

## APPENDIX A—ENERGY TIMELINE

15 billion B.C.	The Big Bang
500,000 B.C.	Peking man uses fire for warmth, protection, and food preparation.
6,000 B.C.	Cattle are domesticated in Southwest Asia, India, and possibly in North Africa.
5,500 B.C.	Copper is smelted in the Middle East.
4,500 B.C.	The ox-drawn plow is invented in Mesopotamia.
4,200 B.C.	Bronze production begins in what is now western Iran.
4,000 B.C.	The horse is domesticated in the Ukraine.
3,500 B.C.	Egyptians invent the sail.
3,200 B.C.	The first known wheeled vehicles are used in Sumer (now Iraq).
2,600 B.C.	<ul style="list-style-type: none"> <li>- First-known glass is made in Mesopotamia and used for jewelry beads.</li> <li>- Earliest known use of fired bricks for constructing in Indus Valley.</li> </ul>
1,000 B.C.	Coal is used in China.
600 B.C.	Thales, a Greek philosopher, produces static electricity by rubbing a piece of amber. The Greek word for amber is "electra."
550 B.C.	A method of mass-producing cast iron is invented in China.
425 B.C.	Democritus, a Greek philosopher, theorizes that all matter is made of tiny particles that he calls "atoms."
400 B.C.	<ul style="list-style-type: none"> <li>- An oil well is dug on an island in the Ionian Sea, and the oil is used in lamps.</li> <li>- The horse collar is invented in China and is a major boost to agriculture.</li> </ul>
285 B.C.	A lighthouse is built at Alexandria in Egypt. The light from a fire is projected by the lighthouse mirror and can be seen 30 miles away.

100 B.C.	- Waterwheels are used in what is now central Turkey. - Single-wheeled carts (or wheelbarrows) are invented in China.
65 B.C.	Windmills are used in Greece.
60 A.D.	Hero, a scientist from Alexandria in Egypt, describes a crude steam engine in his writings.
100	Pliny, a Roman senator, writes that oil from the island of Sicily is burned in lamps in the Temple of Jupiter. This is the earliest mention of petroleum being used as an illuminant.
250	The waterwheel is introduced in China.
600	Water mills are in use in France and Switzerland.
760	A waterwheel is used in England to mill grain.
900	Basques hunt whales for their oil, although pictures carved in rocks in Norway thousands of years ago suggest that Norwegians may have been the first whalers.
1000	Oil wells are drilled in Burma.
1005	Eilmer, a Benedictine monk, flies a glider for six hundred feet from a tower of an English abbey.
1013	Natural gas wells are drilled in China. The gas flows through bamboo tubes (the first known "pipelines") and may have been used in the manufacture of porcelain.
1044	Wu Ching Tsao Yao of China writes the first known recipe for making saltpeter, the principle ingredient of gunpowder.
1180	Coal is first mined systematically in England.
1226	Coal is being transported from northeast England to London for use in heating.
1232	Hot-air balloons are invented in China.
1267	Roger Bacon theorizes that air could support a craft in the same manner in which water supports a boat.
1280	The belt-driven spinning wheel is brought to Europe from India.
1295	Marco Polo returns to Venice and describes the use of petroleum and coal in China.
1340	Wind-driven pumps are used to drain Dutch marshlands.
1415	The first regular street lighting is installed in London, England.

1472–1519	Italian Leonardo da Vinci sketches plans for a centrifugal pump, bicycle, rope-and-belt drive, beveled gears, spiral gears, universal joint, flying machine, helicopter, air screw or propeller, and a parachute (among other inventions) in his notebooks.
1474	At Nuremberg, compressed air is used to force wine from one cask to another. This is the first known use of compressed air to move materials.
1556	Georg Bauer (a.k.a., Agricola) publishes <i>De Re Metallica</i> , a treatise of mining and metallurgy.
1600	<ul style="list-style-type: none"><li>- England faces a shortage of timber and wood for fuel.</li><li>- English physician William Gilbert publishes <i>De Magnete</i> (“Concerning Magnetism”). Gilbert is credited with discovering how to make magnets and with coining the term “magnetic pole.”</li></ul>
1623	In Wurttemberg (now Germany), Wilhelm Schickard creates a mechanical calculator capable of adding, subtracting, multiplying, and dividing.
1624	An experimental submarine travels two miles between Westminster and Greenwich.
1640	An oil well is completed in Italy. Kerosene from the oil is used for lighting.
1641	French scientist Blaise Pascal invents a mechanical adding machine.
1650	Otto von Guericke, a German scientist, invents a vacuum pump.
1662	Irish scientist Robert Boyle formulates his laws of gas expansion.
1665–66	Isaac Newton develops calculus, the concept of force, the laws of motion, the Universal Law of Gravitation, and many of the laws of optics.
1668	John Wallis discovers the principle of conservation of momentum.
1673	In Germany, Gottfried von Leibniz invents a calculating machine.
1678	The wave theory of light is first suggested by Dutch mathematician Christiaan Huygens.
1680–90	Christiaan Huygens in France and Denis Papin in Holland experiment with pistons, activity that would lead to the internal combustion engine two centuries later.

