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“From Steam to Space Revisited”

by Andrew H. Wilson

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Abstract

This paper is based on the talk given by the author during the Special Engineering History Session of the International Conference of the Canadian Society for Mechanical Engineering at the University of Toronto in early June 2014.

The book that is being 'revisited' was published originally to commemorate the 25th Anniversary of the founding of CSME. The talk covered some of the background to its publication and brief descriptions of a half dozen of the mechanical engineering activities that were included in the book to illustrate mechanical engineering's contributions to Canada's development. This paper amplifies these.

While the talk made use of illustrations in a power-point presentation, with one exception (on page 2), these have not been included in this paper. They all appeared in the book.

This paper also makes the suggestion that preparations begin soon for a second book to help commemorate CSME's 50th Anniversary in 2020.

About the Series

Principally, the Cedargrove Series is intended to preserve some of the research, writings and oral presentations that the author has completed over the past half-century or so but has not yet published. It is, therefore, a modern-day version of the privately-published books and pamphlets written by his forebears, such as his paternal grandfather and grandmother, and his grandfather's brother John.

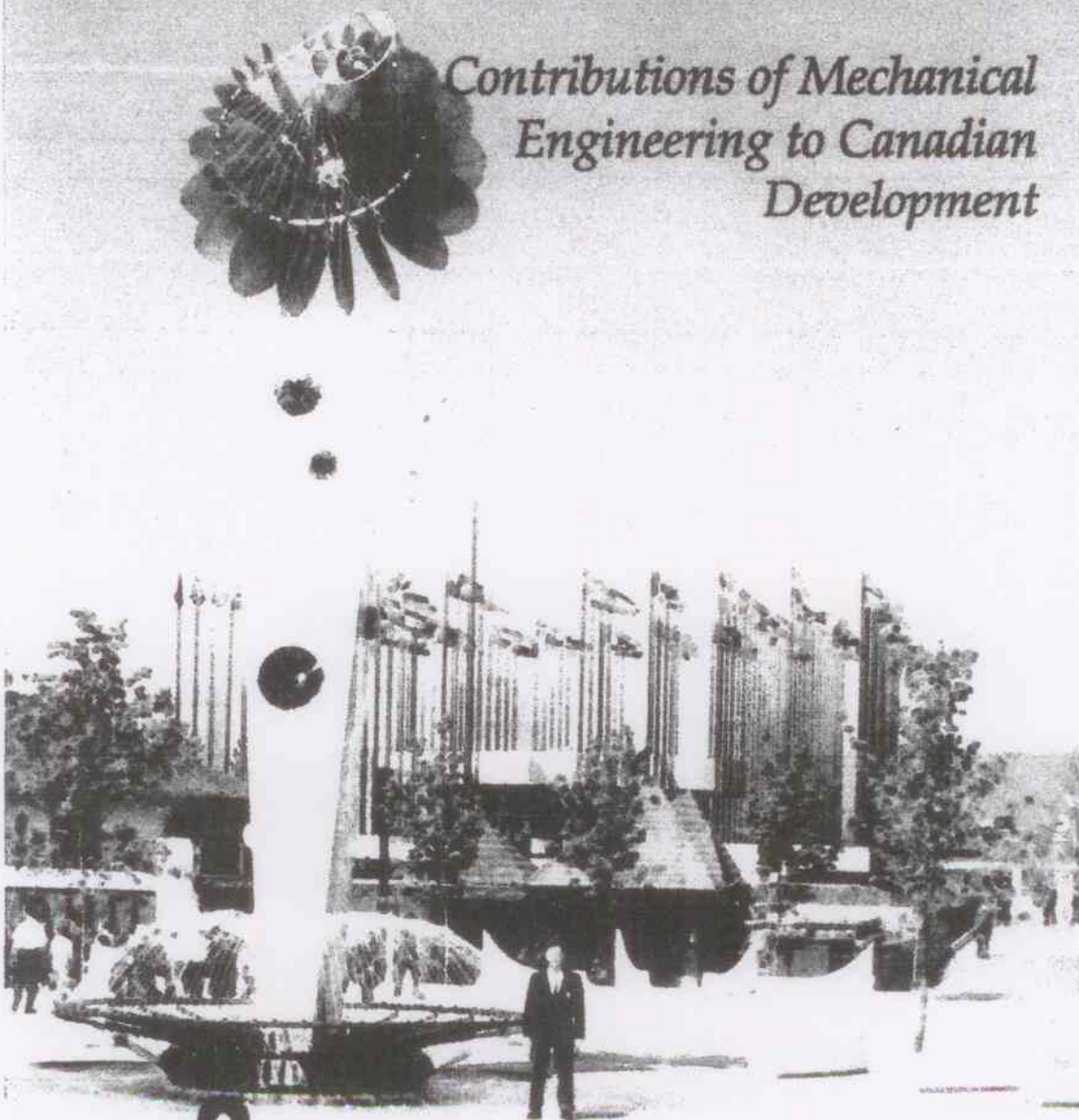
About the Author

He is a graduate in mechanical engineering and the liberal arts and has held technical, administrative, research and management positions in industry in the United Kingdom and the public service of Canada, from which he retired over 25 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 in 1975 and served both CSME and the Engineering Institute of Canada in this capacity for varying periods of time until 2003. He has researched, written and edited historical material for both organizations, as well as for the Canadian Society for Senior Engineers. He is also a past president of CSME and EIC.

