THE MOTOR CAR - SOURCE COMPANION

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How to read this companion

Every reference number in square brackets in The Motor Car resolves here. Each entry gives the source, the read level (full, excerpt, abstract-level, search-result-level; “desk” marks reads at the owning source by the series research desk, “writer” by the book’s writer), what it supports, and any limitations. Excerpt-level and abstract-level reads support only the specific claims noted. Conflicts between sources are flagged in the entries, never smoothed over.

C1 - Mercedes-Benz Group, “1885-1886: The first automobile”

Read level: full (writer)
URL: https://group.mercedes-benz.com/company/tradition/company-history/1885-1886.html
Supports: Ch 1, Ch 5, Ch 14
Notes: Benz 1879 two-stroke; Patent-Motorwagen 1885 spec (0.75 hp single-cylinder four-stroke, tubular steel frame, differential, three wire wheels); patent DRP 37435 filed 29 Jan 1886; July 1886 first public outing; Bertha Benz Aug 1888 Mannheim-Pforzheim 180 km incl return with sons; Benz Velo 1894 ~1,200 units “world’s first production car”; double-pivot steering patent 1893; contra engine 1897.

C2 - Mercedes-Benz Group, “Forerunners to the automobile”

Read level: full (desk)
URL: https://group.mercedes-benz.com/company/tradition/company-history/forerunners-to-the-automobile.html
Supports: Ch 5
Notes: priority context: Cugnot 1769, de Rivaz 1807, Samuel Brown 1826, Lenoir 1863, Marcus 1870.

C3 - DPMA, Patentschrift DRP 37435 scan

Read level: search-result (document exists; not read in full).

URL: https://www.dpma.de/docs/dpma/veroeffentlichungen/de37435a_benzmotorwagen.pdf
Supports: Ch 5
Notes:

C4 - DPMA, “Bertha Benz” (Ingenious Women)

Read level: full (desk)
URL: https://dpma.de/english/our_office/publications/ingeniouswomen/berthabenz_1/index.html
Supports: Ch 5
Notes: 5 Aug 1888, ~106 km, dowry financed Carl’s work.

C5 - University of Houston, Engines of Our Ingenuity ep.1596

Read level: full (desk)
URL: https://engines.egr.uh.edu/episode/1596
Supports: Ch 5
Notes: Siegfried Marcus second car hidden from Nazis, rediscovered Vienna 1950 still driveable.

C6 - WHO, Global status report on road safety 2023 (publication page)

Read level: full (writer)
URL: https://www.who.int/publications/i/item/9789240086517
Supports: Ch 1, Ch 32
Notes: 1.19M deaths 2021 (5% below 2010’s 1.25M); leading killer aged 5-29; 12th cause of death overall 2019; 92% of deaths in LMICs; by user: riders 30%, car occupants 25%, pedestrians 21%, cyclists 5%; regional shares SE Asia 28%, W Pacific 25%, Africa 19%, Americas 12%; Europe -36% since 2010. Caveat: WHO revises historical estimates; cite edition+year.

C7 - IEA, Global EV Outlook 2025 executive summary

Read level: full (writer)
URL: https://www.iea.org/reports/global-ev-outlook-2025/executive-summary
Supports: Ch 2, Ch 18, Ch 34, Ch 38, Ch 40
Notes: 2024 >17M EVs sold, >20% share; China >11M (~half of sales; 1 in 10 cars on Chinese roads electric); Europe ~20% share; US >10%; 2025 expected >20M / >25%; 2030 stated policies >40% (China ~80%, Europe ~60%, US ~20%); EVs displace >5M bbl/d oil 2030; price parity 2/3 of Chinese EVs cheaper than ICE; US +30%, Germany +20%; China >70% of world EV production; “electric cars” = BEV+PHEV.

C9 - OICA, World Motor Vehicle Production by country/region and type, prod-total-2025.pdf

Read level: full (writer; PDF metadata 22 Apr 2026, covers Q1-Q4 2025; URL upload folder 2025/11 noted)
URL: https://oica.net/wp-content/uploads/2025/11/prod-total-2025.pdf
Supports: Ch 1, Ch 29, Ch 31
Notes: World: 2019 91,876,377; 2021 80,020,230; 2022 84,881,558; 2023 93,540,766; 2024 92,723,280; 2025 96,383,650. China 2025 34,530,738 (+10% yoy, ~36% world); USA 10,243,844; Japan 8,410,232; India 6,490,810 (4th, ahead of Germany); Germany cars-only 4,148,836. Footnotes: estimate flags; Audi/BMW/JLR/Mercedes not reported in car splits since certain dates; manufacturer-reported via national associations.

C10 - OICA, Passenger Cars 2024

Read level: full (writer)
URL: https://oica.net/wp-content/uploads/2025/10/Passenger-Cars-2024.pdf
Supports: Ch 1
Notes: world PC production 2024: 67,674,745 (Oct 2025 release basis; pairs with that release’s all-vehicle 92,504,338 -> derived CV ~24.8M; keep separate from Nov-file revised total).

C12 - OICA, Total World vehicles in use 2020

Read level: full (desk)
URL: https://oica.net/wp-content/uploads/Total-World-vehicles-in-use-2020.pdf
Supports: Ch 1
Notes: ~1.59 billion vehicles in use 2020 (1.287B 2015; 209/1,000 inhabitants). Caveat: most recent full OICA parc; no post-2020 OICA parc.

