

Lecture Demonstration 1:

Heat Engines

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Outline of the lecture:

1. Heat engine motivation.
2. Stirling engine.
3. Erikson engine.

Hand-out to fill in during the lecture.

Heat engine motivation:

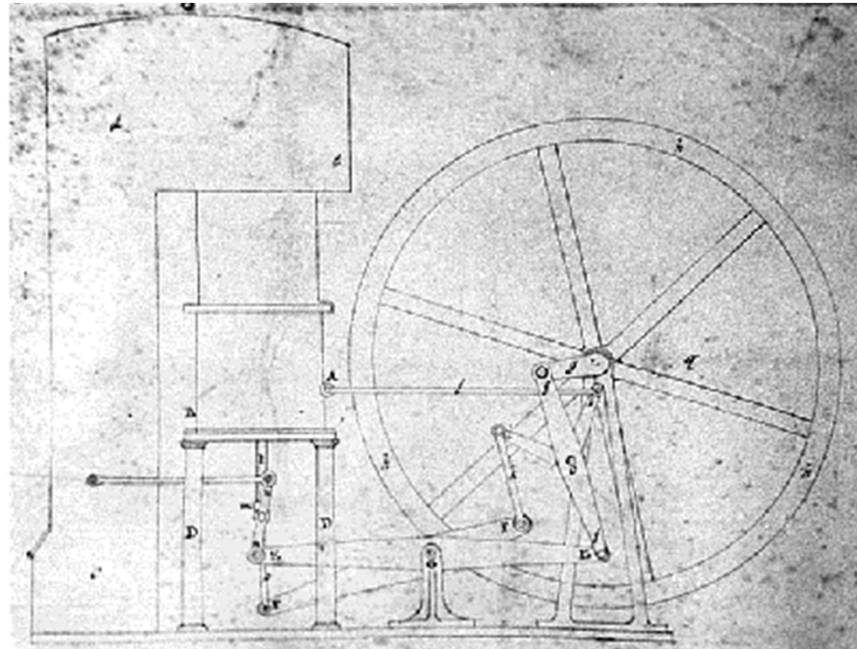
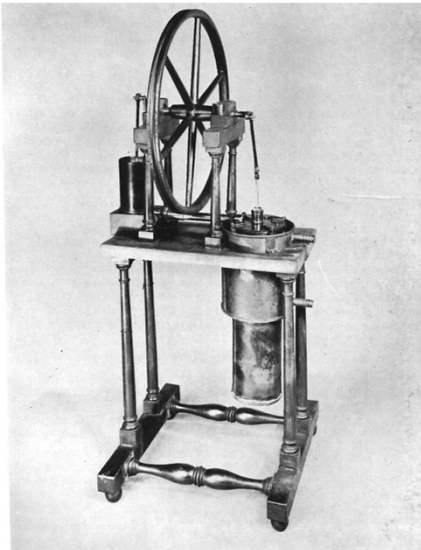
1. **Very flexible**: they can operate using any available source of heat such as solar or geothermal.
2. They are also **reversible**:

Recall the Carnot principle (derived from the 2nd Law):

The efficiency of an irreversible engine is always less than that of a reversible one, operating between the same two reservoirs.

Exercise: Calculation of the efficiency of an internal combustion engine.

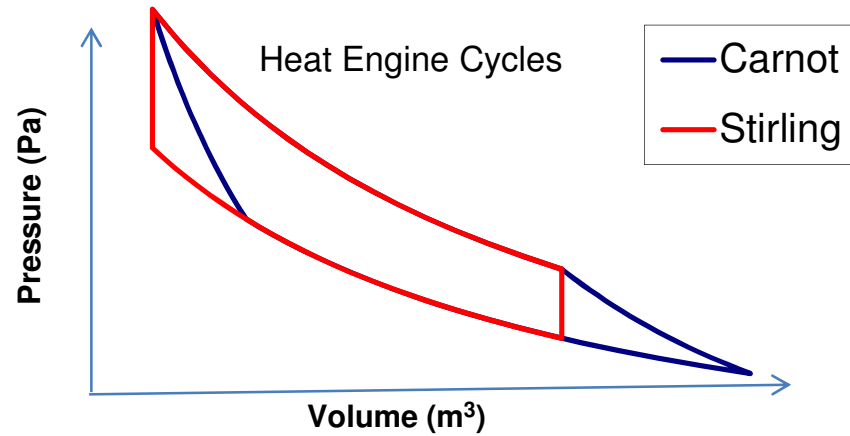
Stirling engine:



Robert Stirling, 1816

The patent was a heat exchanger, which he called an "**economiser**" for its enhancement of fuel economy in a variety of applications.

