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“A Review of ASME's Book on U.S. Mechanical Engineering History”

by Andrew H. Wilson

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#56/2022

U.S. MECHANICAL ENGINEERING HISTORY: ASME VERSION

by Andrew H. Wilson

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Abstract

In June 2021, the American Society of Mechanical Engineers published CHRONICLES OF MECHANICAL ENGINEERING IN THE UNITED STATES, edited by Thomas H. Fehring and Terry S. Reynolds, a record of the activities, members etc. of the ASME History and Heritage Committee over the 50 years since its founding in 1971.

This present paper contains my comments on this new American document.

About the Series

Principally, the Cedargrove Series is intended to preserve some of the research, writings and oral presentations that the author has completed, but not yet published, over the past half-century or so.

About the Author

He is a graduate in mechanical engineering and the liberal arts and has held engineering and administrative positions in industry in the United Kingdom and engineering, administrative, research and management positions in the Public Service of Canada, from which he retired over 30 years ago. He became actively interested in the history of engineering on his appointment to chair the first History Committee of the Canadian Society for Mechanical Engineering (CSME) in 1975.

To begin the story...

This is a rather marvellous book. It presents the story of mechanical engineering in the United States from post-Revolution years and not just from the time of the establishment of the ASME in 1880, or of its History and Heritage Committee in 1971. It provides an economic/political background to the founding of the Republic and the Society. But before it is finished, the book has also covered more contemporary branches of mechanical engineering, such as refrigeration and aviation, but not mechatronics. It also includes biographical information on a great many of ASME's distinguished members over the years. So I propose to limit my comments to the content generally, without repeating the technical details of the different parts of it. Nor will I try to cover all of the subjects. The book has been well illustrated by photographs and drawings.

For the record, however, the book begins with information on the pioneer engineering activities of Eli Whitney (cotton gin), David Bushnell (underwater 'turtle') and Robert Fulton (the steamboat *Clermont*), as well as the contributions of European J.P. Blanchard, who brought with him his accumulated knowledge of ballooning and began the American affection for aviation. Included, it should be noted, are some of the interests of Presidents Washington and Jefferson and of Ben Franklin. For source material, the book has relied heavily on the 1915 publication of the Society's history and on articles in the ASME magazine, *Mechanical Engineering* by several eminent engineer-historian members of ASME, including this book's editors.

The year 1876 has been well documented because of the connection between engineering and the World Exhibition at Philadelphia that celebrated the country's contemporary engineering and included the design and erection for the Exhibition of an eponymous George H. Corless beam engine, which also provided power to drive the exhibits in the Machinery Hall. In my view, the 1876 Exhibition also ushered in the era of American world leadership in all phases of engineering, something that continues to this day....although not unchallenged!

The book has also emphasised the roles of Moses Brown, Samuel Slater, and the State of Rhode Island in the establishment of mechanical engineering-based manufacturing in the U.S. and of Frederick Taylor and the Gilbreths in giving ASME a start in the techniques of the management of engineering.

By the way, the Gilbreths were also famous for their family of twelve and for the tag line, 'cheaper by the dozen.' After her husband died, Lillian Gilbreth carried on with the work they had begun. She also became a frequent visitor and speaker at the annual meetings of the Engineering Institute of Canada.

Interestingly, it appears that all, or almost all, of the early presidents of ASME began their careers as machinists and mechanics, or owners of machine shops, something that does not seem to be happening now, in the 21st century. They were essentially self-made men in the days that practice preceded theory, sometimes by many years.

More comments...

The biographical material in the book concentrates on the distinguished early presidents and other early leaders of the Society, and especially Robert H. Thurston, the first ASME president. Others include the first two U.S. presidents, Washington and Jefferson, as well as the first American 'Everyman', Benjamin Franklin, and even Paul Revere. Also included are George H. Corless, John F. Fritz, John E. Sweet, E.D. Leavitt, H.R. Worthington, and George Westinghouse, Frederick W. Taylor and the Gilbreths, Elmer Sperry, George H. Babcock, Alexander Lyman Holley, Henry Ford, John D. Montgomery, Edwin Drake, U.S. Navy Admirals George Melville and Hyman Rickover, and Professor Stephen Timoshenko. However, the 'modern' ubiquitous ones, such as Dan Drucker, 'Scotty' Kezios, Don Zweip, Leroy S. Fletcher, the Roes (father and son), and the History Committee chairs like Donald E. Marlowe and John H. Lienhard might all have received more coverage than they did (of them, Eugene S. Ferguson got the most). The 105th president was the first lady, Nancy D. Fitzroy, in 1986.

