Energy is eternal delight.

William Blake

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SES 194

Energy in Everyday Life

Fuel Cells

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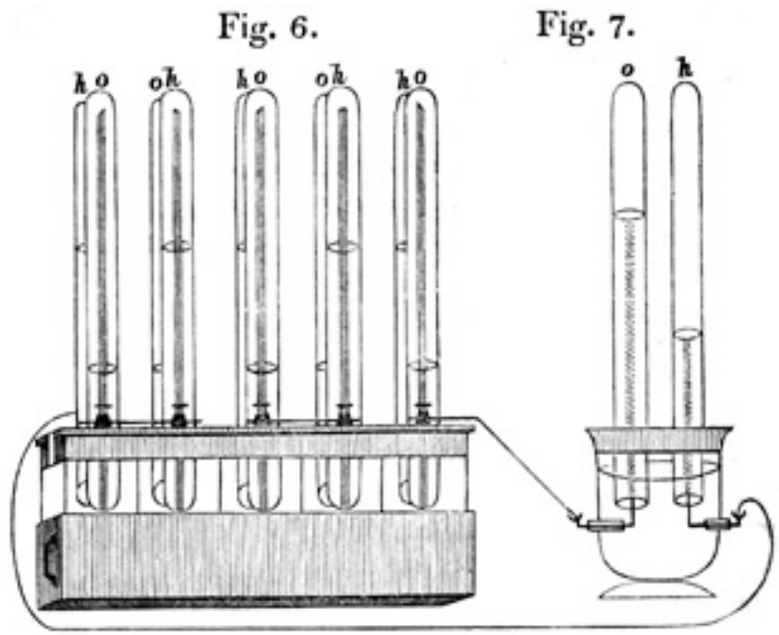
Another source of electrical energy from chemical energy is found in fuel cells.

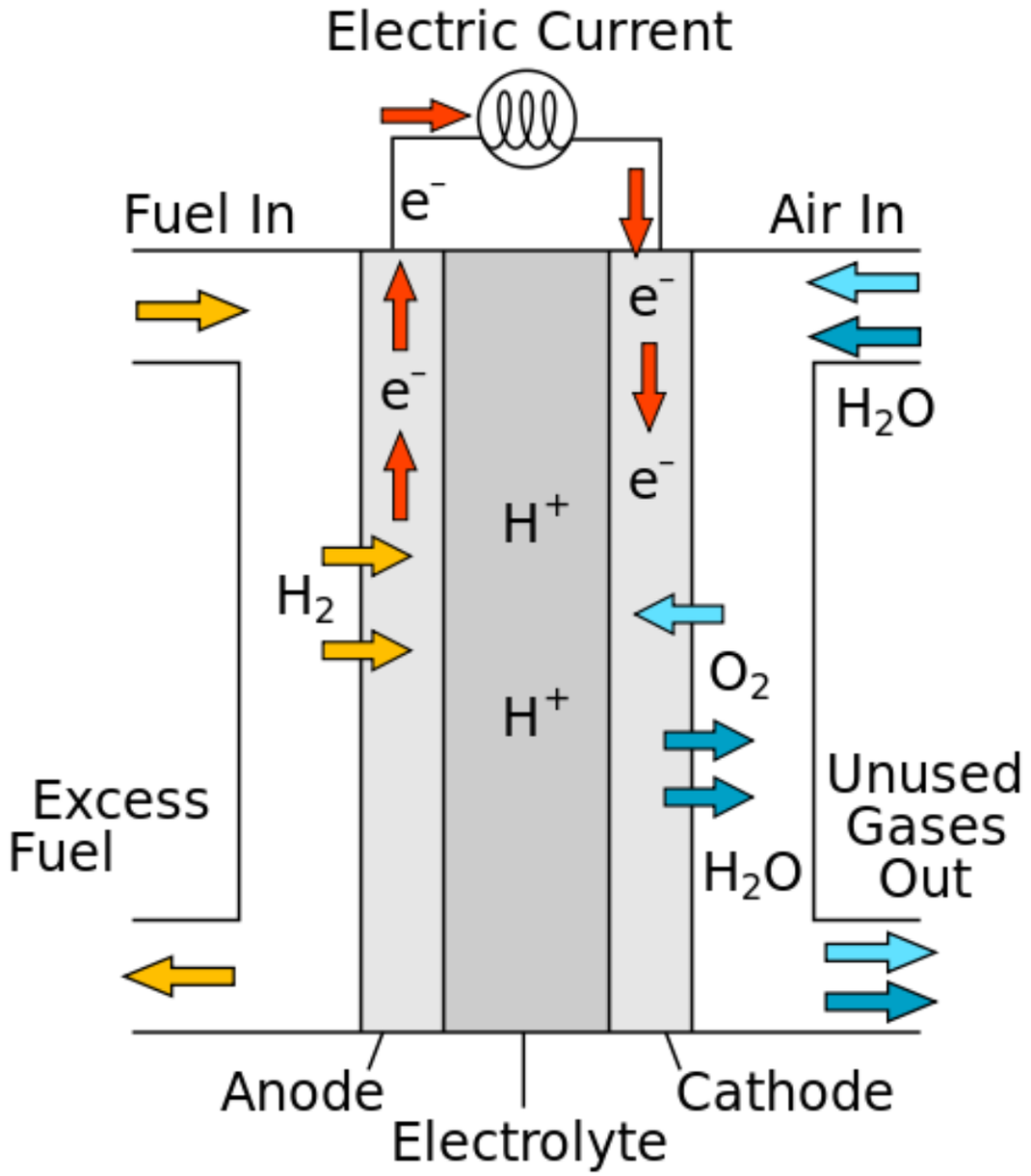
Fuel Cells were first developed in 1839 by William Grove.



