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### **ENGINEERING HISTORY PAPER #39**

## **“Persons of National Historic Significance: Members of the Engineering Institute of Canada”**

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EIC HISTORY AND ARCHIVES

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## **Abstract**

Since 1919, the Historic Sites and Monuments Board of Canada has pursued a program of historical commemoration that designates historic sites, events and persons as being of national historic significance. Among the 560 or so persons so designated have been a number of engineers, members of the Engineering Institute of Canada or its predecessor, the Canadian Society of Civil Engineers. The purpose of this paper is to provide biographical information about these engineers, all of whom were designated by the Board prior to 2008.

To qualify, nowadays, these Persons have had to be deceased for at least 25 years at the time of their nomination (the exceptions being Prime Ministers, who are eligible immediately upon death). Sometime after designation, a plaque is usually erected at a site associated with the designatee.

The stimulus for this paper has been the fact that, for the late 19<sup>th</sup> and the early-to-mid 20<sup>th</sup> centuries, the three most frequently mentioned engineers contributing to the development of the profession and to engineering itself have been Thomas C. Keefer, Sandford Fleming and Casimir S. Gzowski. Others have scarcely been mentioned - yet they exist. So, while it includes information on these three, this paper draws attention to some of the other engineers of prominence in Canadian history.

## **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 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 20 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 and served both CSME and the Engineering Institute of Canada (EIC) in this capacity for varying periods of time until 2003. He has researched, written and edited historical material for both organizations, as is a past president of both.

## Introduction

Three names dominate the history of engineering in Canada: Keefer, Fleming and Gzowski. They are, in effect, the 'heroes' of the profession. The problem is that the list of potential engineering 'heroes' is somewhat larger, although any final list would be for the worshipper to decide.

Although this paper includes biographical material for 'the three,' it suggests a number of other engineers who might be on such a list. Those chosen belong to an elite group: engineers who were members of the Engineering Institute of Canada or its predecessor, the Canadian Society of Civil Engineers, and who have been designated by the Historic Sites and Monuments Board of Canada (HSMBC) as being 'persons of national historic significance.'

In addition to 'the three,' they include: Charles Camsell; E. P. C. (Percy) Girouard; Clarence D. Howe; John Kennedy; Charles A. Magrath; Philip L. Pratley; and Wallace R. Turnbull.

There are undoubtedly still more names that may be added to the list - some who are still living as well as some who are not. Let some other worshipper put them forward!

## The Biographies

**Charles Camsell** was born at Fort Liard in the Northwest Territories in February 1876, the son of J.S. Camsell, then a chief factor with the Hudson's Bay Company. He was educated at St. John's College, Winnipeg and at the University of Manitoba, from which he graduated with a BA degree in 1894. He later took graduate work in geology at Queen's and Harvard Universities and at the Massachusetts Institute of Technology.

Camsell spent his early professional years in the exploration and study of the Mackenzie River basin and from the region west of it to the Pacific Coast. He took part in geological survey work at Great Slave and Great Bear Lakes, and the Coppermine River Basin. During 1901 he explored the Moose River Basin on James Bay for the Algoma Central Railway. In 1902, he was in the Peace River country of the NWT and, in 1903, worked for the Canadian Northern Railway in northern Manitoba and western Ontario.

In 1904, Camsell joined the permanent staff of the Geological Survey of Canada and was assigned to explore the Mackenzie, Stewart and Peel Rivers. In 1906, he was sent to British Columbia where he worked for five years on economic problems. In 1914, he had charge of exploratory GSC work in the area between the Athabaska River and Great Slave Lake. From 1918 until 1920, he was in charge of the Survey's Vancouver office.

In 1920, Charles Camsell was appointed deputy minister of the federal Department of Mines, subsequently, the Department Mines and Resources. He also held the appointment of Commissioner of the NWT. He retired as deputy minister in 1946 but remained Commissioner for several more years.

During his career, Camsell made major contributions to the exploration of northwestern Canada. He was the author of many papers on Canadian geology. He was also known for his organization and 'people' skills - for example, pioneering the use of the aeroplane for remote surveys, initiating laboratory research to complement field surveys, encouraging museum collections in anthropology and palaeontology, and maintaining the morale of his department through the Depression Years.