U.S. President and Engineer Herbert Hoover, is mentioned briefly... but he was not a mechanical! (Jimmy Carter was the other (nuclear) engineer and president.)

The technical material in the book again concentrates on the earlier subject matter, not all of which may first have been invented in America, by Americans - but there *were* American firsts! The list begins with textiles and continues with water and rail transportation. Regarding steam, Oliver Evans (pre-ASME) is mentioned briefly ... he was the American equivalent of Scotland's James Watt, but several of the 'early' mechanical engineers were also active in steam. Also mentioned in the book are A.L. Holley, who brought the steel industry to the United States; Worthington's company and its famous pumps, Yale's locks, Fritz's iron and steel production, and some of Westinghouse's products, plus U.S. Navy Admiral Melville, of the 'steam' Navy, and Admiral Rickover of the 'nuclear' Navy, the work of Edwin Drake in the ground-breaking oil field at Titusville, Pennsylvania, the precision machinery production of Warner and Swasey, Sperry's contribution to the transportation field as a whole, and Willis Carrier's contributions to the birth and growth of air conditioning and refrigeration. Then there were the 75 years of varied mechanical contributions by William H. Durand, the theoretical work of Stephen Timoshenko, and the machine designs of Ralph Flanders.

The book also mentions the Society's Landmarking Study, designed to reveal more 'targets' for its Program of that name, as well as several instances of President Eisenhower's involvement with ASME along with some of his other engineering interests. It deals in some detail with the engine-mounting problems faced by Boeing and Pratt & Whitney over the installation of the engines for the Boeing 747. In other words, the book not only deals with industrial growth in a broader context, but with some important *engineering* details.

The later technical material in the book deals significantly with energy production, thermal efficiency and conversion, with the various types of steam, gas and water

turbines, oil production in the United States, as well as nuclear power and the pressurized water reactor, and finally with the histories of aviation and aerospace, and their hardware in both early and more recent times, and especially around the time of the Wrights and Kittyhawk and, later, when the gas turbine had arrived along with huge aircraft, their problems and the use of ceramics. And finally, the America's large contribution to the Space Race with the Russians. (See the contemporary note at the end of the paper about the Wright/Kittyhawk machine.)

Next up is transportation, material from the humble bicycle to the motorcycle to the car, with special attention being paid to the early 20th century and the company that made Harley-Davidson a household name, as well as to Ford's strategies when manufacturing and selling his vehicles. The discussion of 'modern' mechanical engineering ranges from pipelines for oil and gas, to irrigation, refrigeration, air conditioning and ice-based research and the development of agricultural equipment, to the Pullman railway sleeper car, climate control, rifles, and to the wire-drawing techniques applied to the manufacture of cables for cable-stayed and other bridges, beginning with the Brooklyn one.

Apart from Timoshenko, the researchers and theoreticians of mechanical engineering have received relatively little attention. I wondered why?

Several chapters in the book are devoted to ASME's special work in support of its Boiler and Pressure Vessel Code, for which it is internationally known, and to the infamous Hydrolevel Case, which began as a possible BPVC restraint of trade law infraction in 1971, and ended 13 years later with the Supreme Court involved and ASME having to pay a hefty fine.

The book has also provided a chronology of the establishment of the principal senior medals now awarded annually by ASME, and named after late members.

The book ends with a delightful essay titled, 'The slide rule: far from forgotten,'

which discusses the unforgotten role this ‘engineers’ tool’ once played in speeding engineering calculations.

Finally, another word to the effect that this book is about *American mechanical engineering* and what *it* has achieved. Its acknowledgement of engineering that originated abroad (including in its neighbour, Canada) are few and far between.

Note on Wright/Kittyhawk...

Reference was made above to the claim by the Wright Brothers to be the *inventors* of ‘taking a man on his first flight’ in December 1903. The note refers to the long-running debate on who did this first: the Wright Brothers or, just weeks before Kittyhawk, S.P.Langley, then director of the Smithsonian, on the Potomac. The day before this paper was being completed, (January 15, 2022), the *Ottawa Citizen* published an article (*Wright or Wrong*) by Ronald G. Shafer on the long-running disagreement between the Wrights and the Smithsonian on this matter.

The end of the story...

Reading the detail in the book also illustrates the difficulties Boards of Governors have in maintaining forward momentum within their institutions, as well as preserving historic development within them. Undoubtedly, in ASME’s case, the long-term survival of the History and Heritage Committee has helped significantly.

This is the kind of book I encouraged the present CSME and its History and Archives Committee to produce for the Canadian Society’s 50th Anniversary in 2020, having covered the first 25 years myself, in part, in 1996 with *From Steam to Space*, (when I chaired the CSME Committee). But nothing like this has been produced so far.