From Steam to Space:

*Contributions of Mechanical
Engineering to Canadian
Development*



**Canadian Society for
Mechanical Engineering
1996**

Introduction...

From Steam to Space was published by the CSME in October 1996 to commemorate the 25th Anniversary of the Society's founding in April 1970. Date-wise, it was a year late, due principally to the decision to include material originating during the Society's 25th year. Its production took all of four years, and was the responsibility of the Society's History Committee, of which I was chair and - consequently - became the book's editor. In 1993 I was joined by two assistant editors, Mounir Massoud, to look after the French texts, and Anne Moran, to take care of production details. The CSME Board of Directors received regular progress reports and requests for decisions during the years of preparation. The writers were all volunteers. The production costs were met by the Board. To ease the cash flow for these, members of the Society were invited to contribute to a Sponsorship Fund. A small number of hard-cover copies were also printed.

With regard to content, I already had a possible model: the history-based 25th Anniversary commemorative volume of the Canadian Society for Chemical Engineering, published in 1991 and edited by Leslie Shemilt. I decided that the CSME volume should be similar and would have two principal parts: the first to include essays on examples of Canadian mechanical engineering and their contributions to the country's development, along with a history of mechanical engineering education; and the second to include descriptions of CSME's founding, history and activities up until 1995, along with its honours lists.

The next step was to identify specific subjects and potential authors. A call went out to the Society for authors, but none came forward. However, prior to work beginning on the CSME book, there had been a number of papers and articles published in the CSME *Bulletin* or given at the History Committee's seminars that appeared to be suitable for adaptation for the book. For the rest, I approached members of the History Committee and other possible authors and received encouraging support. Suffice it to say that a great deal of my time as editor was spent acquiring, adapting and editing the incoming texts and preparing sub-sections of the book that had to be specially written.

What follows are brief comments on some of the 18 essays that describe mechanical engineering's contributions to Canada's development. I must emphasise 'brief' since this section of the book had over 200 pages. But if something I say appeals, you can always read the full story in the book itself!

To begin with steam...

The first essay in the book is by Larry McNally, on the subject of the steam engine founders in Eastern Canada in the 19th century, a subject you will be hearing more about from Larry himself in this Session. So let me simply quote parts of the introduction and the summary in this essay:

Mechanical engineers were not the first to do mechanical engineering in Canada. Before they became established as professionals, a variety of craftsmen including mechanics, machinists, millwrights and founders were involved in designing and constructing machinery and mechanical systems such as stationary and marine steam engines, power systems, machines, implements and fittings for locomotives, ships, mills and other mechanical applications...

Through the activities of the Canadian engine foundries (in the early 19th century), it is possible to see the origins of what has come to be known as

'heavy engineering' - the custom building of large machines and equipment. The engine foundries had the tools and techniques to fabricate these from smaller cast and wrought iron components...

Steam power came to Western Canada in the 1880s. In his essay, George Ford has this to say:

The first use of steam traction engines for plowing in the West took place near Regina in 1883 and moved westward with settlement. However, it was soon noticed that the engines intended for plowing had to be heavier, stronger and very solidly constructed. Heavier greasing was also required. The Case 110 hp model was typical of the machines used to break the land...These machines were expensive and required a special knowledge of steam engineering, so that few homesteaders had one and this gave rise to the custom plowman. By 1907 over 400 breaking crews were at work, but as soon as the land was broken the custom plowman began to disappear. The farmer worked the newly broken land himself...

From steam to gasoline...

Heather-Anne Getson describes make-and-break engines as "deceptively simple two-cycle internal combustion engines." Single-cylindered, light-weight and powered by gasoline, their name came from their ignition mechanism. They were nicknamed 'one-lungers' and became the primary source of power for the Atlantic inshore fishing fleet, including Newfoundland, early in the 20th century. Prior to this, fishermen had to row or sail out to their fishing grounds, and row or sail back to harbour at the end of their day. The new engines were also much superior to muscle-power during storms. The less complicated low-voltage ignition system used by these engines was impervious to the damp marine conditions of sea fishing and therefore preferred to spark-plug ignition. Their construction also eliminated gears, cams and valves. They developed between 3 and 6 ½ hp. They allowed the fishermen to "putt-putt" out to their grounds quickly, do their fishing, and return home equally quickly. The fishermen were also able to catch the early market, and could have a second day job in the afternoons, if they wished.

The story goes that these engines could also be used as anchors during storms at sea. The engine was unbolted, the carburetor removed, and put over the side on a long line. When the storm was over, the engine was hauled back on board, drained of water, the carburetor put back, the engine bolted back in place and started again...!

Americans had a lot to do with the development of make-and-break engines, but so had Nova Scotians - for example, Winfred Ritcey, Forman Hawboldt and Daniel and Charles Young. The brand names included *Atlantic*, *Hawboldt*, *Fraser* and *Acadia*. Some were still in service in the 1970s.

From gasoline engines to boilers, rock drills...

Babcock-Wilcox Canada could trace its origins to two partnerships and a foundry in the mid-19th century. The Dumfries Foundry was established in Galt, Ontario, in 1844 by partners James Andrews and James Crombie. Andrews left in 1850. By the 1860s, partners John Goldie and Hugh McCulloch Sr. had joined Crombie. The firm by then made steam engines, and fitted up flour, saw and rolling mills. During the succeeding years the company, known for much of this time as Goldie & McCulloch, expanded its

