Andreas Myklebust
andmy@isy.liu.se

Vehicular Systems
Dept. of Electrical Engineering
Vehicular Systems
Linköping University
Sweden

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Linköping University

Thermodynamics, Caloric Theory

Current status:

- Heat = caloric, an elastic self-repellent fluid.
- Imponderable substance like electricity, magnetism and light.
- Could neither be created or destroyed.
  - i.e. could not be turned into work.
- Flows into atomic/molecular voids in host substance.
- Squeezed out by friction or fire.
- 1856 Encyclopedia Britannica gave credit to the caloric theory.

Thermodynamics, Timeline of a New Theory

- Francis Bacon, 1620, first "particle motion" concept.
- Benjamin Thompson (Count Rumford), 1798, canon bore experiment
  - Not long enough to remove all caloric.
  - "heat evolved was directly proportional to the time during which the horse acted"
- Humphry Davy, 1799, rubbed ice to produce heat.
- Sadi Carnot, 1824, "Reflections on the Motive Power of Fire and on Machines Fitted to Develop that Power"
- Julius Robert Mayer, 1842, First law "Energy can be neither created nor destroyed, only converted from one form to another."
- James Prescott Joule, 1843, First law
- Rudolf J.E. Clausius & Lord Kelvin, 1850, Second Law "Heat cannot of itself pass from a colder to a hotter body"
  - Buried the caloric theory
- William J.M. Rankine, 1859, First textbook on the subject.
- Ludwig Boltzmann, late 19th century, statistical thermodynamics.

Thermodynamics, Carnot's Work

- Nicholas Leonard Sadi Carnot, 1796-1832, physics/economics
- 1824, "Reflections on the Motive Power of Fire and on Machines Fitted to Develop that Power"
  - Used lawyer brother as literacy critic.
  - Kept alive through Emilie Clapeyron
- How to calculate the efficiency though closed cycle.
- Reversible cycle impossible.
- Efficiency of a heat engine is based on the temperature difference over the power stroke.
  - Steam engines only utilize the temperature drop of the steam =¿ use gaseous medium
- Compress air before ignition (did not consider doing this in the cylinder)
- The original "diesel cycle" on p.32-33. Otto cycle?
- Never officially argued against the caloric theory.

Thermodynamics, Applications

- 1860s student began to be taught "modern" thermodynamics.
- Analytical tool, energy balance.
- Thinking shifted from economy towards thermal efficiency.
  - Always sound?
  - "To phrase it another way, the point of lowest fuel consumption for a specified power output of an engine may not provide the minimum fuel consumption when that engine performs a given task."

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