Stirling engine:



Applications:



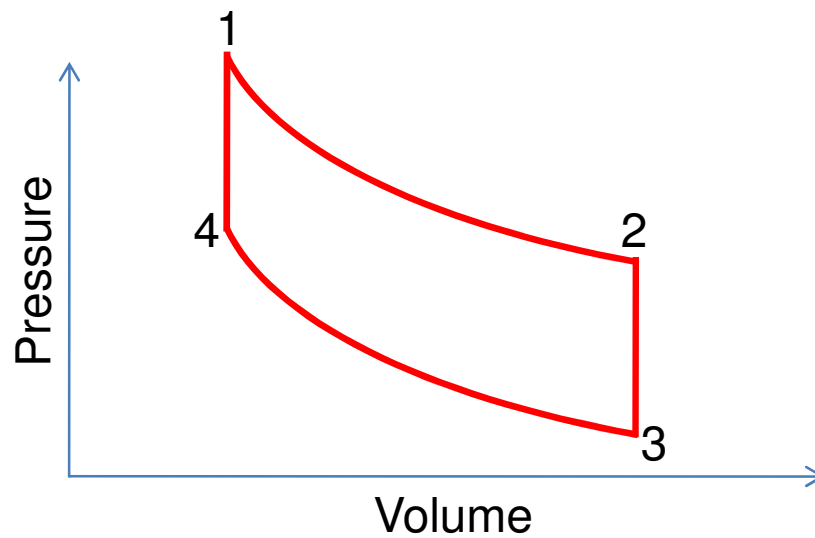
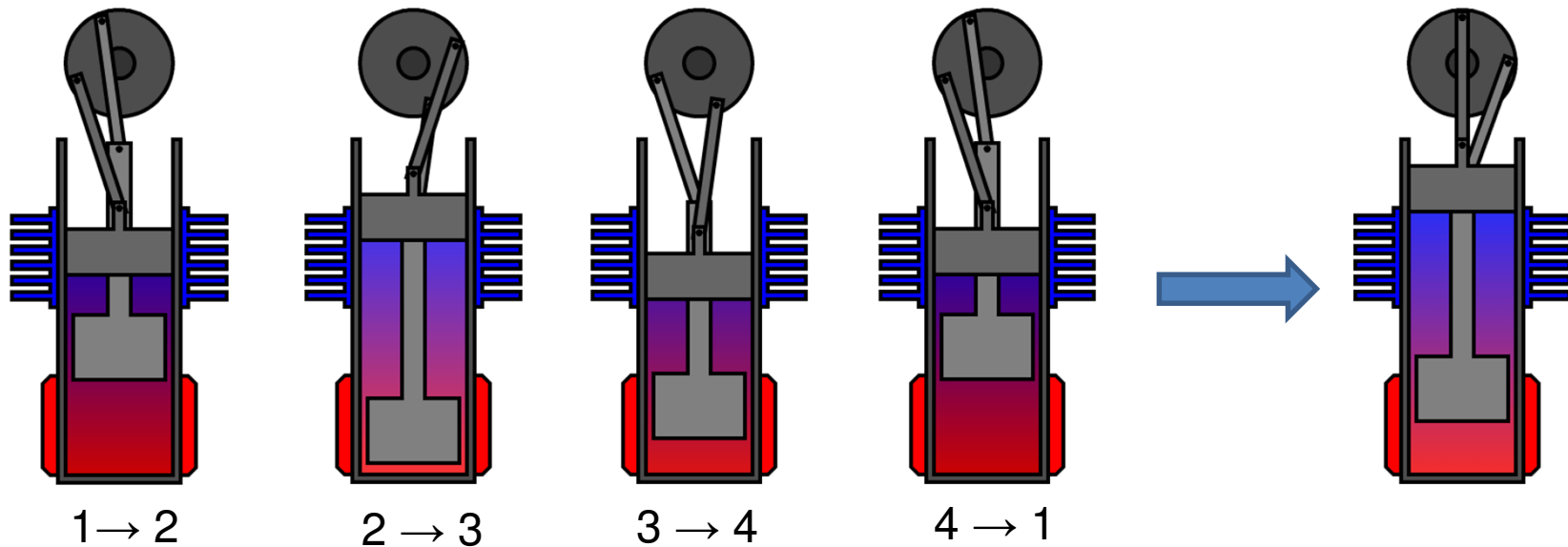
Solar Stirling Engine, 1998



Philips Stirling Engine, 1952



Kockums Naval Solutions, 1980



- 1 → 2 Isothermal expansion
- 2 → 3 Isochoric cooling
- 3 → 4 Isothermal compression
- 4 → 1 Isochoric heating

Ericsson engine:

