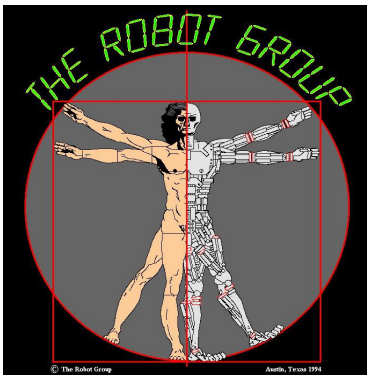
“Stirling Engine”

Model by Rick Abbott

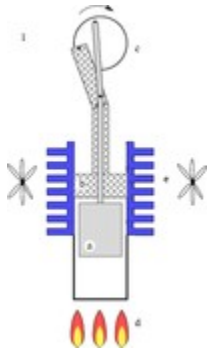
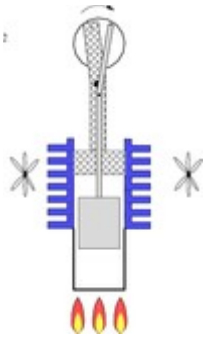
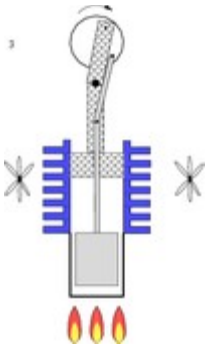
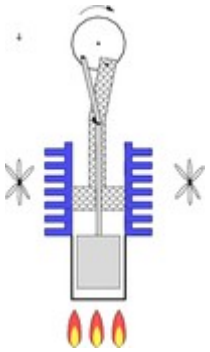


Invention of the Stirling engine is credited to the Scottish clergyman Rev. Robert Stirling 1816. He was later assisted in its development by his engineer brother James Stirling.

The inventors sought to create a safer alternative to the steam engines of the time, whose boilers often exploded due to the high pressure of the steam and the inadequate materials. Stirling engines will convert any temperature difference directly into movement.

Each of the models seen here were hand machined from aluminum, glass, steel, brass, graphite and other (sometimes rather hard to work) materials. Stirling engines are notoriously difficult to create from scratch as they depend on fine balances in order to work properly. These operating models represent **years** of machining time and attention to detail.

Action of a Beta type Stirling engine

 1- Power piston (hatched) has compressed the gas, the displacer piston (grey) has moved so that most of the gas is adjacent to the hot heat exchanger.	 2- The heated gas increases its pressure and pushes the power piston along the cylinder. This is the power stroke.	 3- The displacer piston now moves to shunt the gas to the cold end of the cylinder.	 4- The cooled gas is now compressed by the flywheel momentum. This takes less energy since when it cooled its pressure also dropped.

Rhombic Drive Beta Stirling Design

A beta Stirling has a single power piston arranged within the same cylinder on the same shaft as a displacer piston. The displacer piston is a loose fit and does not extract any power from the expanding gas but only serves to shuttle the working gas from the hot heat exchanger to the cold heat exchanger. When the working gas is pushed to the hot end of the cylinder it expands and pushes the power piston. When it is pushed to the cold end of the cylinder it contracts and the momentum of the machine, usually enhanced by a flywheel, pushes the power piston the other way to compress the gas. Unlike the alpha type, the beta type avoids the technical problems of hot moving seals.