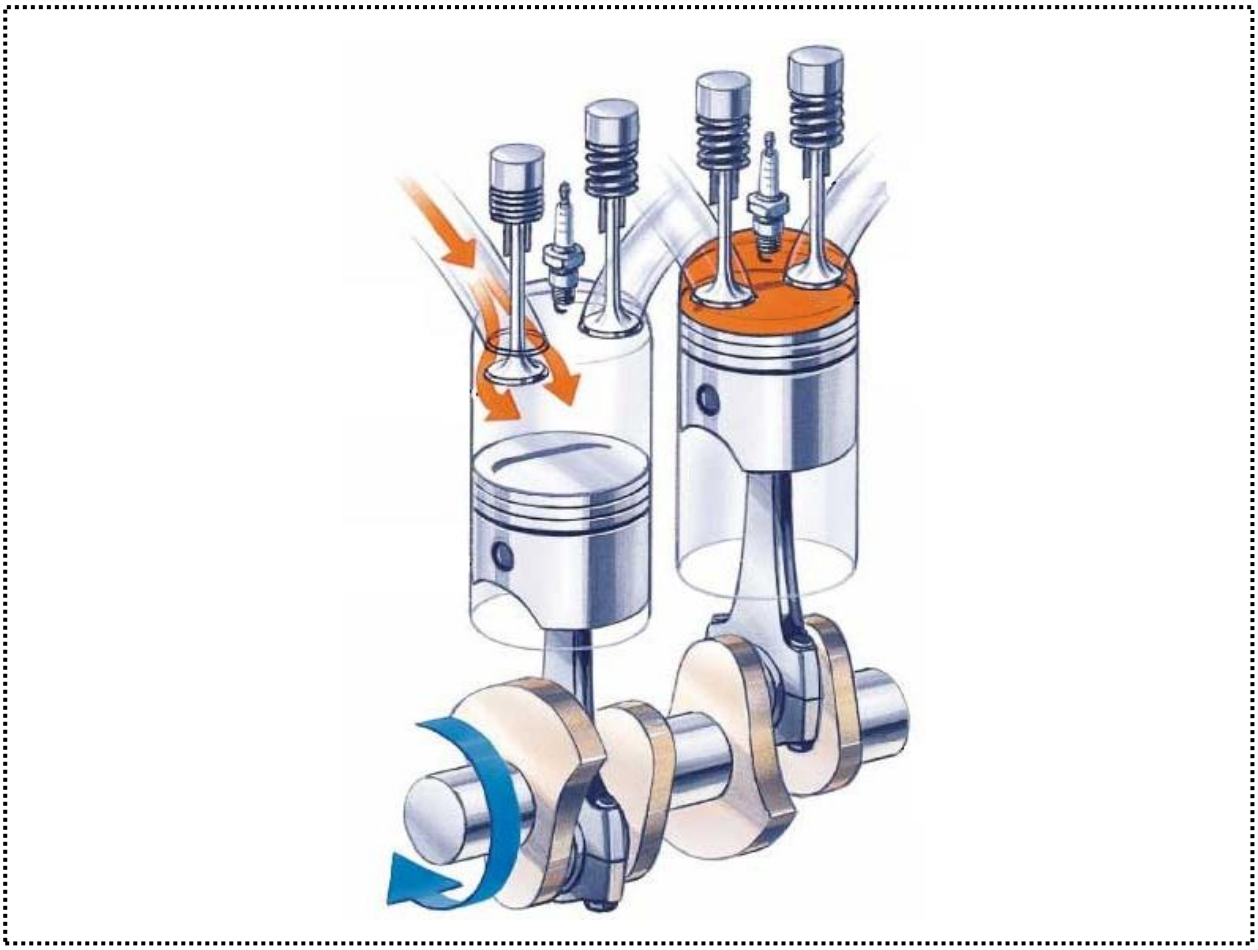
Engine Mechanical 1



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