In the hydrogen-oxygen fuel cell, hydrogen is fed to one porous electrode and oxygen to the other. The electrodes are separated by an electrolytic material.

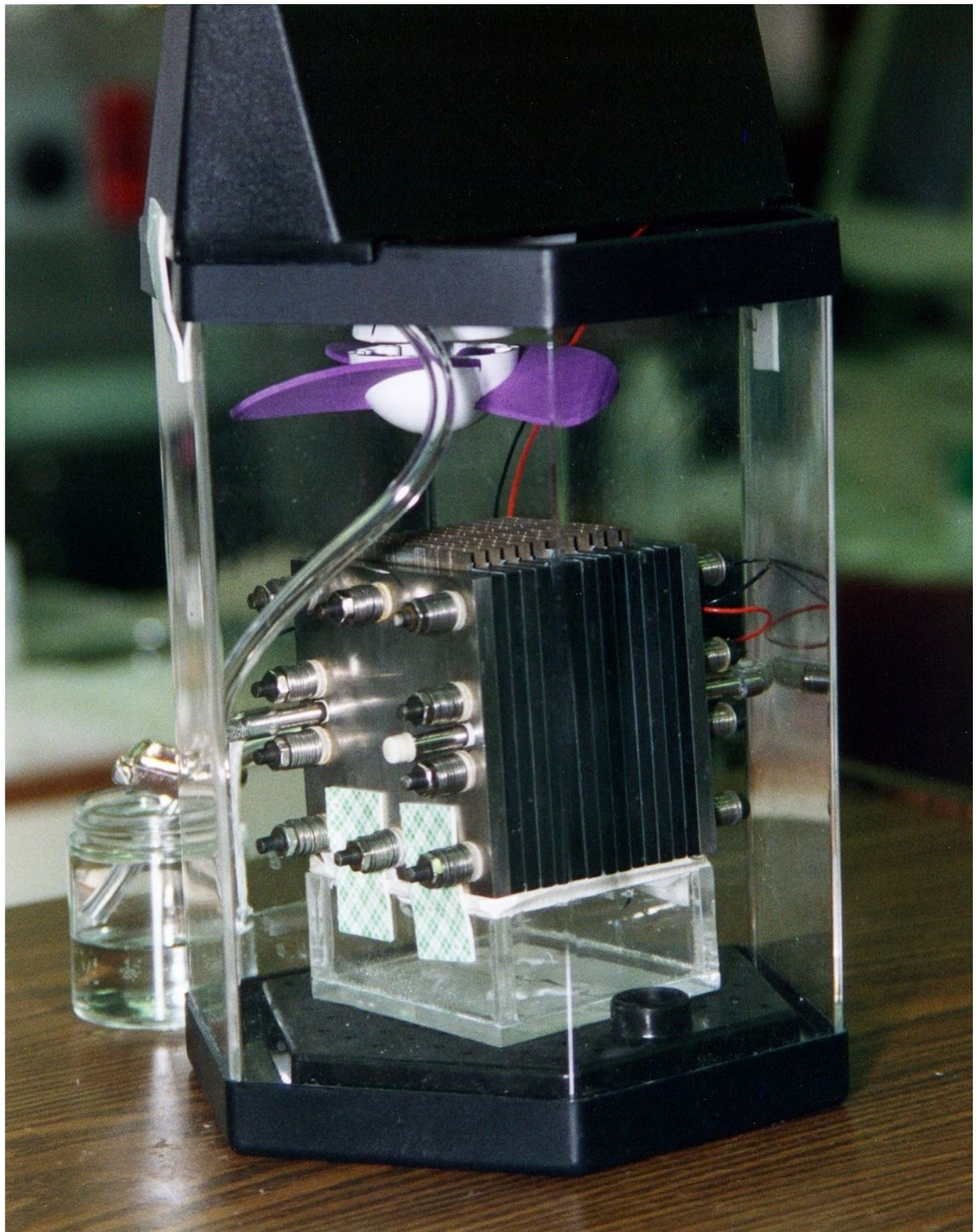
The hydrogen in the electrode is converted catalytically to hydrogen ions (protons), releasing electrons to run through an external electric circuit.