Camsell received an honorary doctorate from Queen's in 1922 and from the University of Alberta in 1929. He was awarded the Murchison Grant of the Royal Geographical Society in 1922 and its Founders Medal in 1945. The Institution of Mining and Metallurgy in England awarded him its gold medal, and he also received the R.B. Bennett Empire Prize in 1945 for a paper presented to the Royal Society of Arts. The Professional Institute of the Civil Service awarded him its medal in 1946, the same year he received the EIC's Julian C. Smith Medal.

Dr. Camsell served on the Institute's Council in 1929 and 1930 and was president in 1932. He was president of the Royal Society of Canada in 1931 and of the Canadian Institute of Mining and Metallurgy in 1947, and was a founding member of the Canadian Geographical Society. He was a member of the National Research Council from 1921 until 1936 and, in 1944, assisted C.J. Mackenzie in the reorganization of postwar science in Canada. The Charles Camsell General Hospital in Edmonton was named in his honour. He died in December 1958 at the age of 82.

Dr. Camsell was designated by HSMBC in 2001.

It has been noted elsewhere that, somewhat surprisingly, **Sandford Fleming** was not a founding member of CSCE. He had been a founding member and leading light many years earlier in the first attempt to organize a national technical society. It later became the Royal Canadian Institute. He also supported the formation of the short-lived Dominion Institute of Amalgamated Engineering. In fact, he did not join the CSCE until 1896, and was never president. He was, however, elected to honorary membership of the Society.

Fleming was born at Kirkcaldy, Scotland, in 1827. He came to Canada in 1845 and, after studying engineering on both sides of the Atlantic, was appointed to the staff of the Ontario, Simcoe and Huron Railway. In 1857 he was named chief engineer of its successor, the Northern Railway. The article on Fleming in Hurtig's *Canadian Encyclopedia* continues the story:

In 1863 the Canadian government appointed him chief surveyor of the first portion of the proposed railway from Quebec City to Halifax and Saint John. Subsequently built as the Intercolonial Railway, Fleming was its chief engineer. In 1871 he was appointed engineer of the proposed new Canadian railway from Montreal to the Pacific Coast and was in charge of the major surveys across the Prairies and through the Rocky Mountains. He proposed constructing the railway along a northerly route through Edmonton and the Yellowhead Pass and then turning south to Burrard Inlet and the Pacific. Although his specific recommendations regarding the route were not followed, his extensive survey

work of various routes, including the Kicking Horse Pass through which the Canadian Pacific main line was built, greatly facilitated Canadian railway construction. In the early years of the 20<sup>th</sup> century, the Canadian Northern Railway was built along the survey route advocated by Fleming.

Fleming retired from the CPR when the Canadian government turned over the project to a private syndicate in 1880, but he continued to do consultative railway work. He also turned his attention to other projects. He was a strong advocate of a telecommunications cable from Canada to Australia, which he believed would become a vital communications link of the British Empire. The Pacific Cable was successfully laid in 1902. He was also interested in the development of a satisfactory world system for keeping time.

The railway had made obsolete the old system where every major centre set its clocks according to local astronomical conditions. Fleming advocated the adoption of a standard mean time and hourly variations from that according to established time zones. He was instrumental in convening an International Prime Meridian Conference in Washington in 1884 at which the system of international standard time - still in use today - was adopted. Fleming also designed the first Canadian postage stamp.....

Fleming carried out the first survey for a railroad across Newfoundland. It was later built and operated by the Reid Company. He was part of the famous photograph - identifiable as the tall man in the middle with the square, white beard - taken in November 1885 at the 'Last Spike' ceremony for the CPR.

While not himself a university graduate, but as a result of his friendship with Principal Grant, Fleming was appointed Chancellor of Queen's University (the Kingston one) and served for 35 years. He received a number of degrees from academic institutions in Canada, the United States and Britain. He was also president of the Royal Society of Canada.

Sandford Fleming was created a Commander of the Order of St. Michael and St. George (CMG) in 1877 and raised to Knight Commander (KCMG) in 1897. He died in Halifax in July 1915 at the age of 88. He was designated by the HSMBC in 1950. His plaque is in Ottawa.