1687	Isaac Newton publishes <i>Principia Mathematica</i> , which describes the natural laws governing the physical universe.
1691	In England, Robert Boyle discovers that by heating coal he can produce a flammable gas.
1694	Oil is produced in England by heating oil shale.
1698	Thomas Savery patents the first practical steam engine in England to pump water from mines.
1705–12	Thomas Newcomen, another Englishman, develops better, more efficient steam pumps.
1714	Gabriel Fahrenheit, a German scientist, invents the mercury thermometer.
1723	Peter the Great, Tsar of Russia, grants mineral rights in the Baku area to private individuals who dig wells by hand and produce oil.
1730	An alcohol thermometer is invented in France by Rene Reaumur.
1738	<i>Hydrodynamics</i> , a book written by Swiss mathematician, Daniel Bernoulli, describes the relationship between the velocity of fluid flow and pressure.
1745	In Holland, Pieter van Musschenbrock invents the Leyden jar for storing electrical charges.
1746	John Roebuck, a British chemist, develops a process for manufacturing sulfuric acid—one of the most important industrial chemicals.
1747–52	Benjamin Franklin's experiments with electricity lead to the invention of the lightning rod and to the theory that the various forms of electricity are a single "fluid." Franklin also deduces the existence of positive and negative electrical charges.
1749	Coal is first mined in the United States at Richmond Basin, Virginia.
1760	A new blast furnace that allows iron ore to be smelted by coal instead of wood is introduced in England.
1765	Scotsman, James Watt, improves the steam engine by adding a separate condenser.
1767	- Whale-oil lamps are used to light the streets of Philadelphia. - English chemist and physicist Henry Cavendish discovers that hydrogen is a component of water.

1769	<ul style="list-style-type: none"> <li>- James Watt patents the first steam engine efficient enough for uses other than pumping.</li> <li>- Nicolas Cugnot of France builds a three-wheeled steam-powered vehicle.</li> </ul>
1774	French chemist Antoine Lavoisier demonstrates that mass is conserved in chemical reactions.
1782	James Watt patents the double-acting steam engine.
1783	<ul style="list-style-type: none"> <li>- In Paris, brothers Joseph and Jacques Montgolfier make the first manned flight—a hot-air balloon ascension.</li> <li>- Jacques Charles, a French physicist, performs the first manned flight of a hydrogen balloon.</li> <li>- Also in France, engineer Glaude de Jouffroy d'Abbans constructs a full-sized paddle-wheel steamboat.</li> </ul>
1784	James Rumsey, an American engineer, experiments with a model steamboat. George Washington witnesses some of Rumsey's experiments.
1785	William Murdock, a Scottish engineer, invents the first oscillating engine.
1787	American John Fitch launches the first workable steamboat.
1788	Fitch makes a 20-mile trip in his steamboat on the Delaware River from Philadelphia to Burlington.
1789	French chemist Antione Lavoisier describes his theory of combustion in <i>Elementary Treatise on Chemistry</i> .
1790	Anthracite coal is first mined in Pennsylvania.
1792	William Murdock produces coal gas and uses it to light his home in Redruth, Cornwall.
1797	Benjamin Thompson illustrates the mechanical equivalence of heat. <sup>304</sup>
1799	Italian physicist Alessandro Volta invents the voltaic pile, the first electric battery.
1800	Infrared light is discovered in England by astronomer William Herschel.
1801	Johann Ritter discovers ultraviolet light in Germany.
1802	A high-pressure steam engine is invented by British engineer Richard Trevithick.