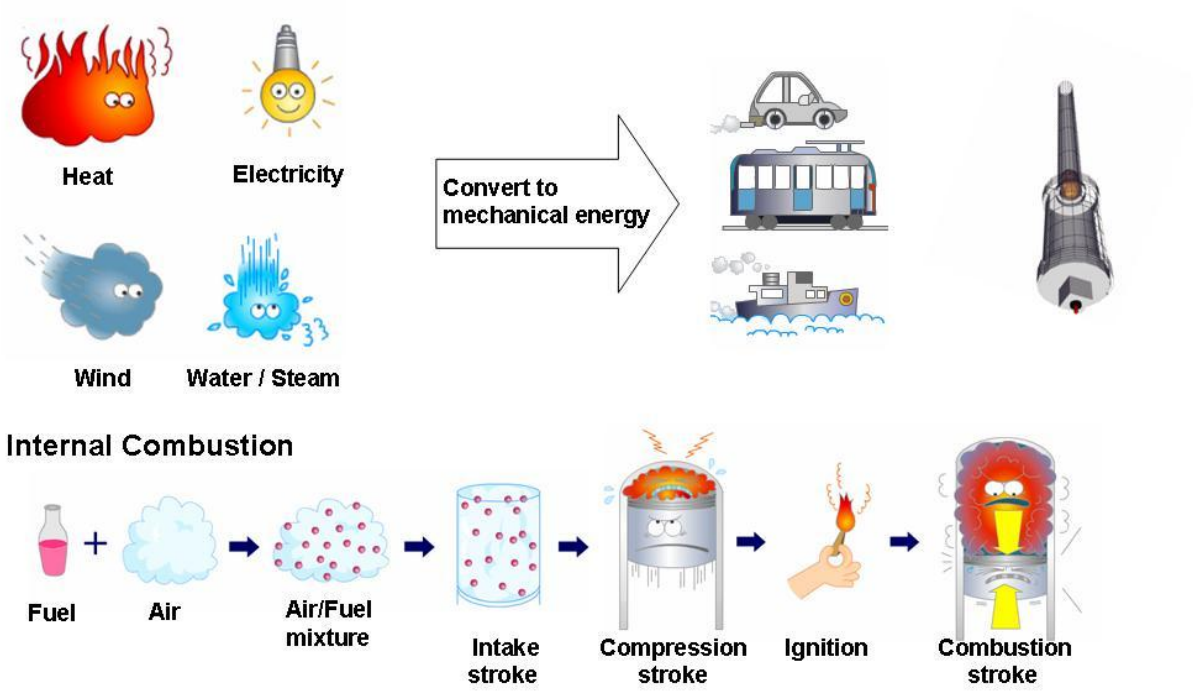
General working principle

