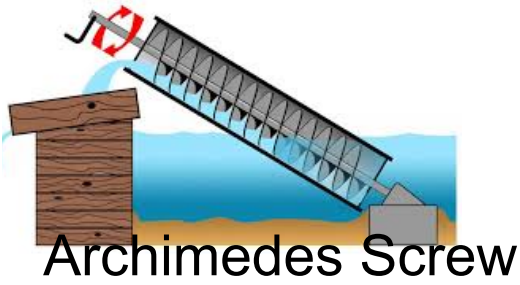
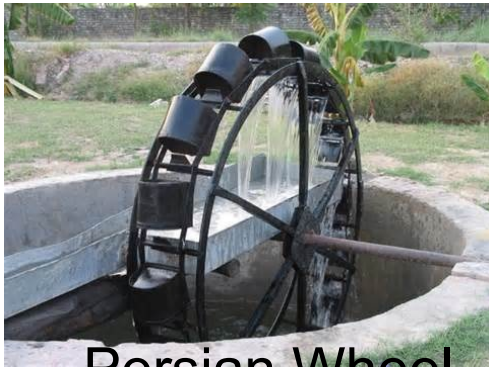


Science 10: Unit B: 3.2  
Engine Development (p206-214)

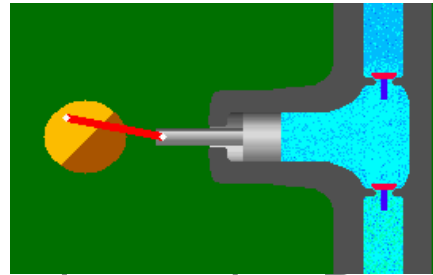


Archimedes Screw



Persian Wheel

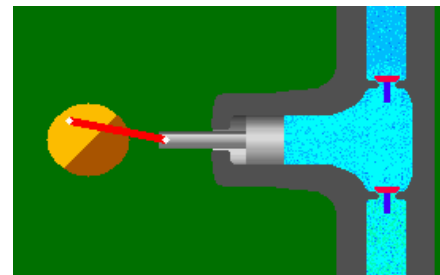
The need for an engine began as a need to pump water for mines. The following all pumped water, but were slow, and not very powerful.



Reciprocating Pump

## 1680: Gunpowder Engine-Christian Huygens

Basically, took a reciprocating pump, and used a gunpowder explosion to move the piston.



Drawbacks: Black powder explosions were dangerous and unpredictable. There was also no "reload" mechanism.

## 1690: Denis Papin - The Heat Engine

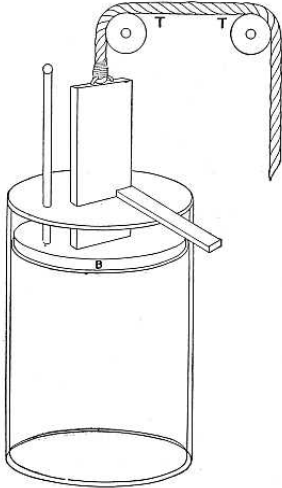
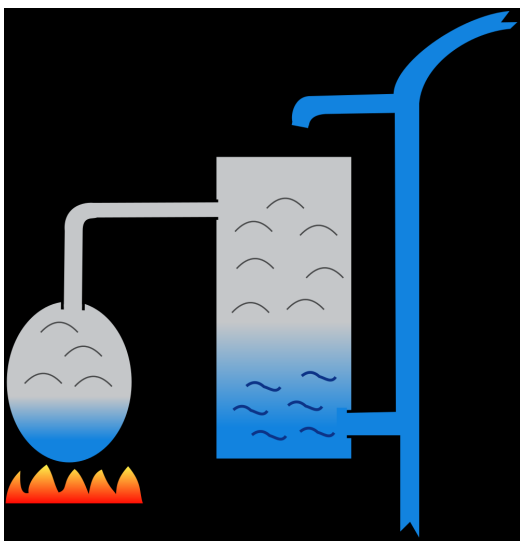


FIG. 12—PAPIN'S ENGINE

Basically, it used steam to raise a piston.

Drawbacks: At the time, he had difficulty building a drum that could handle the pressure and heat.

## 1698: Savery Engine- Thomas Savery



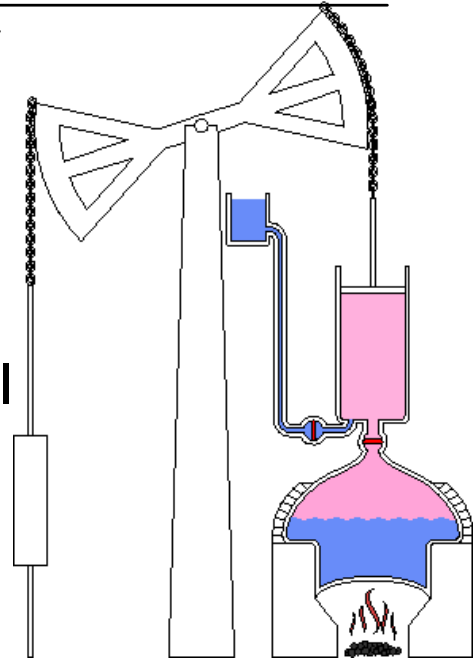
Used steam to pump water out of mines.

Drawbacks: Could only lift water 6m so it wasn't much better than animal power.

## 1712: The Newcomen Engine- Thomas Newcomen

Used steam to raise and lower a piston, which then moved a pump.

