospheric engine - is produced by German engineers Eugen Langen and Nicolaus Otto.[16]:p29-31 The engine won a gold medal at the Paris Exhibition in 1867[20] and was patented in 1868.[16]:p31 Fuel consumption of this engine was less than half that of the Lenoir and Hugon engines.[16]:p34-35 1865: The Hugon engine - an improved version of the Lenoir engine with flame ignition, better fuel economy[21] and water injection into the cylinders for cooling - is introduced by French engineer Pierre Hugon. This engine was produced commercially for applications such as printing presses and patent offices. 1872: The first commercial liquid-fuelled engine, the Brayton's Ready Motor was patented by American engineer George Brayton. This engine used constant pressure combustion and began commercial production in 1876.[16]:p413-414 1876: The first functional Otto cycle engine - called the Otto Silent Engine - is built by Nicholas Otto, Franz Rings and Herman Schumm at the German company Deutz-AG-Gasmotorenfabrik. The engine compressed the air/fuel mixture before combustion, unlike the other atmospheric engines of the time. The engine was a single-cylinder unit that displaced 6.1 dm3, and was rated 3 PS (2,206 W) at 180/min, with a fuel consumption of 0.95 m3/PS·h (1.29 m3/kWh).[16]:p43-44 Wilhelm Maybach later improved the engine by changing the connecting rod and piston design from trunk to crosshead, so it could be put into series production.[16]:p45 1876: Otto applied for a patent on a stratified charge engine that would use the four-stroke principle. The patent was granted in 1876 in Elsass-Lothringen, and transformed into a German Realm Patent in 1877 (DRP 532, 4 August 1877).[16]:p51-52 1879: A prototype two-stroke gas engine is built by German engineer Carl Benz.[22] 1860 Lenoir gas motor 1864-1875 prototype Marcus cart 1870s Brayton's Ready Motor 1880-1899 1885 Grandfather clock engine 1886 Benz Patent-Motorwagen engine 1881: The first commercially successful two-stroke engine design is patented by Scottish engineer Dugald Clerk.[23][24] This engine is amongst the earliest to use a supercharger.[25] 1885: The Benz Patent-Motorwagen - often considered to be the first automobile[26] - is built. It was powered by a 0.55 kW (0.74 hp) single-cylinder four-stroke engine.[27] 1885: The Daimler Reitwagen - often considered to be the first motorcycle[28][29] [30] - is built by German engineer Gottlieb Daimler. The Reitwagen was powered by the Grandfather clock engine, a high-speed (600 rpm), single-cylinder engine[31] producing 0.37 kW (0.50 hp). 1888: The de Laval nozzle - used in various rocket engines and jet engines - is invented by Swedish engineer Gustaf de Laval. 1888: A rotary engine (not to be confused with a pistonless Wankel engine) is patented by French inventor Félix Millet. This five-cylinder engine was installed in the rear wheel of a bicycle for use in the 1894-1895 Millet motorcycle. 1889: The first V engine is built by German engineer Wilhelm Maybach.[32] 1891: The Hornsby-Akroyd oil engine - often considered a predecessor to the diesel engine - begins production. The engine was designed by English inventor Herbert Akroyd Stuart. 1892: The essay Theory and Construction of a Rational Heat Motor is written by German engineer Rudolf Diesel.[16]:p. 394 The essay discusses several concepts that led to the invention of the diesel engine. 1897: The first functional diesel engine - called the Motor 250/400 and designed by Rudolf Diesel - is built by Maschinenfabrik Augsburg in Germany. 1897: The first flat engine is built by Carl Benz. The configuration used later became known as a boxer engine, due to the pistons "punching" back and forth simultaneously.[33] 1897: An ignition magneto is adapted for use in a motor vehicle engine by German engineer Robert Bosch.[34] 1900-1919 1902: The first V8 engine is built by French engineer Léon Levassieur. The engine called the Antoinette 8V was used for early French airplanes. 1903: The first gas turbine that was able to produce more power than needed to run its own components is built by Norwegian inventor Egidius Elling.