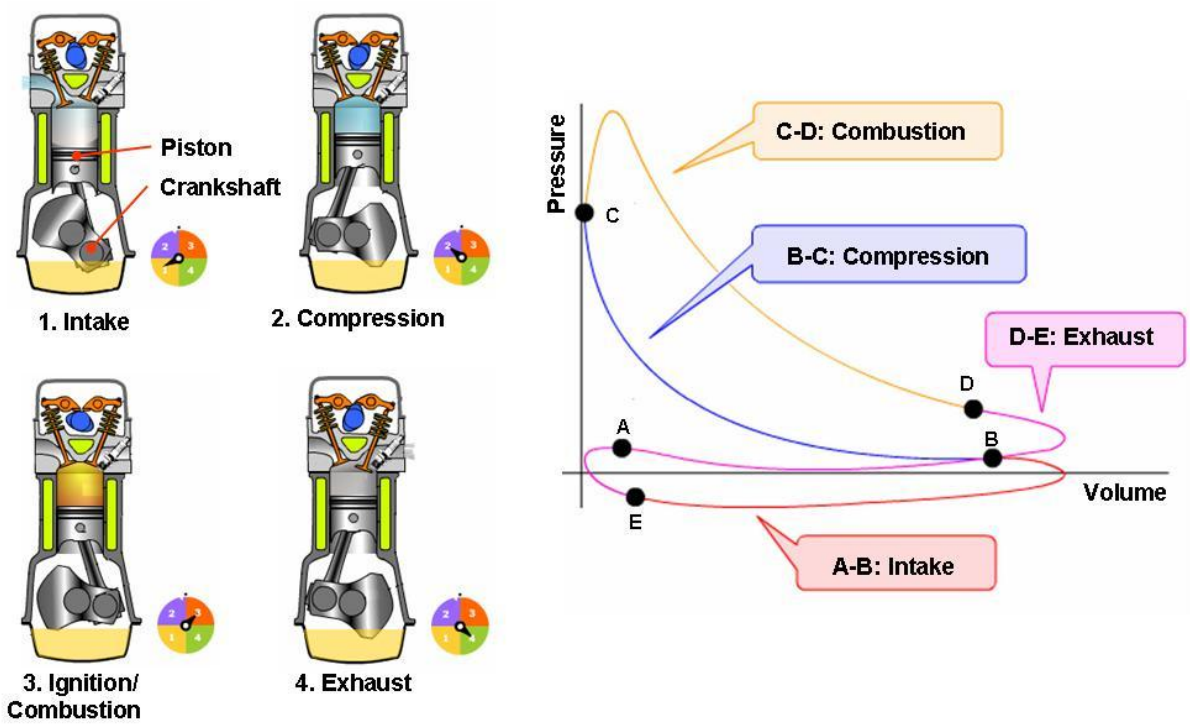


The purpose of a gasoline car engine is to convert gasoline into motion so that your car can move. Currently the easiest way to create motion from gasoline is to burn the gasoline inside an engine. Therefore, a car engine is an internal combustion engine**,** combustion takes place internally.
There are different kinds of internal combustion engines. Diesel engines are one form and Gasoline engines are another. Each has its own advantages and disadvantages.

A steam engine in old-fashioned trains and steam boats is the best example of an external combustion engine. The fuel (coal, wood, oil, whatever) in a steam engine burns outside the engine to create steam, and the steam creates motion inside the engine.

Internal combustion is a lot more efficient (takes less fuel per mile) than external combustion, plus an internal combustion engine is a lot smaller than an equivalent external combustion engine.
One good example for internal combustion is an old Revolutionary War cannon. You have probably seen where the soldiers load the cannon with gun powder and a cannon ball and light it. The generated heat and gases force the cannon ball to be pushed out the barrel at very high speed.
The cannon uses the basic principle behind any reciprocating internal combustion engine: If you put a tiny amount of high-energy fuel (like gasoline) in a small, enclosed space and ignite it, energy is released in the form of expanding gas.

4-stroke working cycle



Reciprocating engines are classified into two types, the 2-cycle and the 4-cycle type. The principle of the reciprocal engine is that the mixture of the air and the gasoline are injected into the cylinder, the mixture is combusted, the combustion force drives the piston in reciprocal movement, and the reciprocal movement is changed to the rotational movement by the crankshaft. Almost all cars currently use what is called a four-stroke combustion cycle to convert fuel into motion. The four-stroke working cycle is also known as the Otto cycle, in honor of Nikolaus Otto, who invented it in 1867. The horizontal axis of the graph represents the pressure inside the combustion chamber and the vertical axis represents the volume of the combustion chamber.