Although designated by the HSMBC as a 'person of national historic significance,' Sir Percy Girouard spent his professional career outside Canada - in Africa and Britain.

**Edouard Percy Cranwill Girouard** was born in Montreal in January 1867, less than six months before the Canadian Confederation, and graduated from the Royal Military College, Kingston, in 1886. However, his first job were as a rodman and an assistant engineer with the Canadian Pacific Railway. There being no standing army in Canada at the time, he went to Britain to join the Royal Engineers in 1888, was commissioned, and attended the School of Military Engineering at Chatham.

In 1896 he was sent to the Sudan, where he served in the expeditionary force under Lord Kitchener and was assigned to direct railway transportation. He showed exceptional ingenuity in making possible the building of a railway through 500 miles of desert. His construction of a by-pass line was considered to have made possible Kitchener's victory at Omdurman. For these and other services he was promoted in 1899 and awarded the Distinguished Service Order (DSO) as well as the Khedive Medal.

Girouard's next appointment was as the president of the Egyptian Railway Board, which he held until sent to South Africa by Lord Kitchener at the outbreak of the South African War, again to take charge of railways. He was knighted for his services in that War (KCMG), at the conclusion of which - in 1902 - he appointed Commissioner of Railways in the Transvaal and Orange River colonies. In 1907 he was appointed High Commissioner and Governor for the Protectorate of Northern Nigeria, where he was again faced with railway problems; in particular, an 800-mile long track into the interior. Between 1909 and 1912, Girouard was Governor and Commander-in-Chief of what later became Kenya. However, some of his policies conflicted with those of the British Government and he resigned, returned to England and became a director of the armaments firm, Armstrong Whitworth. In 1913, he established Armstrong-Whitworth of Canada, at Longueuil, Quebec, and was its first president. Except for a brief period during World War I when he served as Director-General of Munitions and Supply, he served the company in England from 1916 until 1932 - the year he died in London - as managing director.

Sir Percy joined the Canadian Society of Civil Engineers as an associate member in 1888 and was elected a full member in 1903. He was later awarded an honorary membership in the Institute. A memorial tablet to him has been erected at RMC, Kingston. The HSMBC honoured him in 1938 as a military engineer and a constructor of railways in Africa. His plaque is located in Montreal.

Of Polish origin, **Casimir Stanislaus Gzowski** was born in St. Petersburg, Russia in March 1813, the son of a nobleman and officer in the Imperial Guard. Intended for a military career, he was placed in the Military College at Kremenetz at the age of nine, and remained there for eight years. In 1830 he obtained a commission in the Imperial Russian Engineers. Three years later, owing to the parts he and other officers of the same nationality had played in the Polish Insurrection of 1830-31, he was confined to a military prison, and then exiled to the United States. He landed in New York in the summer of 1833 with neither friends nor money. He also had no knowledge of the English language.

With his characteristic intelligence and energy, he studied the language while making his living teaching German, French and Italian and giving drawing and fencing lessons. Still with engineering in mind, he also articulated as a law student with a firm at Pittsfield, Massachusetts. After three years he had passed all of the requisite examinations and, after four, had become an American citizen. He began practice as an advocate in Pennsylvania. However, in 1841, he abandoned the law and moved to Canada, to Toronto where, in 1842, he obtained a position in the Department of Public Works of the Province of Canada through his friendship with Sir Charles Bagot. For six years he was superintending engineer for roads and harbours in Western Ontario, by which time he had become

a British subject. Leaving government service, his next employment was with the Upper Canada Mining Company. From 1850 to 1853, he served as engineer of the harbour works at Montreal and, at the same time, was consulting engineer on ship canal improvements between Montreal and Quebec.

Turning his attention to the construction of railways, Gzowski then became chief engineer of the main line of the St. Lawrence and Atlantic Railway (later part of the Grand Trunk Railway) between Montreal and Island Pond. Next, in partnership with Sir Alexander Galt and others, he was involved in the construction of the GTR main line from Toronto to Sarnia.. Then, in partnership with Sir David Macpherson, he continued as a railway construction contractor and carried out a number of large contracts in Western Ontario. The Gzowski-Macpherson company also completed successfully the construction of the International Bridge across the Niagara River between Fort Erie and Buffalo in 1873, with Gzowski contributing personally to the design of the structure. Thereafter, he practised on his own account and was consulted by the Canadian government with regard to harbours and railways, including the enlargement of the Welland Canal. He also took part in a study of inland waters from the St. Lawrence to Lake Superior, which anticipated the waterway system that became the St. Lawrence Seaway. This period of his life provided him with financial security.