C13 - fueleconomy.gov (US DOE/EPA), “Where the Energy Goes: Gasoline Vehicles”

Read level: full (writer)
URL: https://www.fueleconomy.gov/feg/atv.html
Supports: Ch 2, Ch 18
Notes: 12-30% of fuel energy moves vehicle; city engine losses 71-75%, to wheels 14-20%; highway to wheels 22-30%; diesels ~1/3 more efficient than gasoline; 5-7% rolling-resistance cut -> 1% fuel-economy gain; aero drag further reducible 20-30%; regenerative braking recovers energy; ORNL analysis of 100+ vehicles, EPA test cycles.

C14 - ACEA, “Facts about the automobile industry”

Read level: full (desk)
URL: https://www.acea.auto/fact/facts-about-the-automobile-industry/
Supports: Ch 1
Notes: auto = 7% of EU GDP; ~13M European jobs (direct+indirect); vehicle manufacturing 2.4M jobs = 8.1% of EU manufacturing employment (2022); ACEA Pocket Guide 2024/25 world production 93.9M in 2023.

C15 - IEA, Breakthrough Agenda Report 2025, Road transport chapter

Read level: full (desk)
URL: https://www.iea.org/reports/breakthrough-agenda-report-2025/road-transport
Supports: Ch 1, Ch 34, Ch 41
Notes: road CO2 just over 6 Gt 2024, +8% vs 2015; growth slowed to 0.2%/yr 2019-24 from 1.7%/yr 2015-19; >60% of road emissions cars+vans; trucks ~1/3; buses+2/3-wheelers ~7%.

C16 - IEA, “Sheltering from oil shocks”, road transport fuels

Read level: full (desk)
URL: https://www.iea.org/reports/sheltering-from-oil-shocks/road-transport-fuels
Supports: Ch 1, Ch 18, Ch 19, Ch 21, Ch 27, Ch 30, Ch 34, Ch 36
Notes: road transport ~45% of global oil demand (1/3 Korea to 2/3 parts of Europe/LatAm); advanced-economy passenger cars ~60% of road energy use.

C17 - US EPA, transportation sector emissions

Read level: full (desk)
URL: https://www.epa.gov/ghgemissions/transportation-sector-emissions
Supports: Ch 1, Ch 34
Notes: transportation 28% of US GHG 2022 (largest sector); on-road vehicles 81% of transportation emissions. Caveat: some EPA pages round 2022 to 29%; use 2024-07 fact sheet 28%.

C19 - GM Heritage, 1903 Oldsmobile Curved Dash Runabout

Read level: full (desk).
URL: https://www.gm.com/heritage/collection/oldsmobile/1903-oldsmobile-curved-dash-runabout
Supports: Ch 7
Notes:

C20 - Smithsonian NMAH, Curved Dash runabout 1903

Read level: full (desk).
URL: https://www.americanhistory.si.edu/explore/stories/race-museum-oldsmobile-curved-dash-runabout-1903
Supports: Ch 7
Notes:

C21 - Henry Ford Museum, Curved Dash Oldsmobile set

Read level: full (desk)
URL: https://www.thehenryford.org/collections/explore/sets/detail/the-curved-dash-oldsmobile
Supports: Ch 7
Notes: 425 built 1901, 2,500 1902, 3,924 1903; stationary assembly, interchangeable parts; “first mass-produced automobile”.

C22 - Henry Ford Museum, “Ford Methods and the Ford Shops”

Read level: full (desk)
URL: https://www.thehenryford.org/collections/explore/articles/detail/articles/2021/07/22/ford-methods-and-the-ford-shops
Supports: Ch 8, Ch 9, Ch 10, Ch 13, Ch 15, Ch 16
Notes: flywheel magneto experiment ~1 Apr 1913: 20 min -> 13 -> 5 min; chassis assembly Aug 1913 12.5 h -> 93 min by early 1914; ~140 workers, 150-foot line; turnover >300% in 1913; peak Model T year 1.8M (1923). CONFIRMED-QUOTE: “by late 1913, labor turnover was 380 percent” (~50k hires / ~14k workforce); Wikipedia/Ford-claimed 31.9%->1.4% on unresolved basis - omitted from ms.

C23 - Library of Congress, “This Month in Business History” (Ford $5 day)

Read level: full (desk).
URL: https://guides.loc.gov/this-month-in-business-history/October/Ford
Supports: Ch 10
Notes:

C24 - Dassbach 1991 (Sage)

Read level: abstract only
URL: https://journals.sagepub.com/doi/10.1177/089692059101800105
Supports: Ch 9, Ch 10
Notes: $5 day as labour control for line-driven turnover, not generosity.

C25 - History.com, “The Cars That Made America”

Read level: full (desk)
URL: https://www.history.com/articles/the-cars-that-made-america
Supports: Ch 8
Notes: Model T production 1 Oct 1908 - 26 May 1927: 15,458,781.

C26 - Model T Ford Club of America, 1925 price list

Read level: full (desk)
URL: https://www.mtfca.com/model_t_encyclopedia/1925/
Supports: Ch 8
Notes: $260 Runabout / $290 Touring 1925; $825 Runabout 1908/09 baseline.