<sup>304</sup>Thompson's nationality is a bit difficult to pin down, largely because of his apparently limitless ability to antagonize everyone around him. He was born in America, but became a spy for the British during the Revolutionary War, and was forced to flee to England in 1775. Later, suspected of spying for France, he again fled—this time to Germany. After making powerful enemies there, he returned to England.

- 1803
  - In Scotland, coal gas is used to light a factory for the first time.
  - The streets of Italian cities Parma and Genoa are lit by kerosene from an oil well in Modena.
- 1804 Richard Trevithick operates the first rail steam locomotive.
- 1806 In Newport, Rhode Island, David Melville uses gas lighting in his house.
- 1807 In America, Robert Fulton's *Claremont*, the first commercially successful steamboat, travels up the Hudson river from New York City to Albany, a distance of 150 miles, in 32 hours.
- 1809 Gas streetlights are installed in Pall Mall, London.
- 1814
  - In England, George Stephenson's locomotive pulls the first train of cars.
  - *The Blucher*, another steam locomotive, is built by British engineer George Stephenson.
- 1816
  - A museum in Baltimore, Maryland is illuminated with gaslights.
  - Robert Stirling, a Scottish scientist, invents an external combustion engine.
- 1817 The Gas Light Company of Baltimore is incorporated, becoming the first gas company in the United States.
- 1819 Danish physicist and chemist Hans Christen Oersted discovers that an electrical current moving through a wire causes a magnetic effect on the environment surrounding the wire.
- 1820 French physicist Andre Ampere establishes the science of electromagnetism.
- 1821 Building on the work of Oersted, Englishman Michael Faraday discovers the principles of the electric motor.
- 1822
  - Charles Babbage, an English mathematician, creates "Difference Engine No. 1," considered the first mechanical computer.
  - The French scientist, Jean Fourier, publishes his theory of heat conduction.
- 1823 In London, Samuel Brown creates and runs a gas-vacuum (internal combustion) engine.
- 1824
  - English scientist Sir Humphry Davy describes the principle of cathodic protection. Used to keep pipelines

- from corroding, the first wide-scale application of this technique occurs 105 years later in New Orleans, Louisiana.
- Sadi Carnot, a French engineer, publishes *On the Motive Power of Fire*, a book that establishes the foundations of Thermodynamics.
- 1825
- The first regularly operating steam railroad begins running in England.
  - Natural gas is used for illumination for the first time in Fredonia, New York, after a pipeline was laid from a gas well to a house.
  - Hans Oersted discovers how to produce aluminum.
- 1827
- Goerg Ohm publishes his law of electrical voltage and current in Germany.
- 1828
- Gaslights illuminate New York City's Great White Way.
- 1830–40
- The golden age of whaling along the U.S. East Coast.
- 1830
- The inaugural trip of George Stephenson's steam locomotive, *Rocket*, and seven sister engines on the Liverpool and Manchester Railroad, marks the beginning of real commercial rail transportation.
  - A steam locomotive is placed in regular passenger and freight service in Charleston, South Carolina.
- 1831
- Michael Faraday discovers that a moving magnet induces a current in a coil of wire—the principle of the electric generator.
  - American physicist Joseph Henry publishes a description of an electric motor.
  - The first American coal-fired steam locomotive is tested in York, Pennsylvania.
- 1832(?)
- Scotsman Robert Davidson builds an electric car capable of speeds of up to four miles per hour.
- 1835
- American inventor Thomas Davenport builds an electric automobile.
- 1836
- In America, Samuel F. B. Morse invents the telegraph.
- 1838
- Britain's *Sirius* becomes the first vessel to cross the Atlantic under steam power alone (an American ship, *Savannah*, crossed the Atlantic in 1819 using both steam and wind power).