Gzowski retained his interest in military matters throughout his life. He took an active part in the founding of the Ontario Rifle Association, was president of the Dominion one, and helped send the first competitive Canadian rifle team to England. In 1873 he was appointed lieutenant-colonel of the Central Division of Volunteers. Six years later he was full colonel and gazetted an honorary A.D.C. to Queen Victoria, whose friendship he enjoyed. He also served as the founding chairman of the Niagara Parks Commission and, for a short time during 1896, as Acting Lieutenant-Governor of Ontario.

Gzowski was one of the founders of CSCE in 1887 and its third president, serving for three years - the only one so far to do so within CSCE/EIC. During his term, he established and endowed the Gzowski Medal "for the best original paper read before the Society." In 1890, he received a knighthood within the Order of St. Michael and St. George (KCMG) in recognition of his engineering and military services.

Casimir Gzowski died in 1898. He was designated by the HSMBC in 1956. Since he has been similarly honoured by Ontario and plaqued, the Board has no plans to erect a second plaque.

Since Confederation, few engineers have been elected members of the House of Commons in Ottawa, and fewer still have served in the federal Cabinet. One of them was **Clarence Decatur Howe**. Howe was also a Canadian by adoption, having been born at Waltham, Massachusetts, in January 1886. As Bothwell's article in the *Canadian Encyclopedia* has noted, he was the most successful businessman-politician of his day and provided a link between the Liberal Party and Canadian industry.

A 1907 engineering graduate of M.I.T., Howe came to Dalhousie University in Halifax to teach engineering in 1908, but abandoned academia five years later to accept a position with the Board of Grain Commissioners, designing wheat elevators across the Prairies. In 1916 he started his own engineering firm at Port Arthur, Ontario, specializing in this same field and, between then and 1935, built elevators across Canada - including those at Churchill, Manitoba - and abroad and, incidentally, made his fortune. He even invented what was called "the Howe dumper" - for lifting and emptying grain cars. The Depression, however, ended his business and in 1935 he turned to politics, ran in the riding of Port Arthur and won a seat in the House. He entered the Cabinet immediately, as Minister of Marine and of Railways. In 1936 these portfolios were combined and he was made Minister of Transport. Along the way, he helped to modernize the country's railways, ports and radio systems and to create Canada's national airline. In 1937, he was a passenger in the DoT plane that made the first trans-continental daylight flight from Montreal to Vancouver.

After World War II began, Howe was appointed Minister of Munitions and Supply and in charge of organizing and energizing Canada's war production program, the success of which owed a great deal to the ability of this efficient, but less open, Liberal minister to work with the more conservative industrial managements. He was also named to the War Committee of the Canadian Cabinet. In 1944, he was appointed as minister of the Department of Reconstruction, to oversee the reconversion of the economy to peacetime. Subsequently, he became Minister of Trade and Commerce and, in tandem, Minister of Defence Production. During these years, he helped establish Canada's "peaceful uses of atomic energy" program, oversaw the work of crown corporations, and sponsored the building of the original trans-Canada pipeline. However, the legislation affecting this project and the way it was handled upset the Parliament of the day and led to the defeat of the government in 1957. Howe lost his seat and retired from politics. When Mr. King retired as prime minister, Howe had continued in the service of his successor, Louis St. Laurent.

In retirement, Howe remained busy as a company director and adviser and travelled continuously. Age, however, caught up with him and he died on New Year's Eve 1959. John D. Harbon, in his short book on Howe's career, said this about him, "He brought to the practice of politics his engineer's common sense and a businessman's ability to take quick decisions and make them stick.....Parliamentary niceties irritated him..."

C.D. Howe joined the Engineering Institute as a full member in 1922, was made an honorary member in 1937, and became a life member in 1957. He was awarded a Julian C. Smith Medal in 1959 in recognition of his many contributions to the development of Canada. He was also awarded several honorary degrees and served as Chancellor of Dalhousie University. From the United States, he received a Guggenheim Medal in 1954.