C27 - Smithsonian American Enterprise, “Designed to Sell”

Read level: full (desk)
URL: https://americanhistory.si.edu/explore/exhibitions/american-enterprise/online/consumer-era/designed-sell
Supports: Ch 11, Ch 27, Ch 28

Notes: GM annual model change 1920s; Harley Earl; Kettering “New Necessity” 1932.

C28 - Sloan, My Years with General Motors (chapter)

Read level: excerpt.
URL: https://erenow.org/biographies/my-years-with-general-motors/14.php
Supports: Ch 11
Notes:

C32 - US DOE, “History of the Electric Car”

Read level: full (desk)
URL: https://www.energy.gov/articles/history-electric-car
Supports: Ch 2, Ch 7
Notes: 1900 ~28% of US cars electric; EVs outsold other types late 1890s.

C35 - US EPA (archive), VW Clean Air Act violations notice

Read level: full (desk)
URL: https://www.epa.gov/archive/epa/newsreleases/epa-california-notify-volkswagen-clean-air-act-violations-carmaker-allegedly-used.html
Supports: Ch 21, Ch 33
Notes: NOV 18 Sep 2015.

C42 - Environmental History / IJOEH, leaded gasoline

Read level: full (desk)
URL: https://environmentalhistory.org/ijoeh-lead/
Supports: Ch 2, Ch 18, Ch 19, Ch 20, Ch 33
Notes: TEL adopted 1921-23 GM/Dayton (Midgley, Kettering); alternatives known; Patterson vs Kehoe.

C43 - US EPA, timeline major accomplishments transportation air pollution

Read level: full (desk)
URL: https://www.epa.gov/transportation-air-pollution-and-climate-change/timeline-major-accomplishments-transportation-air
Supports: Ch 18, Ch 20, Ch 21, Ch 33
Notes: unleaded fuel required from US MY1975 for catalyst cars.

C45 - US DOE, Quadrennial Technology Review 2015 ch.8

Read level: full (desk)
URL: https://www.energy.gov/documents/qtr2015-8d-lightweight-automotive-materialspdf
Supports: Ch 1, Ch 2, Ch 13, Ch 15, Ch 41
Notes: avg US passenger vehicle ~3,350 lb (1,520 kg); ~54% iron/mild steel by mass; 10% weight cut -> 6-8% fuel-economy gain.

C46 - American Chemistry Council, “Chemistry and Automobiles”

Read level: full (desk; industry source, weight as such)
URL: https://www.americanchemistry.com/content/download/17686/file/Chemistry-and-Automobiles-Driving-the-Future.pdf
Supports: Ch 1, Ch 2, Ch 13
Notes: avg automobile 4,439 lb 2023 (+136 lb yoy); plastics ~10% of mass, ~50% of volume.

C47 - MATEC Web of Conferences 2025, Skoda Octavia teardown LCA

Read level: full (desk)
URL: https://doi.org/10.1051/matecconf/202541203001
Supports: Ch 1

Notes: full teardown 1,290.15 kg inventoried; ferrous metals dominant.

C48 - Statista, leading global automotive suppliers

Read level: search-result (paywalled)
URL: https://www.statista.com/statistics/199703/10-leading-global-automotive-original-equipment-suppliers/
Supports: Ch 13
Notes: Bosch largest.

C49 - Automotive News, Top 100 global suppliers 2025

Read level: excerpt.
URL: https://www.autonews.com/manufacturing/suppliers/an-top-suppliers-2025-main-page-0622/
Supports: Ch 13, Ch 15
Notes:

C50 - Vox, streetcar history

Read level: full (desk)
URL: https://www.vox.com/2015/5/7/8562007/streetcar-history-demise
Supports: Ch 3
Notes: quotes Norton; streetcars declining from 1920s.

C66 - NYC Department of Records, "Horsepower: The City and the Horse" (2023)

Read level: full (writer)
URL: https://www.archives.nyc/blog/2023/10/20/horsepower-the-city-and-the-horse
Supports: Ch 3, Ch 25
Notes: first NYC horse omnibus Broadway 1832; horse-drawn passenger vehicles until 1918; 34-horse girder team 1911; fire companies from 1860s.

C67 - MAUTO (Museo Nazionale dell'Automobile), "An almanac of steam vehicles"

Read level: full (writer)
URL: https://www.museoauto.com/en/qrcode/an-almanac-of-steam-vehicles/
Supports: Ch 4
Notes: Watt patent 1769/renewed 1775/in force to 1800; Cugnot 1769 front-drive artillery tractor; Murdock 1784 model 6-8 mph; Trevithick 1796 model, 1801 full-size 4-5 mph, 1803 London demos; James 1824 4WD; Gurney 1827 Royal Patent; Hancock 1827 phaeton; Johnson Brothers US 1828; 1830s high-water mark, Hancock Autopsy+Era 4,000 passengers 1834; tolls/sabotage/railway opposition; 1861 first restrictive legislation.

C68 - Tandfonline, Int. Journal for the History of Engineering & Technology, "Steam engines on UK roads, 1862-1865: Banning orders, agricultural locomotives and the 'red flag' Act"

Read level: search-result
URL: https://www.tandfonline.com/doi/full/10.1080/17581206.2020.1797447
Supports: Ch 4
Notes: existence and era of the red flag legislation.