- Ruben Drake drills a 1011-foot brine well in Louisiana, probably the first use of a rotary drilling rig.
- 1839
  - British physicist William R. Grove invents the fuel cell.
  - Edmund Becquerel, a French physicist, discovers the photovoltaic effect.
- 1843
  - James Joule, an English brewer, demonstrates the conservation of energy (the First Law of Thermodynamics) in a series of experiments.
- 1844
  - On May 24, the first telegraph message is sent—from Washington, D.C. to Baltimore.
  - A patent is granted to Englishman Robert Beart for a rotary drilling machine that uses hollow drill rods and a circulating fluid to remove cuttings.
- 1845
  - In America, whale oil lubricant costing \$1.30 a gallon competes with rock oil priced at only \$0.75 a gallon.
- 1848
  - Robert Mallet proposes the concept of seismic mapping to the Royal Irish Academy. He suggests that by setting off a charge of gunpowder, an “earthquake wave” can be set in motion that could be recorded by suitable instruments miles away so as to survey and map “formations constituting the land . . . [and the] bottom of the great ocean.”
  - The first gaslight is turned on at the White House.
- 1850
  - German physicist Rudolf Clausius publishes the first clear statement of the Second Law of Thermodynamics.
  - A Pennsylvania canal boat operator, Samuel Kier, invents a process of distilling petroleum to obtain an illuminant he calls “carbon oil.”
  - George P., an American scientist, builds an electric locomotive.
  - The first submarine telegraph cable is laid between England and France.
- 1853
  - In Pittsburgh, chemist Abraham Gesner produces an improved illuminating oil from coal that he calls “kerosene.”
  - In Cincinnati, Alexander Latta invents the first practical, steam fire engine.
- 1855
  - Benjamin Silliman, a chemist in Connecticut, obtains tar, gasoline, and a number of solvents by distilling petroleum.



- Abraham Gesner patents a process for extracting kerosene from bituminous shale and coal.
- In Germany, chemist Robert Wilhelm Bunsen patents the bunsen burner, now commonly used in laboratories to produce heat.
- 1856 - On Long Island, Abraham Gesner's New York Kerosene Company begins manufacturing kerosene as an illuminant. Its price is advertised as being one-seventh that of sperm oil.
- 1857 French physicist Alexandre Becquerel experiments with fluorescent lighting, coating electric discharge tubes with luminescent materials.
- 1859 - Edwin Drake drills the first commercially productive oil well at Titusville, Pennsylvania. His 69'-6" deep well marks the start of the oil industry in America. Petroleum kerosene soon replaces whale oil as the primary fuel for lamps.
- In Washington, D.C., George Simpson patents the first electric range.
- 1860 - Luxembourg's Jean Joseph Etienne Lenoir develops an internal combustion engine fueled by benzene.
- The Pennsylvania Railroad uses gas to light a passenger car.
- French civil engineer Rodolphe Leschot uses a power-driven rotary drill with a diamond-studded bit.
- English engineer and inventor Sir Henry Bessemer introduces the first successful method of making steel in quantity at low cost. The Bessemer Process is key to the expansion of the railroads, the construction of steel bridges and buildings, and the manufacture of automobiles.
- English physicist Joseph Swan demonstrates a working, though not yet practical, light bulb.
- 1861 In America, a transcontinental telegraph line is completed.
- 1862 John D. Rockefeller builds an oil refinery in Cleveland, Ohio.
- 1865 Samuel Van Syckel of Titusville, Pennsylvania, builds and operates the first crude oil pipeline.
- 1866 American Cyrus Field lays the first transatlantic telegraph cable.

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| 1869 | <ul style="list-style-type: none"> <li>- The Transcontinental Railroad is completed in America.</li> <li>- The first pneumatic subway begins operations in New York City.</li> <li>- In Russia, scientist Dmitri Mendeleyev introduces the periodic table of the elements in his treatise, <i>Principles of Chemistry</i>.</li> </ul>                                       |
| 1872 | The first long distance natural gas pipeline, running five miles from Newton Wells to Titusville, Pennsylvania, is put into service.  |
| 1873 | <ul style="list-style-type: none"> <li>- James Clerk Maxwell, a Scottish physicist, publishes <i>Electricity and Magnetism</i>. The book contains Maxwell's famous four equations that mathematically describe the nature of electromagnetic radiation.</li> <li>- American paleontologist J. S. Newberry presents an organic theory of the origin of petroleum.</li> </ul> |
| 1875 | <ul style="list-style-type: none"> <li>- A Scottish immigrant to America, Alexander Graham Bell, invents the telephone.</li> <li>- In Austria, Siegfried Marcus invents an internal combustion engine.</li> <li>- A building in France is illuminated with electric lighting.</li> </ul>  |
| 1876 | <ul style="list-style-type: none"> <li>- Nicholas Otto of Germany incorporates the principles of ignition, combustion, and cooling to construct a four-cycle internal combustion engine.</li> <li>- Also in Germany, Carl von Linde patents the ammonia compression refrigerator.</li> </ul>  |
| 1877 | <ul style="list-style-type: none"> <li>- Thomas Edison invents the phonograph.</li> <li>- Ludwig Boltzmann, an Austrian physicist, publishes his formulas linking kinetic energy and temperature.</li> </ul>  |
| 1878 | <ul style="list-style-type: none"> <li>- In England, Joseph Swan patents the first electric incandescent electric light bulb.</li> <li>- American Charles Brush invents the electric arc lamp.</li> <li>- The first hydroelectric dam in the United States is built at Niagara Falls.</li> </ul>  |
| 1879 | <ul style="list-style-type: none"> <li>- Carbon-arc lamps light the streets of Cleveland, Ohio.</li> <li>- In the United States, Thomas Edison patents an incandescent light bulb.</li> </ul>   |
| 1880 | In Rixford, Pennsylvania the Bradford Gas Company begins using the first natural gas compressor. The du-  |

- plex compressor is driven by a 580-horsepower steam engine.
- 1881 - The first commercially successful electric car is introduced in Europe.  
- The Edison Machine Works in New York City builds the first commercially successful generator, a direct current unit weighing 27 tons.
- 1883 - American inventor Charles Fritts describes the first selenium wafer solar cells.  
- Baseball is first played under electric lights in Fort Wayne, Indiana.
- 1884 - In Germany, Paul Nipkow proposes the first practical television system.  
- Also in Germany, Carl Auer von Welsbach develops the Welsbach mantle at the Robert Bunsen laboratory. The new mantle enables the use of low-Btu gas for illumination.  
- Charles Parsons patents a steam turbine in England.
- 1885 Gottlieb Daimler and Karl Benz of Germany, working separately, invent gasoline engines similar to those still used today. Benz uses his engine to power a three-wheeled carriage, while Daimler builds a two-wheeled motorcycle.
- 1886 - Americans George Westinghouse and William Stanley perfect the transformer, a device that raises or lowers the voltage of alternating current and makes long distance power transmission feasible.  
- The first alternating current power plant goes into operation in Barrington, Massachusetts.  
- American scientist Charles Hall invents a process for using electrolysis to obtain aluminum from bauxite.
- 1888 Charles Bradley invents the rotary AC/DC converter.
- 1889 - Herman Hollerith receives a U.S. patent for his tabulating machine, a forerunner of the modern computer.  
- German physicist Heinrich Rudolf Hertz develops the electromagnetic theory of light.  
- In America, the Fuel Gas and Electric Engineering Company introduces the Automatic gas water heater.

1890s	Solar water heaters are commercialized in the United States and remain competitive until the 1940s and 1950s.
1890	In America, S. R. Dresser invents pipe couplings to make pipeline joints seal completely.
1891	<ul style="list-style-type: none"> <li>- In the United States, Nikola Tesla, a Croatian immigrant, invents the Tesla coil widely used today in radios, television sets, and other electronic equipment.</li> <li>- The first natural gas pipeline to span a distance of more than 100 miles is built between gas fields in Indiana and Chicago, Illinois.</li> <li>- William Morrison builds the first American electric automobile.</li> </ul>
1892	<ul style="list-style-type: none"> <li>- German engineer Rudolf Diesel patents the diesel engine.</li> <li>- Charles and Frank Duryea of Springfield, Massachusetts, build and operate the first gasoline-powered automobile in the United States.</li> <li>- Gasoline-powered cars are produced in Paris for the European market.</li> </ul>
1893	<ul style="list-style-type: none"> <li>- German physicists Julius Elster and Hans Geitel invent the photoelectric cell.</li> <li>- Westinghouse uses Nikola Tesla's alternating current systems to light the World's Columbian Exposition in Chicago.</li> </ul>
1894	<ul style="list-style-type: none"> <li>- In Germany, Russian born chemist Wilhelm Ostwald formulates the principle behind the fuel cell.</li> <li>- Standard Oil of New York begins marketing kerosene in China. Because kerosene will not burn properly in native lamps, Standard Oil manufactures millions of small tin lamps with glass chimneys and gives them away or sells them at prices that the poorest peasant can afford.</li> <li>- Union Oil successfully uses fuel oil to power Southern Pacific and Santa Fe steam locomotives.</li> </ul>
1895	<ul style="list-style-type: none"> <li>- Basing his work on that of Nikola Tesla, Guglielmo Marconi transmits the first radio signals.</li> <li>- Physicist Wilhelm Konrad Roentgen of Germany discovers X-rays.</li> <li>- The first auto race in the United States. Sponsored by the <i>Chicago Times-Herald</i>, the race is won by the Duryea "motor wagon."</li> </ul>

