Sadi Carnot

ALSO LISTED IN
Physicists

FAMOUS AS
Physicist and Scientist

NATIONALITY
French   Famous French Men

BORN ON
01 June 1796 AD   Famous 1st June Birthdays

ZODIAC SIGN
Gemini   Gemini Men

BORN IN
Luxembourg Palace

DIED ON
24 August 1832 AD

PLACE OF DEATH
Paris

FATHER
Lazare Carnot

SIBLINGS
Hippolyte Carnot

MARRIED
No

EDUCATION
École Polytechnique, École Royale du Génie, Sorbonne, Collège de France

Popularly described as the "Father of Thermodynamics", Sadi Carnot was the man behind the first successful theoretical account of heat engine, today known as the Carnot cycle. A man with a mission, Carnot did not let the unrest and instability of his early life overshadow his living. He is accounted for concepts such as Carnot efficiency, Carnot theorem and the Carnot heat engine amongst others. His book, Reflections on the Motive Power of Fire, laid the foundations for the second law of thermodynamics. Carnot's concept of the idealized heat engine led to the development of a thermodynamic system that could be quantified, a key success that enabled many of the future discoveries that lay ahead. Read further to know more on the life of this prolific scientist and engineer.

His venture towards developing a theory for steam engine led to the discovery of the mathematical theory of heat and helped start the modern theory of thermodynamics. Until then, no research discovered the fundamental scientific principles behind the operation. Most scientists believed in caloric theory, which maintained heat was an invisible liquid that flowed when it was out of balance. Carnot wanted to use his research to improve the efficiency of steam engines. His first major work was a paper that he penned in 1822-23. It contained a mathematical expression for the work produced by one kilogram of steam. However, this paper was never published and was discovered in the manuscript form only in 1966.

In 1823, after the death of Lazare Carnot, Hippolyte Carnot returned to Paris and helped Sadi Carnot, who was then working on the book on steam engines aiming to answer two questions. Firstly, whether there was an upper limit to the power of heat, and secondly whether there was a better means than steam to produce this power. It was in 1824 that Carnot published his work,*Réflexions sur la puissance motrice du feu et sur les machines propres à développer cette puissance* (Reflections on the Motive Power of Fire). The book contained details of his research and presented a well-reasoned theoretical treatment for the perfect heat engine, presently known as the Carnot cycle.

His Work - Reflections on the Motive Power of Fire

While the book dealt with a wide range of topics about heat engine, the most important section was the one that was dedicated to an abstract presentation of an idealized engine, which could be used to understand and clarify the fundamental principles that are generally applied to all heat engines, independent of their design. Arguably, the most significant contribution that Carnot made to thermodynamics was his abstraction of the essential features of the steam engine. The same resulted in a model thermodynamic system based on which exact calculations could be made. The Carnot cycle is, perhaps, one of the most proficient possible engines, as it not only emits friction and other incidental wasteful processes, but also assumes no conduction of heat between parts of the engine at different temperatures. Carnot knew that the conduction of heat between bodies at different temperatures is a wasteful and irreversible process, and thus must be eliminated if the heat engine is to achieve maximum efficiency.

As for the second question, he was certain that the level of utmost efficiency did not depend on the nature of the working fluid. He predicted that the efficiency of an idealized engine depended only on the temperature of its hottest and coldest parts and not on the substance that drove the mechanism. Carnot also introduced the concept of reversibility in his book, according to which motive power could be used to produce the temperature difference in the engine,a concept subsequently known as thermodynamic reversibility. Though formulated in terms of caloric, rather than entropy, this was an early rendition of the second law of thermodynamics. Though Sadi Carnot’s book garnered excellent reviews as soon as it was published, it acclaimed public attention only after Clapeyron published an analytic reformulation of it in 1834. Carnot's ideas were later incorporated into the thermodynamic theory of Clausius and Thomson.