Howe was designated in 1984. His plaque is located in Thunder Bay.

**Thomas Coltrin Keefer** was the founding president of CSCE in 1887 and served a second term ten years later. He was born in Thorold, Ontario, in 1821, a descendant of United Empire Loyalists who



had walked from New Jersey to the Niagara Peninsula in 1790 to establish a new home for the family. His father, George, prospered. He operated a general store, as well as saw and grist mills, was a surveyor and a magistrate, and a member of the militia, serving in the War of 1812. Thomas was ten years younger than his brother Samuel, who was the second president of the Society.

Keefer was educated at Upper Canada College. He served briefly in the militia during the 1837 Rebellion in Upper Canada. His early engineering work was on the Erie Canal and, later, on the Welland Canal. In 1845, the Department of Public Works appointed him chief engineer for the improvement works on the Ottawa River that were needed to assist Canadian exports of timber. He held this position for three years, during which a number of these works were completed at locations along the river.

The following few years were busy ones. He wrote and published a pamphlet on *The Philosophy of Railroads*, and a prize essay on *The Influence of the Canals of Canada*, which enhanced his reputation in these two fields of engineering as well as influencing government policies. For the government, he surveyed the rapids of the St. Lawrence with a view to improving navigation. He undertook railway location surveys between Kingston and Toronto and between Montreal and Kingston, as well as for the site for what became the Victoria Bridge across the St. Lawrence at Montreal, which was constructed in order to link the Atlantic coast with Montreal and Canada West. He also designed the footings and supports for the bridge so that they would break up the spring ice floes on the river, took part in the hearings that decided on the rationalization of the railway gauge in Canada, and was appointed one of the commissioners for the First World Exhibition in London in 1851. In 1853 he became chief engineer of the Montreal Harbour Commission and responsible for the deepening of the St. Lawrence shipping channel. While in Montreal, he was also appointed chief engineer of the Montreal Water Works and built the public water system for the city, including an aqueduct to bring fresh water into it, along with the necessary underground mains, storage reservoirs and pumping stations.

In 1854, Keefer was asked to judge the competition for a new water system for the city of Hamilton. Not satisfied with the entries, he submitted his own suggestion, which was accepted by the city. The resulting waterworks were opened by the Prince of Wales (later Edward VII) in 1860. Building on the reputation earned by his work in Montreal and Hamilton, Keefer went on to act as consultant for waterworks at Toronto, St. Catharines, London, Quebec, Dartmouth and Halifax. He also built the water system for Ottawa, completing it in 1874.

Keefer was appointed a Canadian commissioner for the World Exhibition of 1862, again in London. He did not, however, receive an appointment to the 1876 World Exhibition in Philadelphia, but was the executive commissioner for the Paris Exhibition of 1878. To mark his services in Paris and to engineering, France admitted him to its Legion of Honour. Britain created him a Companion of the Order of St. Michael and St. George (CMG).

In his later years, Keefer was involved in a variety of activities, including consulting and membership of the Royal Commission on Ice Floods and the International Deep Water Commission.

He was also concerned with the mechanics of establishing engineering as a profession in Canada.

Keefer received a generous share of honours and awards. He was elected an honorary member of CSCE in 1903. Much later, in 1942, the Institute established the Keefer Medal in his honour, to be awarded for papers on aspects of civil engineering. He was a member, and later an honorary member, of the British Institution of Civil Engineers and a member of the American Society of Civil Engineers, of which he was president in 1888. He was Fellow of the Royal Society of Canada, and its president in 1898. He received honorary degrees. However, unlike his contemporaries Sandford Fleming, Casimir Gzowski and John Kennedy, he was never knighted.

Thomas Keefer died in Ottawa in January 1915. He was designated by HSMBC in 1938 and his plaque is located in Ottawa.

**John Kennedy**, who in 1892 succeeded Sir Casimir Gzowski as president of CSCE, was another founding member of the Society. Born in 1838 at Spencerville, Ontario, of Scottish parents, and was educated at McGill in the days before this university offered engineering degrees. He first worked in engineering on the St. Lawrence Ship Canal below Montreal, under the legendary Thomas Coltrin Keefer and gained experience in both civil and mechanical engineering.

