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A HISTORY OF CANADIAN INVENTION

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Abstract

This paper was presented originally by the author to the Ottawa Chapter of the Canadian Society for Senior Engineers on April 17, 2012. The version now printed had been expanded to include additional material that could not be accommodated in the allowable speaking time. It includes copies of photographs of J.J. Brown, Morse Robb and Eric W. Leaver - but not the notes - from the Power Point presentation that accompanied the actual talk.

The objects of this paper are to present a much shortened version of the history of Canadian invention as given by Dr J.J. Brown in his book *Ideas in Exile*, published in 1967, and to discuss Brown's criticisms of the apparent failure of Canadians to exploit certain significant technological inventions in the marketplace. The history, by itself, makes a useful contribution to the literature of invention in Canada, but the author's criticisms of the lack of Canadian enterprise remain essentially unexamined.

About this 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 variant 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, and is a past president of both.

Introduction

This paper has been deliberately titled **A** History of Canadian Invention rather than **THE** History because it is the subtitle of the book *Ideas in Exile* written by J.J. Brown and published by McClelland & Stewart in 1967. In fact, no definitive history of Canadian invention exists that deserves to have **THE** in its title. Brown's book may come closest to being one - and certainly much closer than Wikipedia!

When it appeared, *Ideas in Exile* attracted considerable attention, but it has since disappeared from sight. One of the reasons for this is the fact that the first printing was limited and a second one was not apparently attempted. Another is the perception of many people that Canada's invention problems are not greatly important. After all, the inventive might of the United States is right next door. Yet, at the time *Ideas* was published, some Canadians were becoming increasingly interested in what was being called 'science policy' or 'science and technology policy' - thanks in part to the establishment of the Science Council of Canada and the reports it had begun to publish.

Also, the first copy of the book that I bought fell apart quickly. So I bought a second one, which also fell apart and is now being held together by an elastic. I suppose other readers had the same experience. In any case, Dr Brown appears to have written nothing more that is noteworthy about Canadian inventions.

For the record, this particular John Joseph Brown was born in Alberta in 1916, graduated with a bachelor's degree from Victoria College, University of Toronto, in 1939, received an MA and a doctorate in the history of technology from Yale in 1941 and 1943, and collected several prizes along the way. On leaving Yale, he became a full-time writer - journalist might be a better term - who did a little teaching, although he had apparently begun writing and publishing articles as early as 1937. He thought of himself as a social historian, one of whose subjects was the role of technology in history.

At the time *Ideas in Exile* was published in 1967, Brown was described by Tom Alderman in a *Toronto Weekend Magazine* article as "a slim, serious ex-college professor of 50 who (was) also a tinkerer, having patented an inflatable pocket umbrella, which was never manufactured, and who made a name for himself as a management consultant and the author of books on investment, real estate and insurance." He was also, apparently, a remarkably successful investor on his own account, and was able to retire to do research and write articles - and books like *Ideas in Exile*.

When it appeared, this book garnered a good deal of favourable journalistic comment. For example, the magazine *Canadian Business* said that it was "a work of true scholarship and vast research, including much legwork," that took four years, \$120,000, and hundreds upon



J.J. Brown

(Canadian Business, February 1968)

hundreds of interviews with companies, institutions and individuals to research, and that this sum was underwritten by a number of Canadian corporations. In other words, Brown did a great deal of 'grunt work' on this project. But I would guess that not all of the original sponsors were in complete agreement with his conclusions regarding Canada's apparent failure to secure economic advantage from many of its most visible inventions.

Again, on the positive side, in a review in the *Financial Times of Canada*, Anthony J. Patterson wrote that Brown's book could be favourably compared with Arthur Porter's *Vertical Mosaic* and deserved a place in the home or office of every interested Canadian. However, Patterson also said that the book suffered from sloppy proof-reading and lacked important details in regard to some inventions. And, as I have found, it included some quite incorrect information. The scope was also incomplete. By the author's own admission, he omitted medical technology. But he also omitted pharmaceuticals and space technology, including the *Alouette* satellite and the STEM antenna.

Brown writes that his main complaint regarding the lack of appropriate exploitation of certain Canadian inventions was "economic backwardness" brought about because "our ideas have to be taken abroad for development." He goes on to say that, "while we have made contributions to world science and technology out of all proportion to our small number.....we are a timid people, afraid of ourselves and terrified by the demands of the real world.....we have been content to let others take the risk of presenting new ideas to a fiercely resisting world." The purpose of his book was, he says, to set down "some definite notions about what is wrong with invention in Canada."

Brown defined an 'invention' as "an idea embodied into a piece of physical equipment which provides some good or service we did not have before." He defined 'innovation' as "all of the above, except that it does not have to be embodied in any physical equipment." In other words, they may be more or less the same thing where physical equipment is concerned.

In my view, the definition of 'invention' is adequate enough, but the one for 'innovation' is not. The definition I feel to be more appropriate says that *technological* innovation is the completion of the process of bringing a technology-based 'invention' to *market* (my emphasis), and with the proviso that it may involve 'old' as well as 'new' technology.

