

# Stirling Engine

## More Details

### **A contribution to solving the energy problems of the future?**

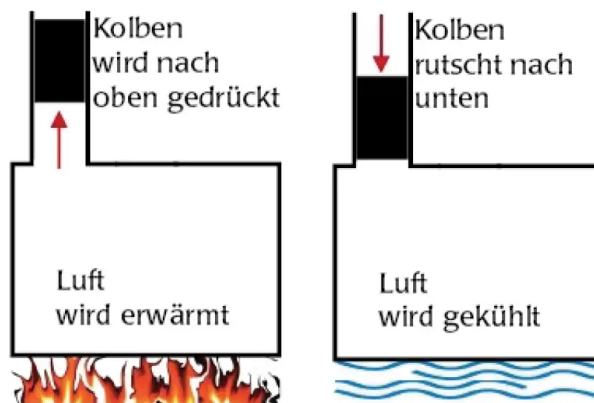
In 1816, the Scot Robert Stirling was granted patent no. 4081 for his "energy converter with external combustion". This means that any fuel is compatible with the Stirling engine. That's right – you do not have to burn anything, any source of heat is sufficient!

The engine can work without fossil fuel, without electricity, without wind or hydropower. An ideal engine for the future that does not produce exhaust gases, neither self-generated nor indirect, e.g. through electricity generation. It runs very smoothly and requires little maintenance.

### **How does this engine of the future work?**

The basic idea is fascinating - and works! Let's look at a simple experiment: hot air expands and cool air needs less space. By alternately heating and cooling the air, the power piston moves back and forth. This is the principle of the Stirling engine: It uses the temperature difference of a gas in a closed system.

However, the technical implementation requires some clever ideas. A Stirling engine has two cylinders and two pistons: the ambient air cools the top of the displacer cylinder and thus the air. If the displacer piston moves upwards, the air flows through the gap between the piston and the cylinder wall into the lower part of the cylinder. There the air is heated (in our case by a light bulb). The compression of air in the cylinder provides additional heating. To ensure that the power piston and the displacer piston work in perfect rhythm, they both sit 90° out of phase on a common crankshaft.



### Where's the catch?

For almost 150 years, the biggest problem had been the sealing and, at the same time, the coupling of power and displacement pistons. In 1962, Prof. William Beale, at the University of Athens (Ohio, USA), came up with a highly intelligent solution. In the middle of his lecture on Stirling machines, he is said to have shouted: "We don't need all this damned nonsense. We can simply do without!" He replaced the purely mechanical, rigid connection of the two pistons with a mass-spring system: the gas acts as a pneumatic spring for the dynamic coupling of the two pistons. This free-piston version is considered the most important improvement of the engine since Stirling.

### Is now the time of the Stirling engine?

The Stirling engine cannot be used as a vehicle drive because it is not temporarily controllable. But because it can be operated with any heat source, it is perfect where constant power is needed and a natural temperature difference is available: geothermal energy, solar energy, residual heat e.g. from power stations; and for cooling: river or sea water.

Globally there are many interesting applications – unfortunately largely unknown: Desalination of sea water (water and solar energy), geothermal power plants (volcanic heat and cold river water),...

The list can surely be continued. Our engine has been denied a widespread breakthrough. The reason is simple: fossil fuels were

apparently unlimited and cheap! Rise in cost and scarcity of fossil fuels will force us to rethink. Many research projects are now working on improving the efficiency and economy of the Stirling engine.