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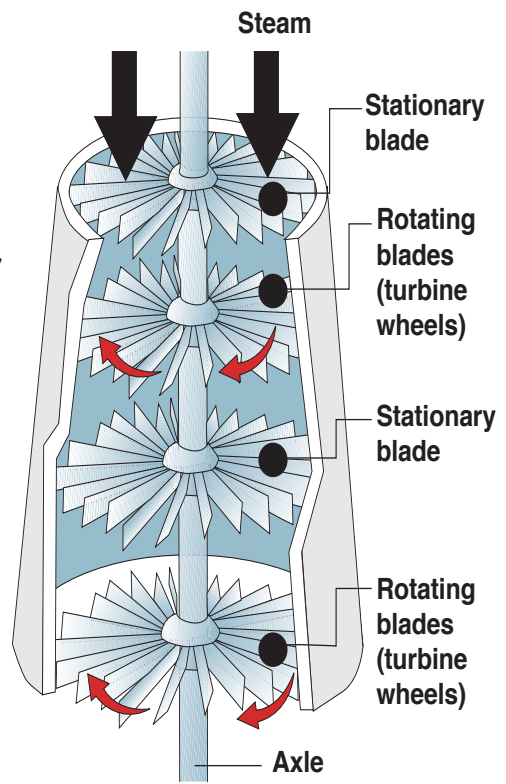
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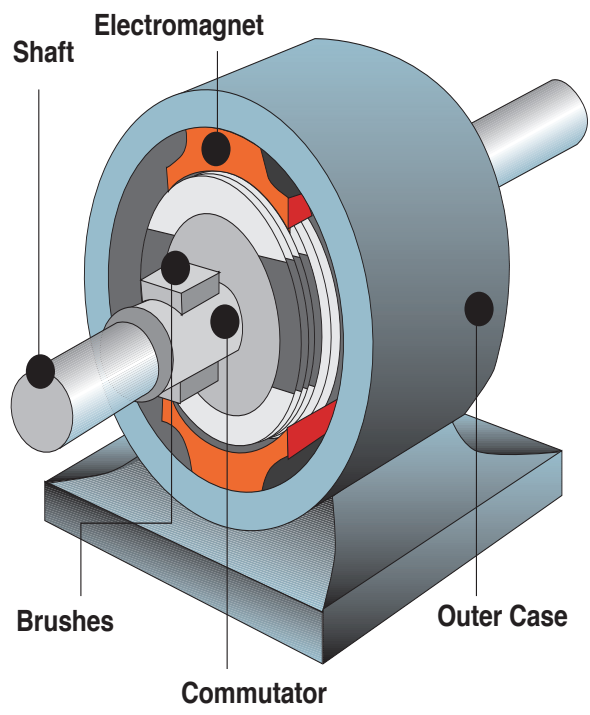
WORLD OF WONDER
Exploring the realms of history, science, nature and technology

MOTORS & ENGINES

Engines are machines that convert energy from fuel into kinetic (moving) energy or mechanical motion. Engines use a variety of power sources, such as oil, gasoline, diesel fuel, air, steam, water or electricity.



Early Greek engine, A.D. 62
Thrust from exhausted steam caused the sphere to rotate.