The electrons then combine with oxygen at the other end producing oxygen ions.

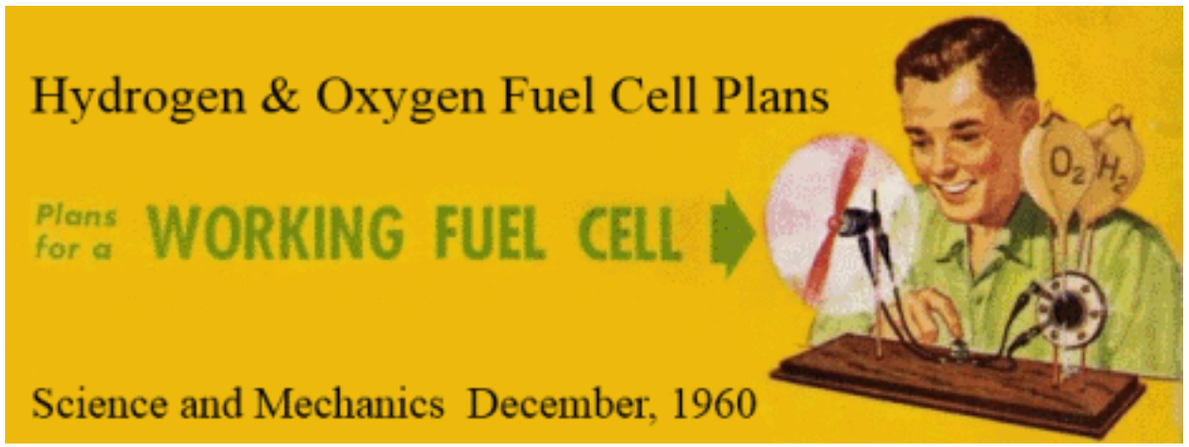


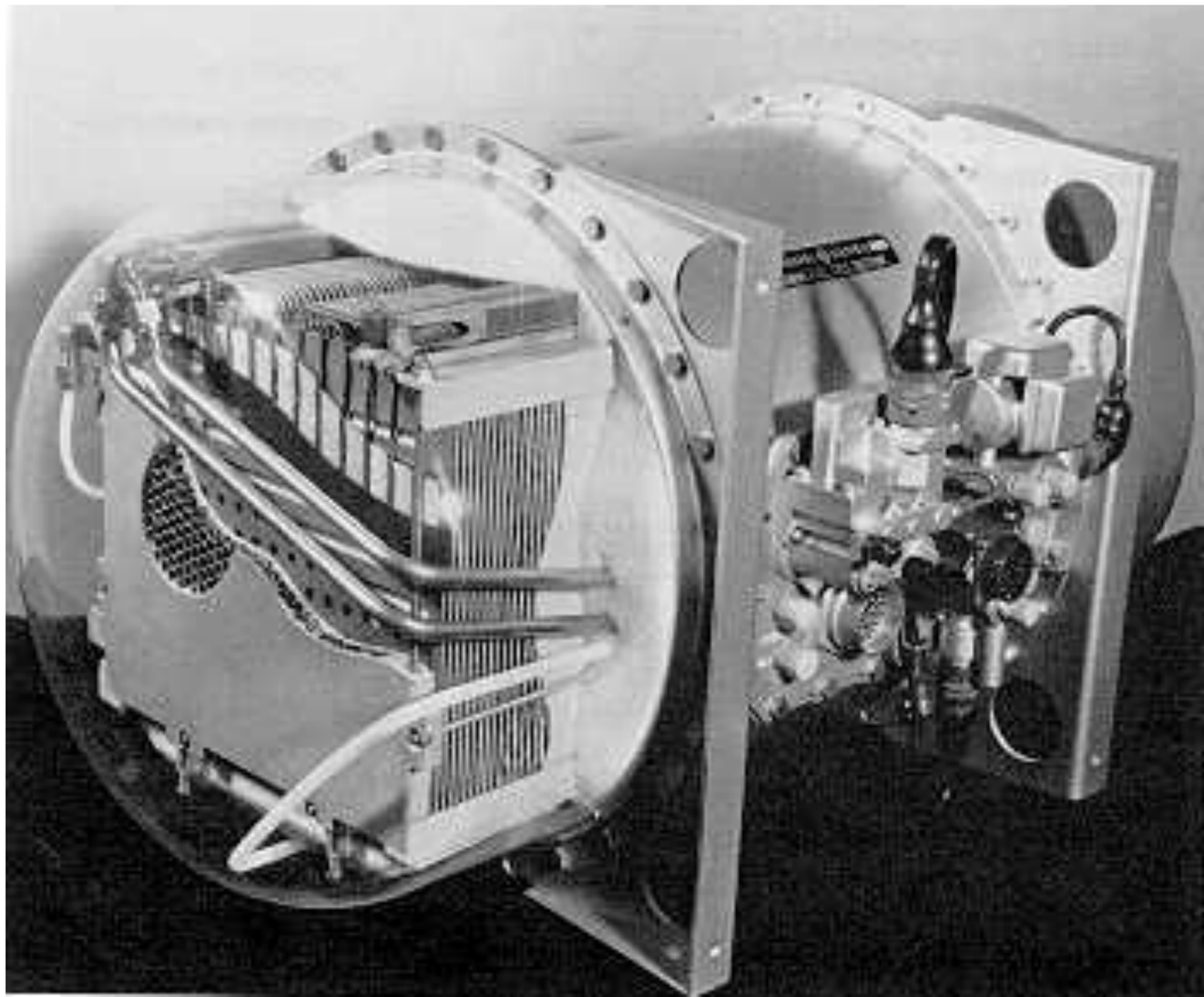
As the ions travel through the electrolyte, they meet and produce water.

The only outputs of fuel cells are water and electrical energy, which continues as long as hydrogen (or another fuel) and oxygen are fed to the cell.



A practical fuel cell first came in the 1950s with the development of suitable ceramics. Rapid progress followed in the 1960s as fuel cells used in the space program.





Most current models use natural gas to supply hydrogen, such as this model for refrigerated trucks.

Advantages of fuel cells for cars:

Much less complicated than a gas or diesel engine.

Not subject to high temperatures, corrosion or structural weaknesses found in other engines.

Continues to operate indefinitely, without complication, as long as it has a fuel source.

Runs quietly.

Sole tailpipe emission is water vapor.

Disadvantages of fuel cells for cars:

No hydrogen refueling infrastructure.

Startup times are slow.

Hydrogen is fairly rare in our atmosphere, meaning that it has to be extracted and currently, that process is cost prohibitive and creates excessive carbon dioxide.

A hydrogen tank would currently be too large for a car.

Hydrogen is a very flammable gas (think Hindenburg), coupled with the gas's propensity for escaping almost any tank, there are concerns about explosions.