1. Carnot Cycle
   1. History

The *Carnot Cycle* introduces the concept of entropy from the standpoint of heat engines through considering their behaviors and properties. A *heat engine* is referred to as, **“a device which converts thermal energy (heat) into work”** (Laughlin & Gaskell, 67). For a long period of time steam engines were used in the industry long before the investigation into the reverse process of converting work into thermal energy. This was finally investigated by Rumford in 1798, where it was noticed that in the operation of the heat engine that some of the energy that had been transferred from the high-temperature heat reservoir was converted into work with the remainder had been transferred to a low-temperature heat reservoir. The diagram below shows a summary of the process occurring in the heat engine.

*q1*

*q2*

Heat Engine

Heat reservoir at high temperature, *t2*

Heat reservoir at low temperature, *t1*

Work, *w*

Figure 1: Diagram depicting the representation of the working of a heat engine

In this context of this diagram, for the system to function properly as an engine, it must return to the original state and start over again. When treating the engine as a system, we can make use of the first law to get that:

This equation states that the change in total internal energy is equal to the heat put into the heat engine minus the work that comes out and the heat that also flows out.

In the context of a steam engine, the superheated steam is passed from the boiler to the cylinders where the steam then performs work by expanding against the pistons. This expansion results in the temperature of the steam to decrease and at the end of the piston stroke, the steam is then exhausted into the atmosphere. At the end of this cycle, a flywheel returns the piston to its original position and thus returns to its original state. This process follows the framework of the previous equation and allows us to look further into other factors such as the efficiency, which is described by the equation below:

In this equation the factoring governing the efficiency of the process were first explained by Carnot in 1824 who then illustrated a cyclic process of what is now known to be the *Carnot Cycle*.

* 1. Summary

1. Relevant Examples