C69 - ACCESS Magazine (UCLA), "From Horse Power to Horsepower" (2007)

Read level: full (writer)
URL: https://accessmagazine.org/spring-2007/horse-power-horsepower/
Supports: Ch 3, Ch 25
Notes: 1898 NY planning conference; 1894 Times prophecy as retold; ~5 acres per horse (could feed 6-8 people); ~15M acres at zenith; manure 15-30 lb/horse/day; NY+Brooklyn 150,000-175,000 horses 1880; manure piles 40-60 ft; 1,300 lb horses; railroads owned largest urban horse fleets; NY density 39,183/sq mi 1800 to 90,366.

C70 - Grace's Guide, "Timeline: Steam Road Vehicles"

Read level: full (writer)
URL: https://www.gracesguide.co.uk/Timeline:_Steam_Road_Vehicles
Supports: Ch 4, Ch 22
Notes: Gurney 1829 Bath-London; Hancock 1829 Fulham-Brompton steam bus; Summers & Ogle 1831 Southampton-London; Stone 1831 Gloucester; London & Birmingham Steam Carriage Co 1832.

C71 - Mercedes-Benz Group, "Gottlieb Daimler"

Read level: full (writer)
URL: https://group.mercedes-benz.com/company/tradition/founders-pioneers/gottlieb-daimler.html
Supports: Ch 5
Notes: born 1834 Schorndorf; gunsmith apprenticeship 1848-52; Stuttgart Polytechnic 1857-59; Bruderhaus Reutlingen 1863, met Maybach 1864; Maschinenbau-Gesellschaft Karlsruhe factory director 1868; Deutz technical manager 1872; split mid-1882; Cannstatt garden workshop; end-1883 small high-speed engine with hot-tube ignition; 1884 "grandfather clock"; Reitwagen, motor carriage, boats; DMG 1890; Maybach left Feb 1891; Daimler squeezed out 1893, returned 1895.

C72 - Britannica, "Nikolaus Otto"

Read level: full (writer)
URL: https://www.britannica.com/biography/Nikolaus-Otto
Supports: Ch 5
Notes: born 1832 Holzhausen, died 1891 Cologne; first gasoline engine 1861; Langen partnership 1864; Paris 1867 gold medal; 1876 four-stroke engine; Beau de Rochas patented cycle 1862; >30,000 engines in 10 years; Otto patent revoked 1886.

C73 - EBSCO Research Starters, "Lenoir's Internal Combustion Engine"

Read level: full (writer)
URL: https://www.ebsco.com/research-starters/history/lenoirs-internal-combustion-engine/
Supports: Ch 5
Notes: Lenoir 1860s illuminating-gas engine; horizontal cylinder, double-acting, two-stroke cycle; powered pumps and a prototype automobile; inefficient.

C74 - Mercedes-Benz Group, "Beginnings of the automobile: the predecessor companies (1886-1920)"

Read level: full (writer)
URL: https://group.mercedes-benz.com/company/tradition/company-history/1886-1920.html
Supports: Ch 6
Notes: Benz and Daimler never met; Daimler licenses in France and Britain; Steinway US/Canada rights; Benz double-pivot steering 1893; Jellinek's Mercedes 35 hp, Nice race week March 1901; Mercedes trademark 1902; DMG to Unterturkheim Dec 1903; DMG+Benz merger 1926.

C75 - Les Doyennes de Panhard & Levassor, "Models from 1891 to the 20's"

Read level: full (writer)
URL: https://doyennes-panhard-levassor.fr/en/models-from-1891-to-the-20s-2/
Supports: Ch 6
Notes: P&L acquired Daimler manufacturing license for France; Levassor twin-V engine car 1890, improved 1891; first series of 30 cars, five sold 1891; supplied Daimler V engines to Peugeot 1890-1896; three-ratio gearbox in casing.

C76 - Britannica, "History of the automobile"

Read level: full (writer)
URL: https://www.britannica.com/technology/automobile/History-of-the-automobile

Supports: Ch 6, Ch 7, Ch 37
Notes: Cugnot 1769 details; Amiens 1790; Paris steam buses c.1800; Oliver Evans 1805; Gurney Gloucester-Cheltenham 1831 (4,000 miles, ~3,000 passengers Feb-Jun); 5 pound vs 3 pence tolls; Locomotives on Highways Act 1865 (2 mph city, 4 mph rural, crew of three with red flag, amended 1878, repealed 1896); Stanley steamer 127.66 mph 1906; Locomobile ~1,000 built 1900, first commercially successful American-made automobile.

C77 - Chicago History Museum, "H. H. Kohlsaat and the First Automotive Race in the US"

Read level: full (writer)
URL: https://www.chicagohistory.org/kohlsaat-and-the-first-automotive-race/
Supports: Ch 6, Ch 7
Notes: Times-Herald race Thanksgiving 28 Nov 1895; Kohlsaat; "motocycle" naming contest $500; $5,000 purse; 80 registered, 11 after snowstorm, 6 starters; three Benz, one Duryea, two electrics; Duryea won in 10+ hours at ~7 mph average; Mueller-Benz second; only two finishers; first Chicago Auto Show 1901.