[35] 1904: The first overhead valve engine in a mass-production car is fitted to the American Buick Model B sedan. 1905: The exhaust-driven turbocharger is patented by Swiss engineer Alfred Büchi. 1908: A gas turbine that uses the Otto cycle is investigated by German inventor Hans Holzwarth.[36][dead link][37][38] 1908: The world's first rotary engine produced for aircraft in commercial quantities - the seven-cylinder Gnome Omega - begins production by French company Société Des Moteurs Gnome.[39] 1910: The first overhead camshaft engine in a mass-production car is fitted to the Italian Isotta Fraschini Tipo KM luxury car. 1913: The ramjet design for a jet engine is patented by French engineer René Lorin.[40] 1920-1939 1921: The concept of an axial-flow gas-turbine engine is patented by French engineer Maxime Guillaume. 1925: The first gasoline direct injection engine - the Hesselman engine for trucks and buses - is built by Swedish engineer Jonas Hesselman.[41][42] 1926: Theoretical improvements in the efficiency of jet engines are proposed in the research paper Aerodynamic Theory of Turbine Design by English engineer Alan Arnold Griffith. Among the suggestions are the design for a turboprop and changing the turbine blades from a flat profile into an airfoil. 1926: The first liquid-propellant rocket is built by American physicist Robert Goddard. 1926: The first double overhead camshaft engine for a production car is fitted to the English Sunbeam 3-litre sports car. 1927: An important reference book for jet engine design - Steam and Gas Turbines by Slovak engineer Aurel Stodola - is published.[43] 1930: The concept of a turbojet engine is patented by English engineer Frank Whittle. The first successful operation of this engine occurred in 1937. 1931: The first working pulsejet engine is designed by American engineer Robert Goddard.[44] 1935: The first mass-production diesel engine for a passenger car - the Mercedes-Benz OM 138 - begins production in Germany. 1937: The first turbojet engine - the Heinkel HeS 1 prototype engine - is built by German inventors Hans von Ohain and Ernst Heinkel. In 1939, the successor Heinkel HeS 3 engine completes the first flight of a turbojet-powered aircraft. 1940-1980 1942: The first operational jet engine-powered airplane - the German Messerschmitt Me 262 fighter-bomber airplane - completes its first flight. 1949: The first airplane powered by a ramjet engine - the Leduc 0.10 - completes a test flight. The ramjet engine was designed by French engineer René Leduc. 1952: The first fuel injection system for a production passenger car - a mechanical injection system produced by Robert Bosch GmbH - is used in the German Goliath GP700 small sedan. 1957: The first working prototype of the pistonless Wankel engine (sometimes called a rotary engine) is built by German engineer Felix Wankel. 1957: First usage of electronic fuel injection (EFI) in a production passenger car, using the American Bendix Electrojector system. 1980 to present This section needs expansion. You can help by adding to it. (January 2023) 2004: The first scramjet-powered airplane - the NASA X-43 prototype - completes a test flight. 2021: During the COP26 conference, 24 countries committed to all new cars sold being zero emission vehicles (effectively banning the production of petrol-powered or diesel-powered cars) by the year 2040. See also Timeline of heat engine technology Timeline of motor vehicle brands References ^ Ogata, Masanori; Shimotsuma, Yorikazu (October 20-21, 2002). "Origin of Diesel Engine is in Fire Piston of Mountainous People Lived in Southeast Asia", First International Conference on Business and technology Transfer, Japan Society of Mechanical Engineers, archived from the original on 2007-05-23, retrieved 2020-12-01 ^ Needham, Joseph (1965), Science and Civilisation in China: Volume 4, Physics and Physical Technology, Part 2, Mechanical Engineering, Cambridge University Press, pp. 140–141, ISBN 9780521058032 ^ Chapters 1-2, Blazing the trail: the early history of spacecraft and rocketry, Mike Gruntman, AIAA, 2004, ISBN 156347705X. ^ "ELECTRIC PISTOL". ppp.univip.it. ^ "The Early History of Combustion Engines". ^ Spies, Albert (1892-95).