Early History

Brown's training as an historian of technology serves him well in the early chapters of his book, when the inventive work he describes is not being criticized for its lack of success in the marketplace. He begins with the French settlements of the 16th and 17th centuries, when

invention was quite uncommon, since people were too busy just surviving. As a result, they copied a lot from the Aboriginal people. Their settlements also suffered from shortages of skilled artisans, and communications were slow. Competition with France was not allowed, so the marketing of most things there was difficult, and the home government's support could not be relied upon. Much of the technical work in the settlements had to do with the military situation and with the protection of civilians from warlike neighbours. Fur, fish and lumber, however, changed a lot of things. The country's interior was opened up as its rivers became its highways and trading was developed with the Aboriginal peoples. A few ships were built, and iron ore deposits exploited.

Things began to improve in the 18th century. More ships were built, including flat-bottomed craft suitable for shallow water travel. So were large defensive works, such as the fortifications at Québec, Halifax and Louisbourg. Metalworking was boosted when *Les Forges St. Maurice* began operations. Other industries included coal mining in Cape Breton, brewing, distilling and tanning and potash production from trees burned as land was cleared for farming. And the colonies' first primitive roads were built.

Change came more rapidly after the Treaty of Paris in 1763. The English settlers, unlike the French, inherited a tradition of trade. As well, the growing enmity between England and her American colonies shone a spotlight on Canadian sources of raw materials, such as timber. There was also the continuing military influence, again with the colonists to the south in mind, as well as the commercial ones of making and transporting goods. New towns appeared, as did new and rebuilt roads and the building of larger boats and ships. Rafts were developed to transport squared timber from interior forests to coastal ports. Canals were built, for both military and civilian purposes. The first one at Lachine, completed in 1781, was probably the first in North America to have locks. Surveying and mapping were pursued with vigour, and Canada acquired an international reputation for them. New crops were planted. And more trained and enterprising settlers arrived after the American Revolution, as well as from Europe.

The 19th Century

This trend continued into the 19th century and innovation increased in the Canadian colonies. The first paper mill in Canada appears to have been built at the turn of the century at St. Andrews East, Québec. By 1846 there were a half dozen mills in Canada West and three in Canada East. The first steamship made totally in Canada – the *Accommodation* in 1809 – was built and owned by John Molson, the Montréal brewer. It was followed three years later by the *Swiftsure*, which had an imported Boulton & Watt engine. Steam engines were built for ships and stationary applications in Montréal and in other places in Québec and Ontario. Armed sloops were built for service on the Great Lakes. As a result of the War of 1812, the Rideau and

Ottawa River Canals were built. The first Welland Canal was also built at Niagara, to meet competition from the Erie Canal in the United States. The first vessel to make the west-east passage of the Atlantic almost entirely under steam - the *Royal William* - was built at Québec, with engines built in Montréal. The Hudson Bay and Northwest Companies were merged in 1821. By 1835, with the building of the Chambly Canal round the rapids in the Richelieu River, there was a direct water route between Montréal and New York, which was time-shortened when the first railway in Canada was built in 1836 between the La Prairie on the south shore of the St. Lawrence and St. Jean-sur-Richelieu. In 1845, the Beauharnois Canal on the St. Lawrence was opened to traffic. By 1850 there were over 2 million people living in British North America.

Meanwhile, in 1824 the Canadian Patent Office had been opened. In his book, Dr Brown mentions a great many early inventions and inventors from this period - too many even to list in this paper. So let me simply give you some examples.

By 1846 a Maritimer, Abraham Gessner, had worked out a method of producing a lamp oil he called 'kerosene' from coal and pitch-like albertite and which replaced whale oil. In the early 1850s, Charles Tripp and his associates began the manufacture of asphalt, which they had discovered in the gum beds of Enniskillen Township in south-western Ontario. The first oil refinery in Canada was built in 1857 after James Miller Williams had discovered wells at Oil Springs, near Enniskillen, a year or so before the discovery of the first American well in Pennsylvania. This was followed by the discovery of a well at Petrolia in 1862, after which the first oil pipeline was built from Petrolia to Sarnia. Brown writes in his book:

By 1876, Canadian teams were going all over the world in the search for oil.....During the seventies and eighties, Canadian teams ranged from Central Europe to Australia, bringing in oil wells by techniques originally developed in Canada.

The 19th century saw the growth of wooden-hull shipbuilding in Halifax and other ports large and small around the Maritimes. Indeed, in his account of the industry, Brown praises the shipwrights for their ingenuity and unusual construction methods, especially when lacking the kinds of tools normally available in shipyards elsewhere. This industry reached its peak of technical development in the 1870s as the day of the sleek clipper ships approached its close.