Showing considerable promise for a young man, Kennedy moved to Ontario in 1868 to be a divisional chief engineer in the Great Western Railway system. He moved back to Montreal in 1875 on being appointed chief engineer of the Harbour Commission. It was principally from then until 1907, in that position, that Kennedy's great reputation as an engineer was earned. He played a significant part in the deepening of the St. Lawrence River ship channel, in the development and enlargement of the harbour facilities and in protecting the city from the adverse effects of springtime ice jams and summer currents in the river. He made possible Montreal's ability to accommodate ocean-going ships and enhanced the reputation of the city itself.

Kennedy's sight began to fail around the turn of the century and, by 1907, it was so far gone that he resigned as chief engineer. But the Harbour Commissioners retained his services as their consulting engineer, a post that he held until his death, and he continued to provide consulting and arbitration services to other public bodies. Even before he resigned as chief engineer, he was called upon to serve on commissions whose findings significantly influenced the development of the country as a whole - for example, the Royal Commissions investigating the leasing of water power on the Lachine Canal and studying the advisability of completing the Trent Valley Canal. He was instrumental in the founding of the Canadian Engineering Standards Association (now the CSA) and took an active part in its affairs.

As mentioned, Kennedy was a founding member and president of CSCE. In 1907 he was elected an honorary member of the Society in recognition of the high position he occupied within the profession. He was also a member of the U.K. Institution of Civil Engineers and, between 1915 and 1921, chairman of its advisory committee for Canada, and of the American Society of Civil

Engineers, of which he was a director for a number of years. The most senior award of the Engineering Institute of Canada was established in 1927 and named after him. It recognizes services to the engineering profession, the Institute and the science of engineering.

Kennedy received his knighthood in 1916 and an honorary degree from McMaster University, and died in October 1921. He was designated by the HSMBC in 2000.

The Internet source says that **Charles Alexander Magrath** was a business man, surveyor, pioneer, Member of Parliament, war-time administrator, and a distinguished servant of his country who died in Victoria, B.C. in October 1949 after a lengthy illness, at the age of 89. The *Engineering Journal* source says that he was one of the great pioneer builders of the Canadian West, that he was a prominent surveyor with commissions to practice in every province and a successful engineer specializing in irrigation and in water resources investigations. The *Register of Designations* of the Historic Sites and Monuments Board of Canada says, quite simply, that he was designated in 1950 for his engineering and surveying and for being the first mayor of Lethbridge, Alberta. His plaque was erected in Lethbridge in 1952.

Charles Magrath was born at North Augusta, Ontario, in 1860. At the age of 18 he accompanied one of the earliest Dominion Government land survey parties to Western Canada. His size and physique fitted him well for the job and the terrain. But it was not until 1907, after the founding of the province, that he was admitted Alberta Association of Land Surveyors, and a further 10 years before he was elected a full member of the Engineering Institute.

Initially qualified as a Dominion Land Surveyor, Magrath practised principally in the (old) Northwest Territories. But from 1885 until 1906 he was engaged in general engineering work, developing irrigation enterprises in the Lethbridge area of what became Southern Alberta, becoming manager of the Alberta Irrigation Company. However, Magrath had a parallel interest in politics. In 1892 he entered the Legislature of the Northwest Territories and was a cabinet minister from 1898 until 1901, the year he became mayor of the newly created city of Lethbridge. In 1906 he was successfully elected the federal MP for Medicine Hat, remaining in Parliament until 1911, when he was appointed a member of the Canadian Section of the International Joint (Waterways) Commission. In 1914 he became chairman of the Canadian Section and served in that capacity until 1935.