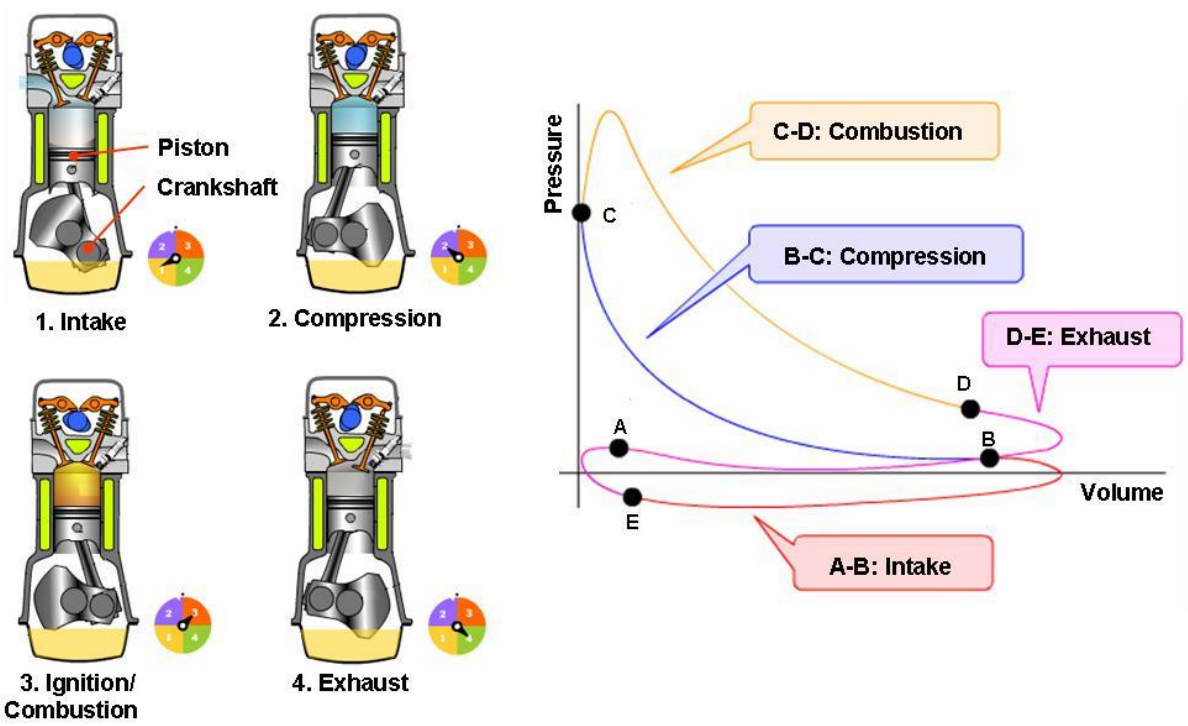
The four strokes are:

1. Intake stroke (A-B):

The piston starts at the top, the intake valve opens, and the piston moves down. On gasoline engines the engine take in a cylinder-full of air and gasoline. On Diesel engines only air is drawn into the combustion chamber.

2. Compression stroke (B-C):

The piston moves back up to compress the fuel/air mixture, so that the pressure and temperature is increased. The fuel is vaporized by the compressive heat of the air. The compression ratio on a gasoline engine is around 10:1, on a Diesel engine it is around 25:1