Modern gas and oil engines. New York, The Cassier's magazine company - via Internet Archive. in 1794, Thomas Mead and Robert Street both obtained patents in England for gas or vapor engines, Mead proposing to raise the piston in his engine cylinder by the ignition of a gaseous, explosive mixture and to utilize for the down-stroke both the weight of the piston and the partial vacuum formed underneath it. ^ "All hail the Pyr  lophore". John Robson. Retrieved 1 January 2023. ^ "The History of the Automobile - Gas Engines". About.com. 2009-09-11. Retrieved 2009-10-19. ^ Hardenberg, Horst O. (1992). Samuel Morey and his atmospheric engine. SP-922. Warrendale, Pa.: Society of Automotive Engineers. ISBN 978-1-56091-240-8. ^ Dugald Clerk, "Gas and Oil Engines", Longman Green & Co, (7th Edition) 1897, pp 3-5. ^ Dugald Clerk, "Gas and Oil Engines", Longman Green & Co, 1897. ^ "The Historical Documents". Barsanti e Matteucci. Fondazione Barsanti & Matteucci. 2009. Retrieved 2013-11-01.{{cite web}}: CS1 maint: url-status (link) ^ Ricci, G.; et al. (2012). "The First Internal Combustion Engine".



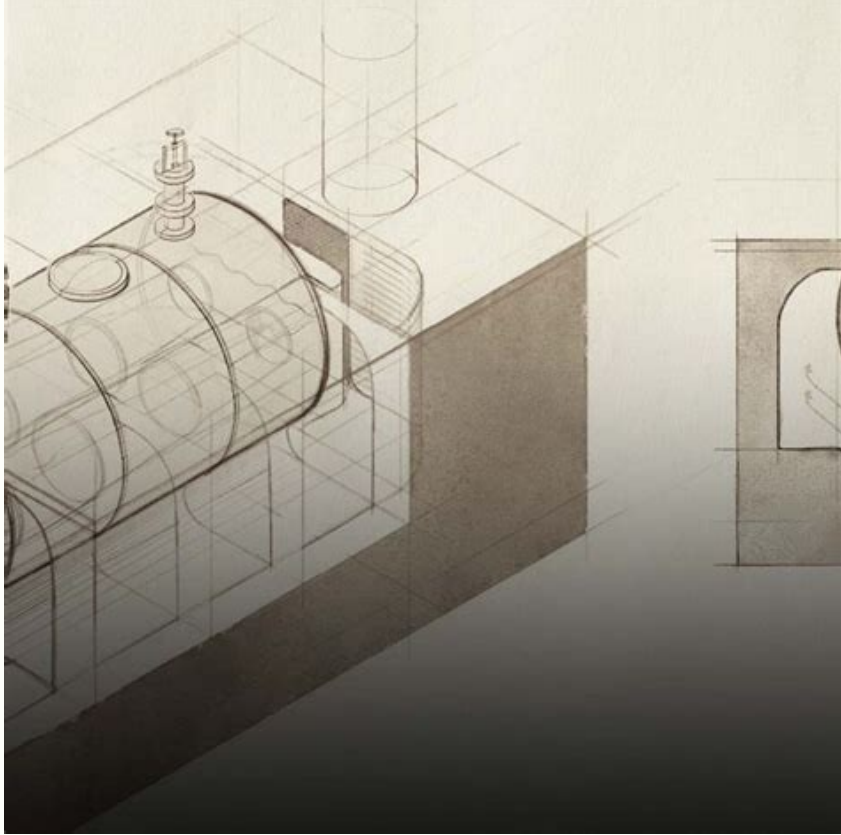
In Starr, Fred; et al. (eds.). The Piston Engine Revolution. London: Newcomen Society. pp. 23–44. ISBN 978-0-904685-15-2. ^ Taylor, Michael J.H. (1983). Milestones of Flight. ISBN 9780710602589. ^ "The Motor Museum in Miniature". www.themotormuseuminminiature.co.uk. Retrieved 2 January 2023. ^ a b c d e f g h i j k l m Friedrich Sass: Geschichte des deutschen Verbrennungsmotorenbaus von 1860 bis 1918, Springer, Berlin/Heidelberg 1962, ISBN 978-3-662-11843-6 ^ "125 Jahre Viertaktmotor". www.nicolaus-august-otto.de. Archived from the original on 7 May 2011. ^ "Siegfried Marcus - German inventor". www.britannica.com. Retrieved 2 January 2023. ^ "Siegfried Marcus Car". www.asme.org. Retrieved 2 January 2023. ^ Ways of the world. Rutgers University Press. 1992. p. 152. ISBN 978-0-8135-1758-2. Retrieved 2 January 2023. ^ Rudolf Krebs: F  nf Jahrtausende Radfahrzeuge: 2 Jahrhunderte Stra  enverkehr mit W  rmeenergie.   ber 100 Jahre Automobile. Springer, Berlin/Heidelberg 1994, ISBN 9783642935534, p. 203 ^ "The Benz Patent-Motorwagen - The First Car in History". www.garagedreams.net. 17 May 2020. Retrieved 4 January 2023. ^ "Sir Dugald Clerk- Scottish engineer". www.britannica.com. Retrieved 4 January 2023. ^ "US249307A- Clerk". www.patents.google.com. 8 November 1881. Retrieved 4 January 2023. ^ McNeil, Ian (1990). An Encyclopaedia of the history of technology. London ; New York : Routledge. p. 315. ISBN 978-0-203-33017-3. Retrieved 4 January 2023. ^ Parissien, Steven (2014). The life of the automobile : the complete history of the motor car. Internet Archive. New York, N.Y. : Thomas Dunne Books, St. Martin's Press. pp. 2-5.



