Industrial Revolutions: From Ctesibius to Mars

Author: Cort MacLean Johns, Ph.D.-HSG

New & Revised, July 2021

Copyrights

"Industrial Revolutions: From Ctesibius to Mars"

Pumbo.nl edition, ISBN/EAN: 978-94-6406-794-1

Published as a color hardback (Netherlands)

Current color edition is a self-published book in June 2021

"The Industrial Revolution – Lost in Antiquity – Found in the Renaissance"

Pumbo.nl edition, ISBN 978-94-63458-44-3 Published as a color hardback (Netherlands)

Rial Edward Hamann, Publishing Editor and Mechanical Engineering Consultant
William J. Lictenwanger, Editing Consultant[3]
Pamela M. Piatkowiak, Graphic Arts Illustrator
Cort Johannes Maclean, Legal Consultant
Marian Johnson Johns, Editing/Historical Consultant
Margery Ann Hamann, Editing Consultant
Julia S. Simakina, Editing Consultant
Thomas McCartney, Graphic's Consultant
Frank Philips, IT Consultant

[3] Bradley, C.J. (William Lictenwanger, Reference Librarian[U.S. Library of Congress]) 299-321

Ctesibius had developed the direct-pressure steam engine's predecessor, the Hydraulis, in ancient Greece. He did this before Hero started his research into siphons and their vacuum effects. Papin's Steam Engine of 1707 was not dependent on previous vacuum experiments nor devices, since it operated on an entirely different principle of steam expansion as opposed to the use of steam contraction inherent in the operation of Papin's vacuum or atmospheric Steam Engine of 1690 nor Watt's separate condenser concept. These two technologies carried the same commonly used term, "Steam Engine," but the use of steam should not imply that they performed with common engineering principles or designs.

To better conceptualize the role each technology played in the onset of the Industrial Revolution, historians of technology should maintain each related, dependent innovation's historical roots; otherwise, the entire relationship of technology to economic expansion taking place in the 18th and 19th centuries becomes hopelessly confused and lost. This approach may seem like a technical point; nonetheless, it is critical to the entire analysis for the longitudinal origins of the Industrial Revolution.

Relating the two-thousand-year history of the diffusion and transfer of the Hydraulis of Ctesibius and the siphon experiments of Hero is naturally more complex. The Roman, architect/engineer, Marcus Vitruvius Pollio, described several of the Hydraulis' technical details, however, he also omitted a few critical details. Those who attempted to reconstruct Ctesibius' Hydraulis could rely only on Vitruvius' Latin text description, since no sketches or diagrams remained of it from Antiquity. Vitruvius appears to have not fully understood, and therefore, could not described fully its mechanical details such as the missing description of its piston-like, check or flap valves. Yet, he provided sufficient details so that approximately 1900 years later Franz von Reber and Michael Markovits could by 1865 and 2003, respectively, unravel its operation after archaeologists unearthed a Ctesibius-type pump artifact from (c.100-150 A.D.). in Bolsena, Volsinii, Italy (Figure 7).

Interestingly, Jacob Leupold included his own design similar to the Bolsena Roman pump (Figure 7a).[61]

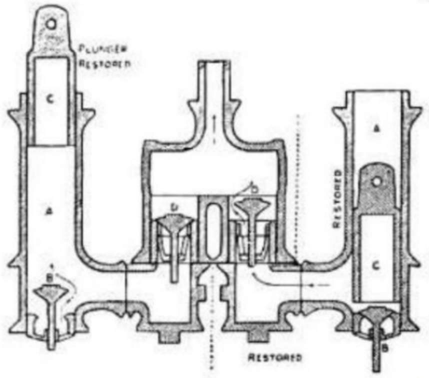

Figure 7 Ctesibius Greek Hydraulic Pump[62]

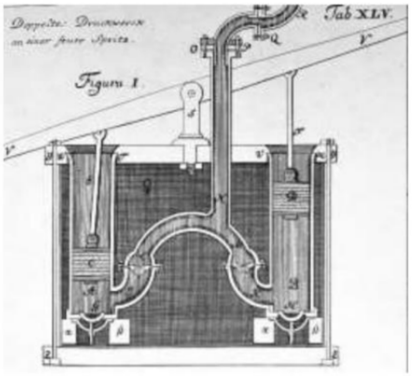

Figure 7a Leupold's Double-Pump Fire Extinguisher [63] **Bolsena, Roman Volsinii (c.100-150 A.D.)**

[61] Hornung, W. (Die Entwicklung der Feuerlöschpumpe vom ausgehenden Mittelalter bis zum 18. Jahrhundert). Hornung explains that there were other fire extinguisher designs, one patented by Nicolas Mandell and John Grey in 1712 claimed to use a compresser to produce a continuous water stream "patentierte Spritzer einen kontinuierlichen Strahl erzeuge". From the time of their patent filing in 1712 until the British Museum obtained the Bolsena pump artifact in 1892, we have a 80-year period in which we have yet to ascertain whether Mandel and Grey and others had the opportunity to inspect the Bolsena pump.
[62] Drachmann, A.G. (The mechanical technology of Greek and Roman antiquity: a study of literary sources) (Ktesibios, Philon, and Heron) 7. Ctesibius-type Hydraulic; the Romans copied his check valves, also used in the Hydraulis.
[63] Leupold, J. (Theatrum mach. hydr. Band I) Tab. XLV, Fig.I, Leipzig, 1724. 123. Acquired by the British Museum in 1892: https://research.britishmuseum.org/research/collection_online/collection_object_details.aspx?assetId=129817001&objectId=399918&partId=1