3. Ignition/ Combustion stroke (C-D):

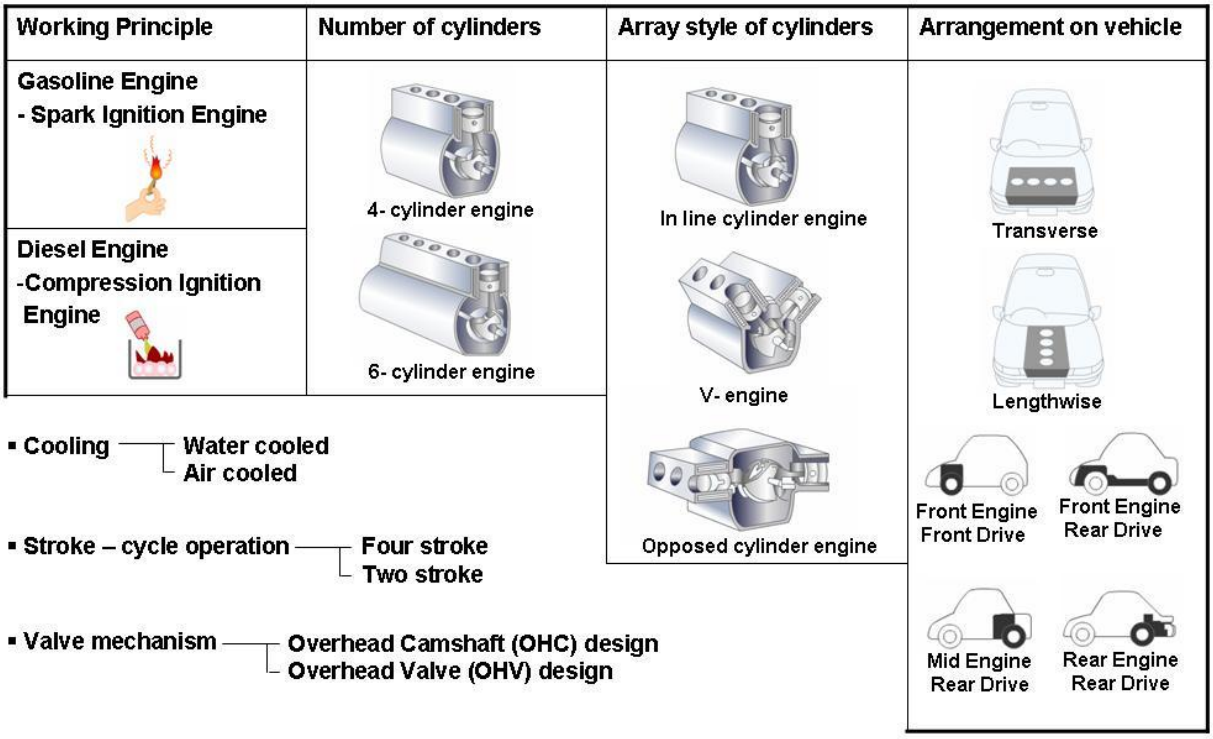
The piston reaches the top of its stroke, also referred to as Top Dead Center (TDC). On gasoline engines the ignition will be performed by the electric spark generated from the spark plug. On diesel engines fuel is injected into the combustion chamber just before the piston reaches TDC and the air fuel mixture is ignited by the heat of compression. The mixture is not fully combusted at the ignition time. As a result there is some time lag from the ignition to the maximum pressure that arises inside the combustion chamber. The air/fuel mixture in the cylinder explodes, driving the piston down.

4. Exhaust stroke (D-E):

Once the piston hits the bottom of its stroke, also referred to a Bottom Dead Center (BDC), the exhaust valve opens and the exhaust leaves the cylinder to go out the tail pipe.

Now the engine is ready for the next cycle, so it intakes another charge of air and gas.

Engine classification



Engines can be classified as follows:

- Working Principle: Gasoline (spark ignition engine) or Diesel (compression ignition engine)
- Cooling: Water or Air cooled
- Stroke cycle operation: Two or four stroke
- Valve mechanism: Overhead Camshaft (OHC) or Overhead Valve (OHV) design
- Number of cylinders: Engines can have 4,6, or 8 cylinders.
- Array style of cylinders: In a multi-cylinder engine, the cylinders usually are arranged in one of three ways, known as inline, V or opposed.

The in-line type engine has the cylinder in sequentially arrayed. In the in-line type, the structure of the cylinder block is very simple and the cylinder head is one unit, so the engine is light and compact. 3, 4, 5 or 6 cylinder can usually be found on the in line engine. The V-type engine is usually available with 6,8,10 or 12 cylinders. They are usually installed at large vehicles or sports cars. The opposed engine is available with s 6, 8, 10 or 12 cylinders. Due to the low center of gravity it is mainly applied to sports vehicles.