

Stirling Engine

Apparatus

small working Stirling engine

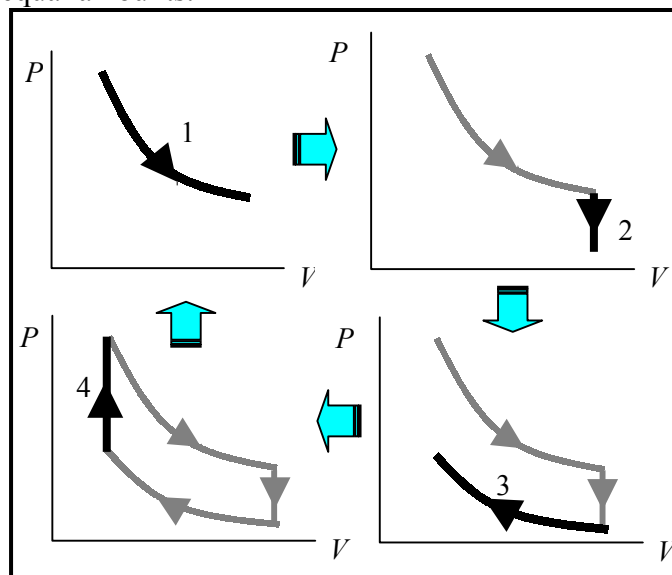
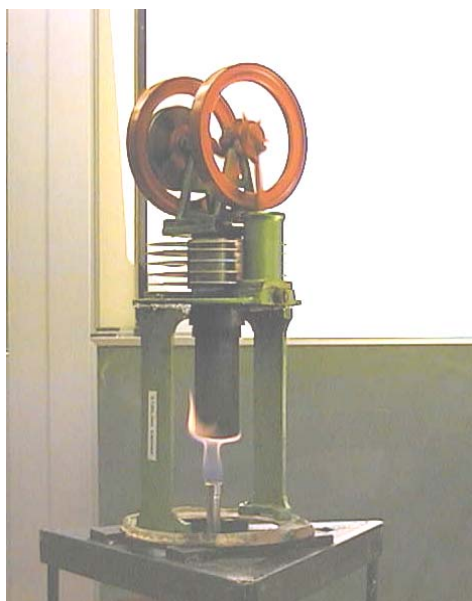
Action

The students set the engine going and observe the cycle. The students are provided with a schematic drawing of the Stirling cycle. They should try to follow the cycle on the real engine, and identify the heat reservoirs. They then draw p - V diagrams for the four stages. Note – specific instructions for individual engines may be necessary. (An addition schematic diagram is included on the next page.)

The Physics

There are four processes in the Stirling cycle:

1. Isothermal expansion at T_H . Left piston moves down and heat Q_H is transferred to the gas from the left cylinder wall, which is kept hot by the heat reservoir at T_H .
2. Constant volume process – temperature decreases from T_H to T_C as hot gas passes through the wire mesh. The gas heats the mesh. The volumes change by equal amounts.
3. Isothermal compression at T_C back to original volume. Heat Q_C is lost from the gas on the right hand side to the cold reservoir.
4. Constant volume process – temperature increases from T_C to T_H , cold gas is pushed across the hot wire mesh and the changes in volume of the two cylinders are equal.



Accompanying sheet

Stirling Engine

Set the Stirling engine running.

Examine the Stirling engine and compare the up and down strokes of the engine to the four stages of the Stirling cycle on the schematic diagram.

Draw p - V diagrams for the four stages.

Diagram of Stirling cycle - can be enlarged and included with instruction sheet for students to refer to.