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| 1896      | <ul style="list-style-type: none"><li>- French physicist Antoine Henri Becquerel announces his discovery of radioactivity. The discovery occurs when radiation from a specimen of uranium left atop an unexposed piece of photographic film partially exposes the film.</li><li>- Henry Ford introduces his first automobile.</li><li>- The first offshore oil drilling in the United States is done from piers at Summerland, California.</li><li>- A Westinghouse-Tesla hydropower plant delivers electricity to Buffalo, New York.</li></ul> |
| 1897      | <ul style="list-style-type: none"><li>- British physicist J. J. Thompson discovers the electron.</li><li>- Manufacture of the Stanley Steamer automobile begins, and continues until 1924.</li></ul>  |
| 1898      | <p>In France, Polish chemist Marie Curie, assisted by her husband Pierre, isolates radium, the first radioactive element to be discovered.</p>  |
| 1899–1904 | <p>Ernest Rutherford, an English physicist, makes fundamental discoveries about the nature of radioactivity.</p>  |
| 1900      | <ul style="list-style-type: none"><li>- In Germany, Count Ferdinand von Zeppelin flies the first dirigible airship.</li><li>- Packard builds a car that uses a steering wheel instead of a tiller.</li></ul>  |
| 1901      | <ul style="list-style-type: none"><li>- Oil drilling begins in Persia (now Iran).</li><li>- The first salt-dome oil discovery is made at Spindletop, a small knoll south of Beaumont, Texas.</li><li>- Marconi transmits a Morse Code message across the Atlantic.</li><li>- American, Peter Hewitt patents the first mercury vapor lamp.</li></ul>   |
| 1902      | <ul style="list-style-type: none"><li>- Oil is found in Alaska.</li><li>- The Southern Pacific and the Santa Fe railroads convert from coal to fuel oil.</li></ul>  |
| 1903      | <ul style="list-style-type: none"><li>- The Wright Brothers fly the first engine-powered airplane near Kitty Hawk, North Carolina. Their machine flies for 59 seconds, reaching an altitude of 852 feet.</li><li>- The first large-capacity steam-turbine electric generator is placed in service in Chicago, Illinois.</li><li>- The first transcontinental automobile trip is made from San Francisco to New York. The trip begins on May 23 and ends on August 1.</li></ul>  |

- H. R. Decker patents the blowout preventer, a device that shuts in an oil well in the event of an otherwise uncontrollable release of oil or gas from the well.
- 1904
  - Albert Einstein publishes his special theory of relativity and a paper on the photoelectric effect.
  - In England, John Fleming invents the diode thermionic valve (or "vacuum tube")
  - American William Vanderbilt sets a new land speed record of more than 76 mph in a gasoline-powered car. Previously, all records have been set by steam and electric automobiles.
  - The New York subway begins operations. It is the first rapid transit underground (and underwater) railway in the world.
  - Geothermal steam is first used on an industrial scale in Italy.
- 1905
  - In Germany, chemist Hermann Nernst develops the Third Law of Thermodynamics.
  - Drive-in automobile service stations open in St. Louis.
- 1908
  - Henry Ford introduces the Model T.
- 1909
  - The U.S. Navy announces a program to convert its ships from burning coal to fuel oil.
  - Hughes Tool Company of Houston, Texas, introduces a "rock bit" that better penetrates rock to speed drilling.
  - Frenchman Louis Bleriot flies across the English Channel.
- 1910
  - In France, physicist and chemist Georges Claude invents the neon light.
  - The first self-contained electric washing machine is patented.
- 1911
  - Dutch physicist Heike Kamerlingh-Onnes discovers superconductivity in a sample of mercury chilled to a temperature of 4° Kelvin.
  - In the United States, Willis Carrier patents the first air conditioner.
- 1912
  - In Normandy, France, Conrad Schlumberger uses electrical measurements to map underground rock formations. Schlumberger's work builds upon seismic wave technology begun in 1885.