C78 - Smithsonian Magazine, "The Forgotten Car That Won America's First Auto Race"

Read level: full (writer)
URL: https://www.smithsonianmag.com/smart-news/model-t-came-duryea-wagon-180961218/
Supports: Ch 7
Notes: Duryea roadster won 1895 race, ~5 mph average per headline (Chicago History Museum says ~7 mph; conflict noted).

C79 - Wikipedia, "Panhard"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Panhard
Supports: Ch 6
Notes: P&L founded 1887 (Panhard, Levassor, Sarazin); first car sold 1890 on Daimler license via Sarazin; Louise Sarazin married Levassor 1890; Systeme Panhard 1891 (front engine, rear drive, sliding-gear transmission, 3500 francs, standard layout for most of next century); license shared with Armand Peugeot 1891; Vacheron steering wheel 1894 Paris-Rouen; Panhard 1-2 Paris-Bordeaux-Paris 1895 (Levassor solo 48h45m); Levassor fatal crash 1896 Paris-Marseille-Paris, died 1897; sleeve valves from 1910.

C80 - Wikipedia, "De Dion-Bouton"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/De_Dion-Bouton
Supports: Ch 6
Notes: steam tricycles; La Marquise; 1887 Le Velocipede trial sole entrant; De Dion dead axle; Paris-Rouen 1894 steam entry averaged 18.7 km/h, disqualified (needed stoker); De Dion-Bouton engine = first high-speed lightweight ICE, licensed to 150+ manufacturers; battery/coil ignition; American De Dion Motorette Co Brooklyn 1900.

C81 - Britannica, "Henry Ford"

Read level: full (writer)
URL: https://www.britannica.com/biography/Henry-Ford
Supports: Ch 7, Ch 8, Ch 9
Notes: farm near Dearborn; Detroit machine shops 1879; chief engineer Detroit Edison 1893; Quadricycle 1896; Detroit Automobile Co 1899 (later Henry Ford Co); "999" racer; left 1902 (firm became Cadillac); Ford Motor Co incorporated 1903, $28,000; Selden patent 1895, ALAM suit, Ford lost 1909, won appeal 1911; Model T announced Oct 1908 "for the great multitude"; 15.5M US + ~1M Canada + 250k GB over 19 years, "half the auto output of the world".

C82 - Britannica, “Charles F. Kettering”

Read level: full (writer)
URL: https://www.britannica.com/biography/Charles-F-Kettering
Supports: Ch 8, Ch 37
Notes: Delco founded with Deeds; first electric starter introduced on Cadillacs 1912; GM research VP 1920-1947; quick-drying lacquer finishes; antiknock fuels/leaded gasoline with Midgley.

C83 - Wikipedia, “Ford River Rouge Complex”

Read level: full
URL: https://en.wikipedia.org/wiki/Ford_River_Rouge_Complex
Supports: Ch 9
Notes: Rouge: site bought 1915, completed 1928, Albert Kahn, 1.5x1 mile, 93 buildings, 16M sq ft, own docks + 100 mi interior rail + steel mill; Rivera murals 1932; Chaplin visited for Modern Times 1936

C84 - Wikipedia, “Highland Park Ford Plant”

Read level: full
URL: https://en.wikipedia.org/wiki/Highland_Park_Ford_Plant
Supports: Ch 9, Ch 10
Notes: HP: Kahn 1908/opened 1910, 102 acres, largest factory in world at opening; moving line 7 Oct 1913; build time 728->93 min; T price $700 (1910)->$350 (1917); 5 Jan 1914 wage $2.34->$5.00, 9h->8h; turnover claim 31.9% (1913)->1.4% (1915). CONFLICT with C22 (>300% turnover 1913) - flag, present cautiously

C85 - Britannica, “tire”

Read level: full
URL: https://www.britannica.com/technology/tire
Supports: Ch 14
Notes: Thomson patent 1845 aerial wheels; Dunlop 1888 bicycle pneumatic; Michelin first pneumatic on motor vehicles; tubeless standard 1950s; Michelin radial 1950s now universal; 200M+ tires/yr, ~90% autos

C86 - Wikipedia, “Fordlandia”

Read level: full
URL: https://en.wikipedia.org/wiki/Fordl%C3%A2ndia
Supports: Ch 14
Notes: Ford 1928 Amazon rubber town, 10,000 km2 concession for 9% profit share; abandoned 1934

C87 - Britannica, “petroleum - History of use”

Read level: full
URL: https://www.britannica.com/science/petroleum/History-of-use
Supports: Ch 18, Ch 19, Ch 20, Ch 21, Ch 36
Notes: Drake well Aug 1859 NW Pennsylvania; illuminants to energy shift via ICE/automobile

C88 - Britannica, “Rudolf Diesel”

Read level: full
URL: https://www.britannica.com/biography/Rudolf-Diesel
Supports: Ch 21
Notes: 1892 patent, 1893 treatise, 1897 25hp demonstration engine, immediate commercial success

C90 - Waymo blog (owning), “Waymo raises $16B investment round” (Feb 2026)

Read level: read (desk)
URL: https://waymo.com/blog/2026/02/waymo-raises-usd16-billion-investment-round/
Supports: Ch 39

Notes: 15M paid rides in 2025 (tripled), 20M+ lifetime, 400k+ weekly, 20+ new cities in 2026 incl. Tokyo & London. NOTE: Feb-2026 actuals, not year-end; label dated