During this period, Magrath served Canada in a number of other ways. In 1913, he was appointed chairman of a special committee to study the highway system in Ontario. Its recommendations strongly influenced the development of this system. In 1914 he became chairman of the Wartime Trade Board, and was appointed the Fuel Controller for Canada in 1917. In 1919 he made a member of the Advisory Council on Highway Construction associated with the administration of the Canada Highways Act. In 1920, he was appointed chairman of a special committee to study agricultural conditions in Southern Alberta and, in 1922, became chairman of the Fuel Advisory Board of Canada. From 1925 until 1929, he was chairman of the Hydro-Electric Power Commission of

Ontario. In 1933, he served on the Newfoundland Royal Commission to rehabilitate financial credit. Magrath attained life membership in the Engineering Institute in 1936 and, two years later, was elected to honorary membership for his expertise in the conservation and the use of water resources. In 1941, he received the Julian C. Smith Medal for his contributions to the development of Canada. He retired to Victoria in 1937.

In his paper on **Philip Louis Pratley**, Robert Passfield notes that his career spanned two distinct periods: the early years (1906-1920) and his years of consulting practice (1921-1958). During the former, he gained wide experience in bridge design and construction and, during the latter, designed a remarkable number of landmark Canadian bridges, as well as serving as a consultant to the bridges of other engineers in Canada and in other countries.

Pratley was born at Liverpool in England in 1884 and graduated in 1905 from the University of Liverpool with a first class honours degree and the university's top student medal in civil and structural engineering. He was then apprenticed in the 'bridge shop' of Francis Morton & Company at Garston before emigrating to Canada in 1906. He worked first as a designer and draftsman with the Locomotive and Machine Company of Montreal, but shortly afterwards took a similar position with the Dominion Bridge Company, where he developed in both experience and competence. Liverpool awarded him an M.Eng. degree in 1908.

In 1909, he became associated with the second attempt by the Government's Board of Engineers to design and construct the cantilever bridge over the St. Lawrence at Quebec City. He was employed as an assistant engineer, with particular responsibilities for the all-important stress calculations. In 1910 he returned to Dominion Bridge and was involved as a design engineer with the St. Lawrence Bridge Company's successful bid to build the Quebec Bridge, then the world's longest span cantilever bridge. When this project was finished in 1917, Pratley returned to Dominion Bridge as a design engineer, with extensive experience, took part in the design of a variety of bridge types and took charge of the company's design office. He also published a number of papers on outstanding bridges fabricated and erected by the company. He was awarded the Telford Gold Medal by the Institution of Civil Engineers (U.K.) for the detailed mathematical analysis for the arch bridge at Saint John. As Passfield remarks, Pratley's approach to design leaned more heavily on laboratory-engineered methods than on the earlier methods based on practical experience. Pratley left Dominion Bridge in 1920 and for a short time was the engineer of bridges for the Grand Trunk Arbitration Board that was examining the bridges of the GTR, following its take-over by the Canadian government.

In April 1921, Pratley formed a partnership with C.N Monsarrat, with whom he had worked while on the Quebec Bridge project. Both brought standing in the field of bridge design and construction to it. Monsarrat had been involved, for example, in the design of the spectacular Lethbridge Viaduct. This partnership lasted until Col. Monsarrat's death in 1940. During these years, the partners were engaged as design and construction supervision consultants on many major bridge construction projects. Pratley's principal concern was design and the publication of technical papers on their

work, while Monsarrat was the business partner. Passfield wrote that Philip Pratley studied the engineering literature and was well-versed in the latest theoretical developments in regard to bridge design, design innovations and the introduction of new structural materials, with the result that his long-span bridges were 'state-of-the-art' structures. Consequently, the technical papers he published were notable for the depth of their analyses. The Monsarrat-Pratley partnership designed and supervised the construction of the Jacques Cartier Bridge across the St. Lawrence at Montreal and the Ile d'Orleans Bridge between the mainland and the island across the north channel of the St. Lawrence, the reconstruction of the Second Narrows Bridge at Vancouver and the construction of the Lion's Gate Bridge across the First Narrows. When erected, the latter had the longest main span of any suspension bridge outside the United States. The partnership also undertook major modifications to the Quebec Bridge to allow for both road and rail crossings.

After the death of Col. Monsarrat, Pratley continued in consulting practice in his own name and designed and supervised the construction of a variety of long-span bridges. These included the Angus L. Macdonald Bridge across Halifax harbour, the Burlington Bay Skyway Bridge at Hamilton, the modification to the Jacques Cartier Bridge at Montreal to accommodate the Seaway, the Cornwall North Channel Bridge crossing the north branch of the St. Lawrence. His company also acted as consultants for bridges built by American companies: for example, the Ambassador Bridge at Windsor, Ontario, and the Blue Water Bridge at Sarnia, and the Thousand Islands International Bridge crossing the St. Lawrence. It had just begun work on the Champlain Bridge at Montreal when he died in 1958.