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| 1913 | <ul style="list-style-type: none"><li>- The world's first geothermal power plant begins operating in Italy.</li><li>- William Burton with Standard Oil of Indiana patents a thermal cracking process for refineries that will significantly increase the amount of gasoline that can be made from a barrel of oil.</li><li>- Electricity is first used to pump oil out of production wells.</li><li>- The U.S. Navy commissions the U.S.S. Jupiter, its first electrically propelled ship.</li></ul> |
| 1914 | American Robert H. Goddard patents a liquid-fuel rocket.   |
| 1915 | Albert Einstein publishes his general theory of relativity.  |
| 1918 | <ul style="list-style-type: none"><li>- Van der Gracht, with Royal Dutch Shell, introduces the diamond core-drill.</li><li>- The Texas Company (Texaco) develops the Holmes-Manley Process, the first commercially successful continuous process for synthesizing gasoline from heavy oil.</li></ul>   |
| 1919 | Englishmen John Alcock and Arthur Brown make the first non-stop transatlantic flight from Newfoundland to Ireland.   |
| 1920 | Radio broadcasting begins in Pittsburgh, Pennsylvania.   |
| 1925 | Seamless pipe is developed, allowing the construction of large-diameter natural gas pipelines capable of operating at higher pressures.  |
| 1926 | <ul style="list-style-type: none"><li>- Television is demonstrated in London by Scottish engineer John Baird.</li><li>- American Robert Goddard launches the first liquid-fueled rocket.</li></ul>   |
| 1927 | Charles Lindbergh becomes the first person to fly solo nonstop across the Atlantic Ocean.  |
| 1928 | In America, Vladimir Zworykin patents a color television system.   |
| 1929 | The Schlumberger company produces the first well logs in the United States.  |
| 1930 | Eugene Houdry, an American engineer, invents the catalytic process for "cracking" crude oil. This process breaks long hydrocarbon chains to convert heavy crude into lighter oil.  |

1931–36	The construction of Hoover Dam, near Las Vegas, Nevada, is completed. The dam's hydroelectric power plant is the first such facility to produce one million kilowatts.
1935	Fluorescent lights are developed independently by scientists in Germany and the United States.
1936	British mathematician Alan Turing develops the mathematical theories behind computing.
1937	<ul style="list-style-type: none"> <li>- The first commercial catalytic cracking refinery goes on stream at Marcus Hook, Pennsylvania.</li> <li>- In England, engineer Frank Whittle builds the first jet engine.</li> </ul>
1938	Two German physicists, Otto Hahn and Fritz Strausman, split a uranium atom by bombarding it with a neutron (fission).
1939	<ul style="list-style-type: none"> <li>- Germany makes the first successful flight of a jet-powered airplane.</li> <li>- Russian-American engineer Igor Sikorsky makes the first helicopter flight.</li> <li>- In the United States, John Vincent Atanasoff and Clifford Berry design the first digital electronic computer.</li> <li>- For the first time electric power is generated by cosmic rays. The current is used to power lights at the 1939 World's Fair in Flushing Meadows, New York.</li> </ul>
1942	The first controlled nuclear fission chain reaction occurs at the University of Chicago under the direction of physicist Enrico Fermi.
1943	Max Newman and Tommy Flowers, wartime code breakers at England's Bletchley Park, design and build Colossus, the first true programmable electronic computer.
1945	<ul style="list-style-type: none"> <li>- The first atomic bomb explodes in a test at White Sands, New Mexico. Bombs dropped on Hiroshima and Nagasaki soon thereafter bring World War II to an end.</li> <li>- Percy Spencer patents the microwave oven in the United States.</li> </ul>
1946	At the University of Pennsylvania, John Mauchly and J. Presper Eckert complete ENIAC (electronic numerical integrator and computer). Because of the secrecy that surrounded Colossus (built in England in 1943),