C92 - GM (owning) press release, 10 Dec 2024, “GM to refocus autonomous driving development on personal vehicles”

Read level: read (desk)
URL: https://investor.gm.com/news-releases/news-release-details/gm-refocus-autonomous-driving-development-personal-vehicles
Supports: Ch 39
Notes: GM ended Cruise robotaxi development Dec 2024, Cruise absorbed into GM; Reuters corroboration https://www.reuters.com/business/autos-transportation/general-motors-drop-development-cruise-robotaxi-2024-12-10/ ; describe as of Dec 2024; no newer statement verified

C93a - Bosch (owning) FY2024 key figures + annual report

Read level: read (desk)
URL: https://www.bosch-presse.de/pressportal/de/media/dam_images/pi11955/apc2025_kenndaten_2024_en_final_ohnesperrfrist.pdf ; https://assets.bosch.com/media/en/global/bosch_group/our_figures/publication_archive/pdf_1/gb2024.pdf
Supports: Ch 27, Ch 31, Ch 41
Notes: FY2024 (latest verified): sales EUR 90.3bn, Mobility EUR 55.8bn, 417,900 employees. FY2025 not retrieved - do not label latest

C93b - Denso (owning) IR financial page + FY2024/3 release

Read level: read (desk)
URL: https://www.denso.com/global/en/investors/financial/ ; https://www.denso.com/global/en/news/newsroom/2024/20240426-g01/
Supports: Ch 27, Ch 41
Notes: FY ending 31 Mar: FY2024/3 JPY 7,144,733M (US$47.2bn); FY2025/3 7,161,777M; FY2026/3 7,539,975M - series current as of Nov 2026

C93c - CATL (owning) FY2025 annual results + FY2024 annual report

Read level: read (desk/writer)
URL: https://www.catl.com/en/news/6773.html ; https://www.catl.com/uploads/1/file/public/202503/20250317094543_6ig9e0mwng.pdf
Supports: Ch 27, Ch 31, Ch 38, Ch 41, Ch 42
Notes: FY2025 (latest verified): revenue RMB 423.7bn (+17% vs 362.0bn FY2024); net profit RMB 72.2bn; power-battery share 39.2% (9th consecutive year). FY2024: RMB 362.0bn (-9.7%).

C93d - Magna (owning) Q4/FY2024 PR, 14 Feb 2025

Read level: read (desk)
URL: https://www.magna.com/docs/default-source/2025-news---press-releases/magna-2024-q4-pr.pdf
Supports: Ch 41
Notes: FY2024 (latest verified): sales US$42.8bn; 2025 guidance $38.6-40.2bn. FY2025 actuals not retrieved - do not label latest

C94 - IEA Global EV Outlook 2026 (owning), “Trends in electric cars”

Read level: read (desk)
URL: https://www.iea.org/reports/global-ev-outlook-2026/trends-in-electric-cars
Supports: Ch 29, Ch 31, Ch 34, Ch 36, Ch 38, Ch 40, Ch 41, Ch 42
Notes: 2025 actuals (electric cars = BEV+PHEV only): world >20M sold (+20%), 25% of new car sales, ~5% of stock, displaced 1.2M bbl/day; BEV 65% of electric sales; China >13M ~55% share (6 of 10 global), 44M on

road; Europe 4.2M 28%; US ~1.5M ~10%, Q4 -45% after Sep-2025 tax credit end (OBBBA); ex-big-3 2.0M, EMDEs ex-China 1.2M +80%

C95 - Wikipedia, “Filling station”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Filling_station
Supports: Ch 20
Notes: first purpose-built gas station St. Louis 1905; first drive-in Columbus 1912 (Standard Oil of Ohio); Gulf Pittsburgh 1913 first architect-designed + free road maps; Wiesloch City Pharmacy 1888 claim; UK first AA drive-through 1919

C96 - Wikipedia, “Good Roads Movement”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Good_Roads_Movement
Supports: Ch 22
Notes: late 1870s-1920s coalition of farmers’ orgs + League of American Wheelmen; Horatio Earle “bicycle is the father of the good roads movement”; AAA joined by 1910

C97 - Wikipedia, “Parking meter”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Parking_meter
Supports: Ch 24
Notes: first installed Oklahoma City 16 July 1935; Magee patent 1938

C98 - Wikipedia, “London congestion charge”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/London_congestion_charge
Supports: Ch 24, Ch 35
Notes: introduced 17 Feb 2003, inspired by Singapore ERP; ~10% traffic-volume reduction (TfL, causality caveats noted); ALS introduced Aug 1974/1975 per ERP page - kept as “mid-1970s” in ms

C99 - Wikipedia, “Traffic light”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Traffic_light
Supports: Ch 24
Notes: first signals Dec 1868 Parliament Square London (J. P. Knight), exploded 2 Jan 1869; semaphore signals in US in first two decades of 20th c.

C100 - Wikipedia, “United States Numbered Highway System”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/United_States_Numbered_Highway_System
Supports: Ch 22
Notes: approved 11 Nov 1926

C104 - Wikipedia, “Interstate Highway System”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Interstate_Highway_System
Supports: Ch 23, Ch 26
Notes: Authorized 1956; built over the following decades; coast-to-coast, suburbs/freight/malls along the exits.