Pratley was elected to student membership in the Engineering Institute in 1907, became an associate member in 1909 and a full member in 1917. He served on the Institute's Council, as its treasurer and as a vice-president. In 1958 he was elected an honorary member. He was also a member of the American and British societies of civil engineers. The Institute awarded him its Gzowski Medal in 1935 and its Duggan Medal and Prize in 1936. The University of Liverpool awarded him a D.Eng. degree for his contributions to the bridge design and its literature in 1939. Some years later, he received the Institute's Julian C. Smith Medal for his contributions to the development of Canada. The 'new' Canadian Society for Civil Engineering established an award in his name in 1987 for the best technical paper in bridge design and construction.

Philip Pratley was designated by the HSMBC in 2005.

Lastly, there was **Wallace Rupert Turnbull**, a pioneer aeronautical engineer, much of whose renown rests on his work with wind tunnels and the variable-pitch propeller. But he did much more.

Born at Rothesay, New Brunswick, in October 1870, a member of a wealthy family, he studied electrical engineering at Cornell, followed by two years' post-graduate work there and further study in Germany. His first job, for six years, was with the General Electric Company at Harrison, N.J.. During this period his interest in aeronautics was stimulated by correspondence with Samuel Langley, the glider experimentalist Otto Lilienthal, and Gustav Eiffel, who built the first wind tunnel.

In 1902, as his interest in heavier-than-air flight was developing, he established his private laboratory at Rothesay. His work there, over the next 14 years, included the building of a wind tunnel - his first, and the first in Canada - which he used for tests on aerofoils. Turnbull also collaborated with aviation pioneers such as Alexander Graham Bell and J.H. Parkin of the University of Toronto. He worked on hydroplanes driven by propellers and built an experimental track for testing airscrews in the open - the first in aviation history - to test their efficiency. The results of this latter work led to Turnbull's receiving a bronze medal and a fellowship from the Royal Aeronautical Society in Britain. At that time he was one of a very few fellows of the RAE in Canada and the only medallist.

Turnbull's 1955 obituary in the *Engineering Journal* goes on to say:

In 1914 he closed his laboratory and went to Britain where he engaged in the design of various wartime devices such as air propellers, bomb sights and torpedo screens. Returning to Canada in 1918, he continued his work on the development of a controllable pitch propeller, begun in 1916 when he was overseas. Because his first idea of mechanical brake control, attempted in 1923, turned out to be impractical, he sought a solution for changing the pitch of the blades by an electrical control. A second model working on this principle was developed (further) and built by Canadian Vickers Limited and was successfully tested at Camp Borden in 1927. Patents on the Turnbull controllable pitch propeller were taken out in Britain by the Bristol Aeroplane Company and in America by the Curtis Wright Corporation. Today, every propeller type aircraft aloft uses this control device - a small metal cylinder at the hub of the blades - for changing the pitch of the blades.

This device provided for safety and efficiency at all engine speeds. Since it was perfected independently in several countries, such as Britain and the United States, and because he licenced its manufacture, Turnbull's work on it tended to be overlooked by historians of aviation.

Turnbull, himself, also moved on. He did research on wing surfaces, patenting the double curvature wing surface. Earlier, in Britain, he had become interested in tidal power. On his return to Canada, he began work on harnessing the power of the Bay of Fundy tides, presenting a paper on this subject to the Engineering Institute in 1919 that attracted wide attention. He became a consulting engineer to, and a director of, the Petitcodiac Tidal Power Company. He was also active in real estate, and worked for the Red Cross.

In 1942, the University of New Brunswick awarded him an honorary doctorate. However, he did not become a member of EIC until 1944. He was elevated to honorary membership seven years later. He died at Saint John in 1954. HSMBC was designated him in 1960 in recognition of his contributions to aeronautical engineering in Canada, and especially his first wind tunnel. The plaque was erected at Saint John.

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