Brown tells the story of Robert Foulis and the development of the first steam foghorn at his foundry at Saint John, New Brunswick, in the early 1850s. Apparently, like a number of other Maritime inventors, he went unrewarded for his ingenuity. So did John Patch, of Yarmouth, Nova Scotia, who played a part in the development of the screw propeller, and John Fraser of Pictou, Nova Scotia, who successfully used underwater diving equipment - of German origin - for the first time in wrecked ship salvage operations off Prince Edward Island. They missed

reward opportunities, as Brown explains, because it was the normal thing for a man to invent improved marine equipment. New devices appeared all the time, so local newspapers paid no attention. Also, it was unlikely that much money was spent by the local inventors on obtaining patent or other forms of protection. If the inventor got a reward, it was either through improvements in his own operations or in the offer of a better job from an employer.

However, transportation by rail stimulated engineering in Canada. The iron and steel industry, for example, benefitted from the construction of tracks, rolling stock and bridges. The first rails were made of wood, with their tops covered by thin strips of iron. But as the weight of the locomotives and cars increased, iron had to be used for the whole rail. Because of the lack of manufacturing facilities in Canada, until at least 1858, iron-based products were imported from Britain and the United States. There were problems, also, stemming from the initial use of two track gauges. The first Canadian-built locomotive was made by James Goode in his Toronto foundry in 1853. Canadians apparently contributed to the development of signalling, braking and coupling systems for trains. The basic patent for the rotary snowplough - a combination of a snowplough and a snowblower - was taken out by a Toronto dentist, J.W. Elliott. Henry Ruttan, an Ontario sheriff, invented a system for cooling passenger cars, the first to be installed in Canada. Theodore Woodruff contributed to the development of the sleeping car.

One of the 'by-products' of the coming of the railways to Canada was an improvement in the use of canals and of steamboats on lakes and rivers, and especially on the Great Lakes. The Welland Canal, for example, was expanded twice, in 1845 and again in 1887. The railway also changed the lumbering industry in the Ottawa Valley. By 1867 it had become an alternative to the use of rafts on the river. The mining and metallurgical industries expanded as new deposits were discovered in places such as Sudbury, Ontario, and Trail, British Columbia. Cheap and abundant supplies of coal were also discovered in south-eastern B.C.. And the world got standard time, thanks to its promotion by Sandford Fleming.

Canada also earned renown for its development of mechanized agricultural machinery, beginning in the mid-19th century, including labour-saving machines that ploughed, sowed, planted and harvested, as well as large steam-driven traction engines that became a feature of Prairie agriculture. The first major name in this business was Massey.

According to Dr Brown, Ebenezer Clemo was the inventor of a method of making wood pulp from straw, although he did not receive credit for it from the Patent Office. Nor did Charles Fenerty of Halifax for inventing a process for making newsprint from wood fibre, some 20 years before a similar process was invented in Europe. John Forbes, also of Halifax, invented the spring skate in 1854 and, in 1861, a company was set up at Dartmouth to manufacture it. In 1887, James Whelpley invented the racing skate, which used straps rather than rivets for attachment to boots.

With regard to a less well-known area of technology, Brown credits George E. Desbarats of Montréal with printing in 1869 the first publication, the *Canadian Illustrated News*, that used letterpress half-tone reproductions of photographs, although he *may* not have been the first to invent it. But Brown then proceeds to put one of his main messages across by writing:

Modern authorities on the history of printing and engraving are pretty well agreed that in the Desbarats half-tone process Canada has a definite world first. The only reason why Desbarats' accomplishment has not been recognized is that *in the past we have had no written history of Canadian invention and technology* (my emphasis). Scholars work from the written record, and if there is no mention of Canadian accomplishments in the learned journals found in world libraries, it is not surprising that the names of Canadian inventors do not appear in books. The curator of the graphic arts division of the Smithsonian agrees that the Desbarats illustrations appearing in the *Canadian Illustrated News* in 1869 were definitely the first half-tones to appear in any publication.

It is not surprising, therefore, that Brown and others saw a much-needed contribution - by *Ideas in Exile* - to the literature on Canadian technology.

The telegraph and the railway 'grew up' together, so to speak. Samuel Morse, in the United States, was the pioneer of the electric telegraph. The first one in Canada ran from Toronto to Hamilton in 1846 and the second, a year later, from Toronto to Québec, and by 1861 there were over 3,000 miles in use. The first submarine cable in North America was laid by a Canadian, Frederick N. Gisborne, with the help of an American, Cyrus Field, between Newfoundland and Cape Breton. By 1856 St. John's was linked to New York.

The invention of the telephone in 1876 by Alexander Graham Bell began an even bigger revolution in communications. While Canada can take much of the credit for this invention, it must share Dr Bell with Scotland and the United States. However, Brown complains that the Canadian company set up to exploit Bell's patent needed help from its American counterpart to do so. But he also notes that several Canadians made contributions to the early telephone. Cyrille Duquet of Quebec City probably invented the 'cradle' phone. Romaine Callender of Brantford received a U.S. patent for an automatic telephone exchange. And George Long built a model of the first pay phone.

Brown notes that the first electric light plant in Canada, based on Edison's d.c. system, may have arrived in Toronto in 1879 to serve a restaurant and, in 1881, to serve the Eaton department store. That same year, Thomas Ahearn built a plant in Ottawa and, the following year, there was one in Montréal. Ahearn also demonstrated that an electric stove could be used