C105 - Wikipedia, “Reichsautobahn”

Read level: full (writer)

URL: https://en.wikipedia.org/wiki/Reichsautobahn
Supports: Ch 23
Notes: Nazi state built motor-only roads from 1933 as propaganda; Italy's autostrada (1924) predated it.

C106 - Wikipedia, "American system of manufacturing"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/American_system_of_manufacturing
Supports: Ch 16
Notes: Interchangeable parts; federal armouries Springfield/Harpers Ferry; gauges, jigs, precision measurement.

C107 - Wikipedia, "Austin 7"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Austin_7
Supports: Ch 12
Notes: 1922 small car built under licence worldwide; BMW's first car an Austin; influenced early Datsuns.

C108 - Wikipedia, "Citroen Traction Avant"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Citro%C3%ABn_Traction_Avant
Supports: Ch 12
Notes: Andre Citroen's bid to bring Detroit to Paris; development cost broke the company into Michelin's hands.

C109 - Wikipedia, "Mini"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Mini
Supports: Ch 12
Notes: 1959 transverse engine, wheels-at-corners packaging set the small-car template.

C110 - Wikipedia, "Automotive industry in India"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Automotive_industry_in_India
Supports: Ch 31
Notes: Ambassador (Morris) licence era; Maruti-Suzuki after 1991 liberalization; now third-largest market.

C111 - Wikipedia, "Automotive industry in Japan"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Automotive_industry_in_Japan
Supports: Ch 17, Ch 30
Notes: Interwar cottage industry; out-produced the US by 1980; Toyota passed GM as largest maker 2008.

C112 - Wikipedia, "2020-2023 global chip shortage"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/2020%E2%80%932023_global_chip_shortage
Supports: Ch 42
Notes: Pandemic scrambled electronics supply 2020-21; car plants stopped; millions of vehicles of production lost.

C113 - Wikipedia, "Uber"

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Uber
Supports: Ch 40
Notes: Founded 2009; smartphone ride-hailing put a summoned car in every pocket.

C114 - Wikipedia, “History of Tesla, Inc.”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/History_of_Tesla,_Inc.
Supports: Ch 38
Notes: Founded 2003; Roadster, Model S, mass-market Model 3; built the charging network.

C117 - Wikipedia, “Donald Shoup”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Donald_Shoup
Supports: Ch 27
Notes: The High Cost of Free Parking; American cities devote more space to parking cars than to housing people.

C118 - Wikipedia, “Automotive industry in South Korea”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Automotive_industry_in_South_Korea
Supports: Ch 31
Notes: Hyundai first car (Ford licence) 1968, Pony 1975, US exports 1986; Hyundai-Kia among the world’s five largest.

C119 - Wikipedia, “Tire”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Tire
Supports: Ch 14
Notes: Over 2.5 billion tires manufactured annually (recent estimates ~2.3-3 billion/yr).

C120 - Wikipedia, “Volkswagen Beetle”

Read level: full (writer)
URL: https://en.wikipedia.org/wiki/Volkswagen_Beetle
Supports: Ch 12, Ch 31
Notes: Postwar Beetle made Volkswagen the symbol of the German economic miracle.

C121 - SEMI, “Chips in Cars” (blog)

Read level: excerpt (writer)
URL: https://www.semi.org/en/blogs/semi-news/chips-in-cars-china-semiconductor-surge-mussel-inspired-solution-for-rare-earth-elements-from-earth-to-moon-and-everest-in-pennies
Supports: Ch 42
Notes: Average modern car ~1,400-1,500 chips; some up to 3,000.

C29 - Lean Enterprise Institute, “Toyota Production System” lexicon

Read level: full (desk)
URL: https://www.lean.org/lexicon-terms/toyota-production-system/
Supports: Ch 17
Notes: Toyota Production System: built on waste elimination, stop-the-line defect handling, long-term supplier ties.

C30 - Womack, Jones & Roos, The Machine That Changed the World (MIT/IMVP)

Read level: full (desk)
URL: https://web.mit.edu/esd.83/www/notebook/machine.html
Supports: Ch 17
Notes: MIT IMVP study: lean plants used roughly half the assembly hours/space and a fraction of the inventory of mass-production plants, with fewer defects; advantage held across countries; named ‘lean production’.

C44 - Smithsonian, EV1 exhibit

Read level: full (desk)
URL: https://americanhistory.si.edu/explore/exhibitions/ev1-electric-car
Supports: Ch 37
Notes: General Motors EV1 (1996), purpose-built electric car leased then recalled and crushed after the California ZEV mandate was broken.

C61 - The Verge, self-driving timeline

Read level: full (desk)
URL: https://www.theverge.com/24065447/self-driving-car-autonomous-tesla-gm-baidu
Supports: Ch 39
Notes: Self-driving timelines: several car-makers and tech companies promised robotaxis by ~2020; the last few percent defeated the confident timelines.

C11 - OICA, By-country-region-2024 (Oct 2025 release)

Read level: full (main)
URL: https://oica.net/wp-content/uploads/2025/10/By-country-region-2024.pdf
Supports: Ch 29, Ch 31
Notes: All-vehicle 2024 production by country/region (92,504,338 total, Oct basis); supports the global production map and country ranking.

C31 - Krafcik attribution

Read level: excerpt
URL: https://doi.org/10.1080/21573727.2011.641117
Supports: Ch 17
Notes: The term ‘lean’ for the Toyota system was coined by John Krafcik (1988).