ISBN 978-1-250-04063-3. ^ "The first automobile (1885-1886)". Mercedes-Benz Group. Retrieved 4 January 2023.



^ Gardiner, Mark (1997), Classic motorcycles, MetroBooks, p. 16, ISBN 1-56799-460-1 ^ Brown, Roland (2005), The Ultimate History of Fast Motorcycles, Bath, England: Parragon, p. 6, ISBN 1-4054-5466-0 ^ Wilson, Hugo (1993), The Ultimate Motorcycle Book, Dorling Kindersley, pp. 8–9, ISBN 1-56458-303-1 ^ Hendrickson III, Kenneth E. (2014). The Encyclopedia of the Industrial Revolution in World History, Volume 3. Rowman & Littlefield. p. 236. ISBN 978-0810888883.



^ Larson, Len (2008). Dreams to Automobiles. p. 171. ISBN 978-1-4691-0104-0. Retrieved 2 August 2020. ^ English, Bob (29 April 2010), "The engine that Benz built still survives". The Globe and Mail. Archived from the original on 20 December 2013. Retrieved 19 December 2013. ^ "On a January day in 1902 – a very special patent request of Robert Bosch". Bosch. Retrieved 4 January 2023. ^ Bakken, Lars E et al., p.83-88. "Centenary of the First Gas Turbine to Give Net Power Output: A Tribute to /Egidius Elling". ASME. 2004 ^ "Holzwarth Gas Turbine, 1908". www.deutsches-museum.de. Deutsches Museum. ^ "Hans Holzwarth". www.gracesguide.co.uk. Retrieved 5 January 2023. ^ "Gas-turbine engine - Development of gas turbines". www.britannica.com. Retrieved 5 January 2023. ^ Smithsonian Institution (2018). "Gnome Omega No. 1 Rotary Engine". National Air and Space Museum. Washington, DC: Smithsonian Institution. Archived from the original on July 10, 2018. Retrieved Aug 17, 2018. ^ "SP-4306 Engines and Innovation: Lewis Laboratory and American Propulsion Technology - Chapter 4". www.history.nasa.gov. Retrieved 5 January 2023. ^ Lindh, Bj  rn-Eric (1992). Scania fordonshistoria 1891-1991 (in Swedish). ISBN 978-91-7886-074-6. (Translated title: Vehicle history of Scania 1891-1991) ^ Olsson, Christer (1987). Volvo – Lastbilarna ig  r och idag (in Swedish). ISBN 978-91-86442-76-7. (Translated title: Volvo trucks yesterday and today) ^ Dawson, Virginia Parker (1991). Engines and Innovation: Lewis Laboratory and American Propulsion Technology. National Aeronautics and Space Administration. pp. 93-. ISBN 978-0-16-030742-3. ^ U.S. Patent 1,980,266 Retrieved from "