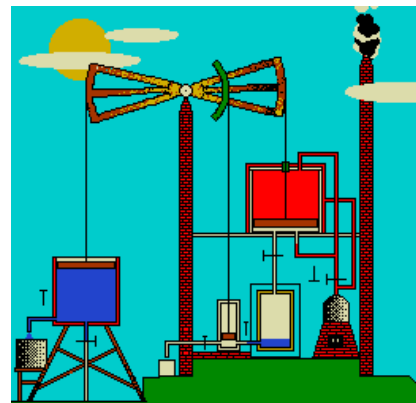
Drawbacks: The original model had water sprayed on the chamber to condense the steam. This made it extremely inefficient.



[http://www.science20.com/chatter\\_box/king\\_coal\\_and\\_heat\\_values\\_fuels](http://www.science20.com/chatter_box/king_coal_and_heat_values_fuels)

## 1763: The Watt Engine - James Watt

Improved the Newcomen engine, by having the steam condense in a separate chamber.



[http://lancefuhrer.com/steam\\_engine.htm](http://lancefuhrer.com/steam_engine.htm)

Drawbacks: Like all steam engines, they were too large and heavy for most applications. They also expelled most of the heat to the surroundings.

## The Internal Combustion Engine

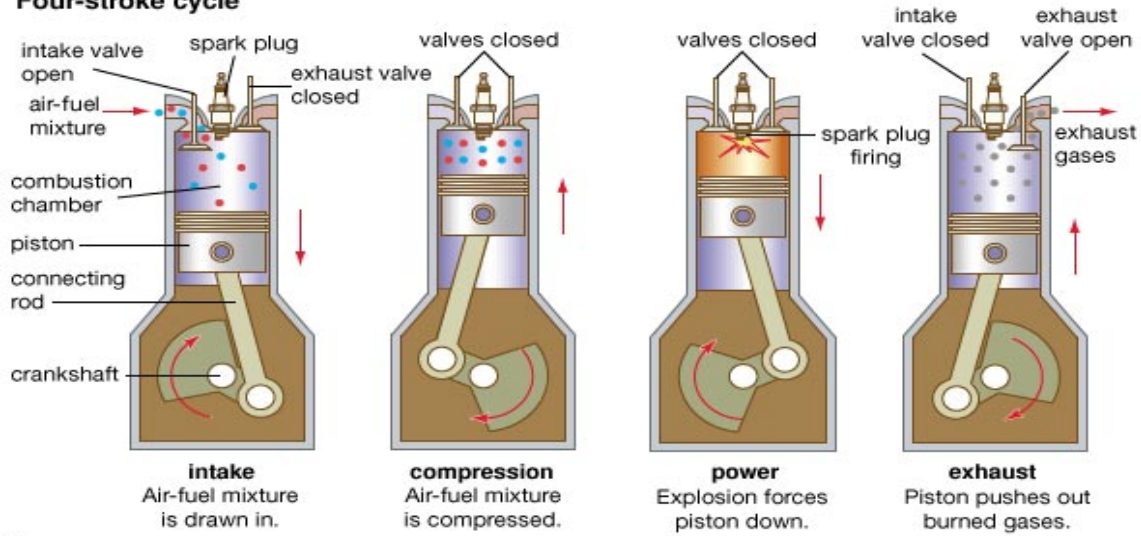
1794- Robert Steele used the idea of Huygen's gunpowder engine, but used gas from oil and tar as fuel.

1801- Philippe Lebon used an electric spark to ignite the fuel.

1867- N.A Otto and Eugen Langen improved efficiency by compressing the gas before ignition. They developed the first 4-stroke engine, which is still the design used today in most automobiles.

1880's- Gottlieb Daimler used petroleum gasoline. This burned hotter, which meant that more power could be used from a smaller engine. This engine was small enough and efficient enough to use for road vehicles.

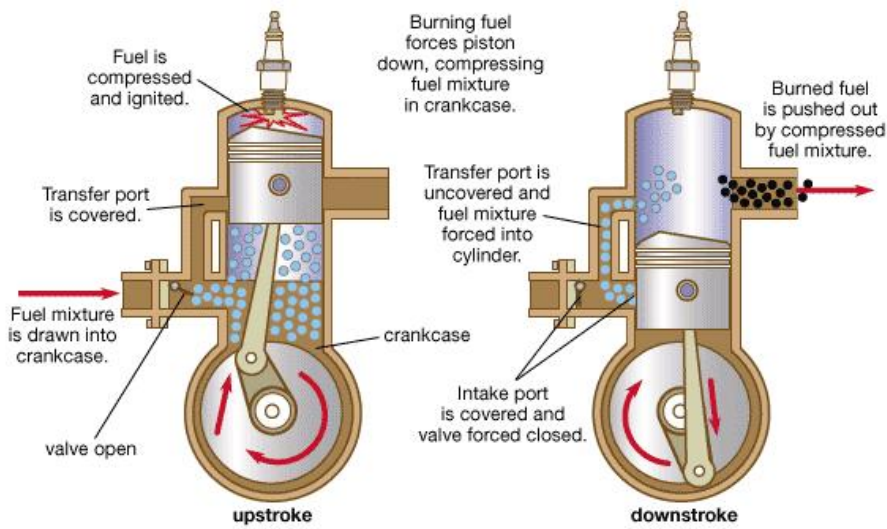
**Four-stroke cycle**



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<https://www.youtube.com/watch?v=SYd40qWQ9Bc>

**Bonus: 2-Stroke Engine**



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<https://www.youtube.com/watch?v=EKQprWAHFTk>

Questions:

#5-10, 12,