C101 - Williams, Haslam & Williams, “Ford versus ‘Fordism’: The Beginning of Mass Production?” Work, Employment & Society 6(4), 1992

Read level: abstract (writer)
URL: https://ideas.repec.org/a/sae/woemps/v6y1992i4p517-555.html
Supports: Ch 9
Notes: Productivity at Ford rose before the moving line was complete; the 1913 single-invention legend obscures a decade of accumulated methods.

C115 - SNE Research, Jan-Dec 2025 global EV battery usage

Read level: excerpt (writer)
URL: https://www.sneresearch.com/en/insight/release_view/586/page/0
Supports: Ch 31, Ch 41
Notes: CATL 464.7 GWh (~39%), BYD 194.8 GWh; CATL+BYD 55.6%; global total 1,187 GWh.

C122 - National Traffic and Motor Vehicle Safety Act (1966)

Read level: full
URL: https://en.wikipedia.org/wiki/National_Traffic_and_Motor_Vehicle_Safety_Act
Supports: Ch 32
Notes: Enacted 1966; first mandatory federal safety standards for motor vehicles; created the National Highway Safety Bureau, now NHTSA.

C123 - Wikipedia, “Amazon rubber cycle”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Amazon_rubber_cycle

Supports: Ch 13, Ch 14
Notes: boom c.1879-1912; Manaus made then broken by the shift to plantation rubber; Wickham smuggled 70,000 seeds 1876 via Kew to Ceylon/Malaya; Southeast Asian plantations undercut the wild forest rubber.

C124 - Wikipedia, “Synthetic rubber”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Synthetic_rubber
Supports: Ch 13, Ch 14
Notes: first synthetic rubber (Hofmann/Bayer isoprene) 1909; Buna 1935; by mid-1942 the Axis held nearly all natural-rubber supply (Malaya, East Indies); US synthetic production expanded greatly during WWII from almost nothing; SBR (styrene-butadiene) the most prevalent type; about two-thirds of rubber is now synthetic.

C125 - Wikipedia, “Diesel engine” (the Diesel car article redirects here)

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Diesel_engine
Supports: Ch 21
Notes: 1935 Daimler-Benz OM 138, the first mass-produced diesel engine for passenger cars; 1936 Mercedes-Benz 260 D, the first mass-produced passenger car with a diesel engine; Reif (2012): EU diesel cars about half of new registrations at the time; diesel the highest thermal efficiency of practical ICEs; car adoption from the 1930s.

C126 - Wikipedia, “Controlled-access highway”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Controlled-access_highway
Supports: Ch 23
Notes: Italy first to connect cities with motor-vehicle-only highways: first autostrada A8 Milan-Varese (Autostrada dei Laghi) opened 1924; Preston By-pass (M6) 1958 the UK’s first motorway; Long Island Motor Parkway 1908 the world’s first limited-access roadway (private).

C127 - Wikipedia, “Expressways of China”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Expressways_of_China
Supports: Ch 23
Notes: first expressway Shanghai-Jiading opened 31 Oct 1988; passed the US Interstate system’s length in 2011; 184,000 km by end-2023, the world’s largest.

C128 - Wikipedia, “Southdale Center”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Southdale_Center
Supports: Ch 26
Notes: opened 8 Oct 1956, Edina, Minnesota; first fully enclosed, climate-controlled shopping mall in the United States; architect Victor Gruen. US-first per the source; commonly cited as the world’s first enclosed mall.

C129 - Wikipedia, “Levittown”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Levittown
Supports: Ch 26
Notes: Levitt & Sons post-WWII mass suburbs for returning veterans; VA and FHA backed purchase financing; assembly-line construction in 27 steps, a house a day; first sales March 1947. Caveat: racial covenants excluded non-White buyers - the ms’s ‘segregation sorted by zoning and mortgage policy’ stands on this history.

C130 - US EPA, “Greenhouse Gas Emissions from a Typical Passenger Vehicle”

Read level: full (desk)
URL: https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
Supports: Ch 34
Notes: 8,887 g CO2 per US gallon of gasoline (about 2.35 kg/L); 10,180 g for diesel; typical vehicle about 4.6 t CO2/yr (22.2 mpg, 11,500 mi/yr). The ms’s earlier ‘two and a half kilograms’ overstated this; corrected to two and a third.

C131 - Wikipedia, “Cheonggyecheon”

Read level: full (desk)
URL: https://en.wikipedia.org/wiki/Cheonggyecheon
Supports: Ch 35
Notes: elevated highway over the covered stream opened in stages 1969-1976; removal begun 2003 under Mayor Lee Myung-bak; stream restored 2005 (about US$281M); traffic sped up after removal - cited as a real-life Braess’s paradox; downtown car entries fell 2.3% while bus and subway use rose.

C132 - US DOE, FOTW #1356 (19 Aug 2024), “Household Vehicles Were Parked 95% on a Typical Day in 2022”

Read level: full (desk)
URL: https://www.energy.gov/cmei/vehicles/articles/fotw-1356-august-19-2024-household-vehicles-were-parked-95-typical-day-2022
Supports: Ch 40
Notes: US household vehicles driven 64.6 min on a typical day in 2022, parked the remaining 95% (FHWA 2022 National Household Travel Survey).