- ENIAC is long thought to be the first true electronic computer.
- 1947
    - At Bell Labs, engineers John Bardeen, Walter Brattain, and William Shockley create the transistor.
    - Oil is discovered in the Gulf of Mexico off the coast of Louisiana.
  - 1950
    - Russians Yevgenyevich Tamm and Andrei Sakharov propose the tokamak, a toroidal plasma confinement device for use in a fusion reactor.
  - 1951
    - Electricity is first generated from atomic power by a government-owned test reactor near Idaho Falls, Idaho.
    - UNIVAC I, the first commercial computer, is built by Eckert and Mauchly.
  - 1953
    - The Union Pacific Railroad puts the first gas turbine, propane-fueled locomotive into service.
    - An Wang, an American engineer, invents magnetic core computer memory.
  - 1954
    - In the Soviet Union, the first practical atomic power station begins operation.
    - The U.S. Navy launches the *Nautilus*, the first atomic submarine.
    - Charles Townes creates the maser (microwave laser) at Columbia University in New York.
    - D. M. Chapman, C. S. Fuller, and G. L. Pearson with AT&T develop the solar cell.
    - Abraham van Heel of the Technical University of Delft in Holland and Harold Hopkins and Narinder Kapany of the Imperial College in London, separately announce imaging bundles (fiber optics) in the British scientific journal, *Nature*.
  - 1957
    - Russia puts Sputnik I, the first man-made satellite, into orbit.
    - Sputnik II carries a dog into orbit.
  - 1958
    - Jack Kilby, a young engineer with Texas Instruments, creates the first integrated circuit.
    - Americans Arthur Schawlow and Charles Townes publish a paper proposing the laser.
  - 1959
    - In the United States, the world's first nuclear-powered merchant ship, the *Savannah*, is launched.

- Robert Noyce, with Fairchild Semiconductors, creates the first practical integrated circuit.
- The Texas Company's Port Arthur refinery becomes the first computer-operated refinery in the United States.
- 1960
  - The first commercial nuclear power plant goes online in Rowe, Massachusetts.
  - Theodore Maiman builds the first optical laser at Hughes Research Labs in California.
  - Geothermal steam is used in Geysers, California to produce electricity. This marks the first time that geothermal power is commercially produced in the U.S.
- 1961
  - Russian cosmonaut Yuri Gagarin becomes the first human being in space.
  - Shell Canada begins *in situ* petroleum extraction from Canada's vast Athabascatar sands.
- 1962
  - American Nick Holonyak, Jr., invents the LED (light-emitting diode).
  - R. N. Hall with General Electric creates the semiconductor laser.
  - NASA places Relay I, the first active communications satellite, into orbit. The satellite was built by RCA.
- 1963
  - German-born American Herbert Kroemer and Russian Zhores Alferov propose a theory that will become the basis for solid-state lasers.
- 1964
  - In Japan, high-speed "bullet" trains go into service. The trains travel at speeds of up to 200 km/hr (125mph).
- 1966
  - The first superconducting motor is created.
  - The first gas-dynamic laser is successfully operated at the Avco Everett Research Lab.
  - Luna 9, a Russian probe, lands on the Moon.
  - In Great Britain, engineers Charles Kao and George Hockham invent fiber-optic telephone cable.
- 1968
  - Oil is discovered at Prudhoe Bay on Alaska's North Slope. With reserves of 10 billion barrels, it is America's largest oil field.
- 1969
  - American astronauts Neil Armstrong and Edwin Aldrin land on the Moon.
- 1970
  - The first major oil find is made in the U.K. North Sea. The Forties field, discovered by British Petroleum, opens

	the way for the North Sea to become one of the world's leading oil producing areas.
	- Corning Glass Works (now Corning Inc.) announces the first communications-quality fiber optics.
	- Boeing 747 jumbo jets begin making commercial flights.
1971	In America, Ted Hoff invents the microprocessor.
1972	Carbon dioxide is pumped into an oil reservoir at Sacroc, Texas to increase production.
1973	American computer scientist Vinton Cerf develops the Internet and Transmission Control Protocols (TCP).
1973–74	M. E. Trostle, Milo Backus, and Robert Graebner perform the first three-dimensional seismic survey in southeast New Mexico.
1975	- British engineers design the first floating petroleum production platform in the North Sea. - Personal computers, in kit form, are sold in the United States.
1979	In Japan, liquid crystal display (LCD) television is developed.
1980	- The first solar-cell power plant is dedicated at Natural Bridges National Monument in Utah and produces 100 kilowatts. - General Electric patents a microbe that can help clean up oil spills.
1984	A cellphone network begins operating in Chicago, Illinois.
1986	IBM scientists discover the first of a new class of high-temperature superconductors.
1989	English computer scientist Timothy Berners-Lee develops the World Wide Web.
1991	Energy is produced by controlled nuclear fusion at the Joint European Torus in Britain.
1992	- COBE, an American satellite, discovers evidence for the Big Bang—"ripples" in background microwave radiation. - In Japan, a propellerless ship driven by magnetohydrodynamics is launched.
1993	The first plasma laser is built.
1994	The "Chunnel," a tunnel linking France and England built under the English Channel, is opened.
1995	Laser diodes break the 1-watt power barrier.