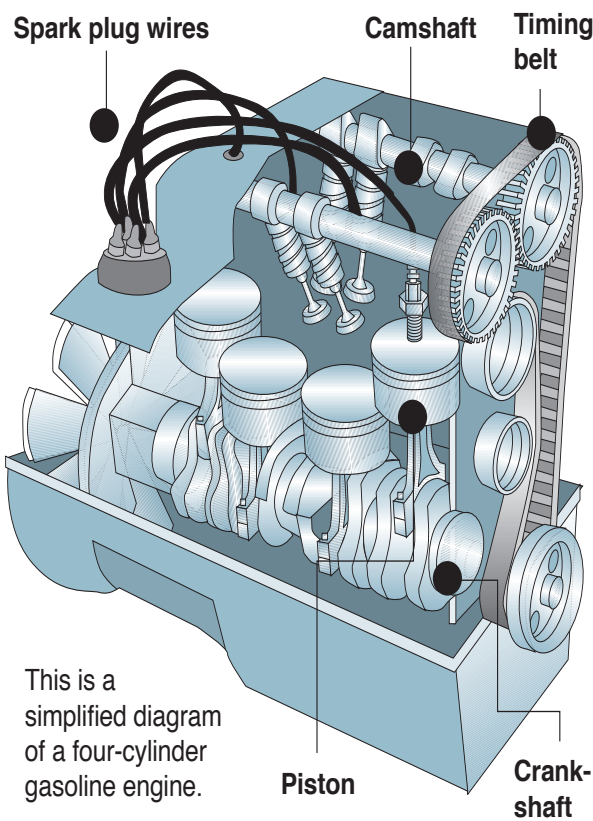
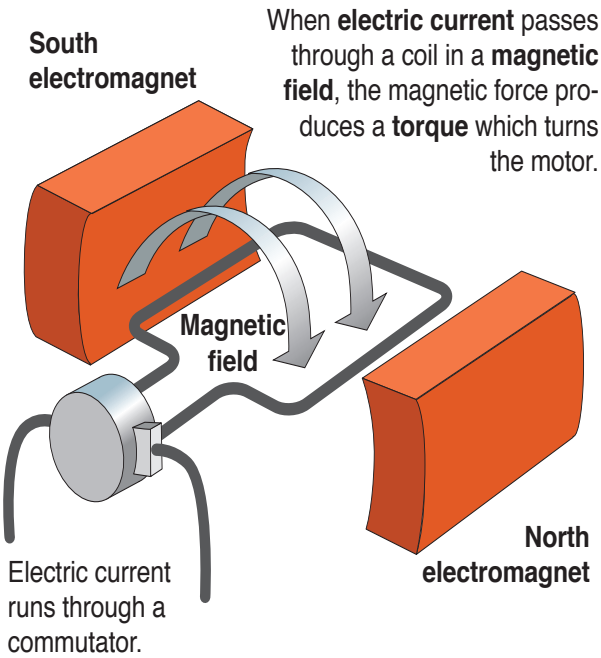


Electric motors

By definition, the **electric motor** is an engine, but it is unlike other engines because it does not rely on explosions of fuel to work. The electric motor changes electrical energy into motion using the basic principles of electricity and electromagnetics. Electric motors are used in so many machines that it is easy to forget how important they are.

Electric motors come in many sizes, depending on how much power is needed. Some are small enough to fit inside a wristwatch; others are as big as a train.

Electric motors use an electromagnet to produce force. When an electric current from a battery, generator or power plant passes through a wire, it produces a magnetic field around a metal rod, and both the wire and rod become magnetized. The magnetic poles attract or repel each other, creating a force that makes the coil and rod spin.



This is a simplified diagram of a four-cylinder gasoline engine.

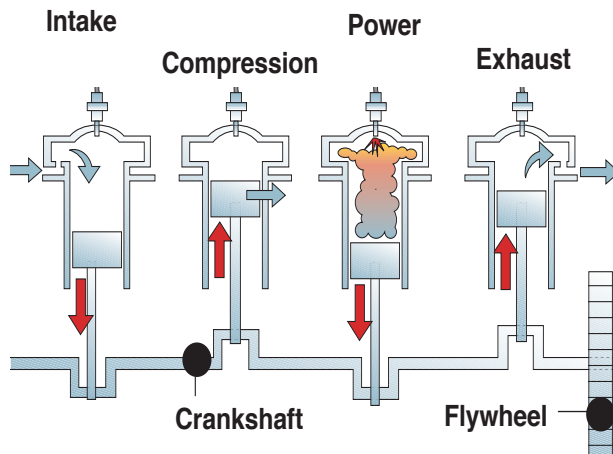
Internal combustion engine

For most of the 20th century, **internal combustion engines** ran nearly all cars, buses and motorcycles. They run on gasoline or diesel fuel.

The basic principle of the internal combustion engine is an explosion of air and fuel that pushes on a piston connected to a crankshaft that turns a flywheel.

The four-stroke cycle

The continuous up-and-down motion of the pistons makes the crankshaft and flywheel turn.



Diesel engines

Diesel engines are a more powerful version of the gasoline engine, fueled with oil and heated air instead of gasoline and spark plug explosions. The pistons of the diesel engine compress and heat air to extremely high temperatures. When oil is added to the hot air, the explosion pushes the piston down. The engine works much like a gasoline engine, but with more force.

Turbine engines

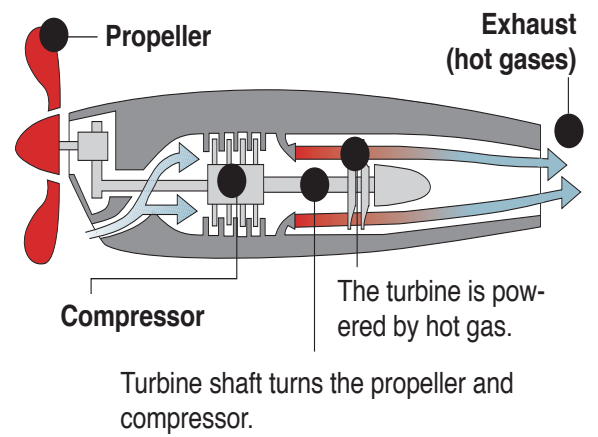
Turbine engines work a lot like wind or water mills, using thin, curved blades. Water, wind, gas and steam have all been used to power turbines. Steam turbines are often used to turn electric generators in power plants.

How it works: High-pressure, super-hot steam enters the turbine chamber, making the turbine wheels and axle spin. Multistaged turbines use stationary blades between rotating wheels to help aim and increase the speed of the steam.

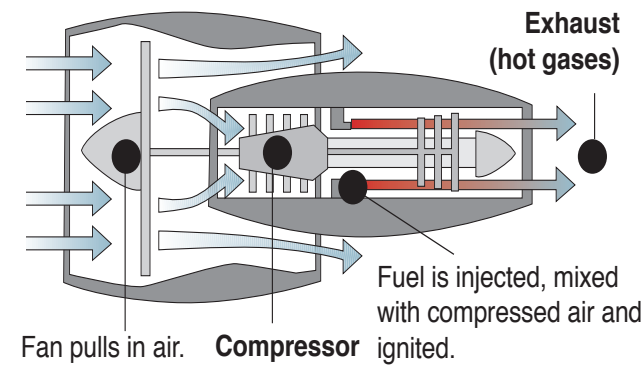
Jet and rocket engines

Jet and rocket engines work on the same principle that makes a balloon fly through the air when you blow it up and release it. Both use a combination of gas and air passing through a nozzle to create thrust. Jet engines burn a mixture of fuel and air in a combustion chamber to create a jet of hot gas that produces thrust.

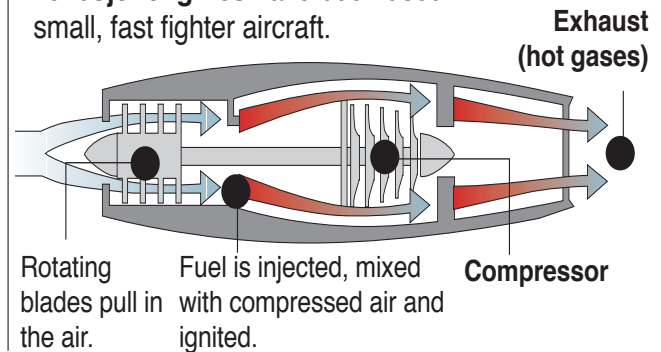
Turboprop engines are used to turn the propeller on smaller airplanes.



Turbofan engines are used in many large commercial aircraft. They are similar to the turboprop, but they run more quietly and use less fuel.



Turbojet engines have been used in small, fast fighter aircraft.



SOURCES: World Book Encyclopedia, World Book Inc.; https://auto.howstuffworks.com; https://www.energy.gov; https://study.com; https://www.explainthatstuff.com

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