THE CEDARGROVE SERIES OF

DISCOURSES, MEMOIRS AND ESSAYS

#24/2013

# BRITISH KNIGHTS OF ENGINEERING

by Andrew H. Wilson

May 2013

**Abstract**

This paper was originally presented as a talk by the author at a luncheon meeting of the Ottawa Branch of the Canadian Society for Senior Engineers on 20 May 2013. It has since been lightly edited for publication and a few photographs added.

For most of the past 200 years, engineers in Britain have been receiving the accolade of knighthood and other national awards for their services to the nation and the profession. This paper discusses the careers of six of them and draws attention briefly to several more who have been so honoured. Until 1919, Canadian engineers were eligible to receive knighthoods from the British Sovereign, and around a dozen did.

**About the Series**

Principally, the Cedargrove Series is intended to preserve the research, writing and oral presentations that the author has completed over the past half-century or so but has not yet published. It is, therefore, the 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 has been active ever since in research, writing and editing historical material on behalf of that Society, the Engineering Institute of Canada and the Canadian Society for Senior Engineers. He has also served as president of CSME and EIC.

## Introduction

Ten years ago I published a paper on Canadian engineers who had received the accolade of knighthood from British Sovereigns, mostly prior to the passage through the House of Commons of a Resolution sponsored by Bolger Nickle, M.P. in 1919 that asked Britain not to give peerages or knighthoods to Canadians living in Canada. I will mention these knights later in this talk. No Canadian engineer has been raised to the peerage.

The theme of this present paper is the identification of some of the British engineers who have received the accolade, and includes a few who became peers. But first, a brief word on the British honours system. I stress 'brief' because this paper is not about peerages or knighthoods as such, but about engineers who received them.

## The British Honours System

The peerage in Britain has five levels of 'pecking order': Duke; Marquess; Earl; Viscount; and Baron. Up until 1958, all of these titles were hereditary, with the eldest male child as the heritor in most cases. However, that year the baronial rank of 'Life Peer' - available to both men and women, but with no hereditary component - was instituted. In 1963, the Peerages Act allowed peeresses in their own right to sit in the House of Lords as well as the 'disclaiming' of hereditary titles, the best-known example of which, perhaps, has been Tony Benn, who refused to become Viscount Stansgate when his elder brother died.

In Britain, the title of 'Baron' is not used and those holding it are called 'Lords' - as in Lord Strathcona or Lord Beaverbrook. However, Baronesses of the 'Life' variety tend to use it as well as using the 'Lady' title - for example, Baroness James of Holland Park, otherwise known as author P.D. James or Lady James. And, as those of us who have watched *Downton Abbey* know, the daughters (and sons) of senior members of the peerage have courtesy titles, composed of their Christian and family names - as in Lady Mary Crawley.

Under the British system, certain judges are titled as Lords, but are not normally peers. On the other hand, archbishops and bishops of the Church of England may sit in the House of Lords.

The title of Baronet is hereditary and is awarded by the Crown. It is effectively the sixth level of peerage. The recipient does not receive an accolade, although he is styled 'Sir' like a knight. Baronetcies have existed since the 1300s. The early ones could be bought. This led in the 17th century, for example, to the creation of a group known as the Baronets of Scotland and Nova Scotia. Since 1965, only one new Baronet has been created - Sir Dennis Thatcher, who died in 2003. His son is now Sir Mark.

Although non-hereditary, current British knighthoods also have a 'pecking order.' Originally

Orders of Chivalry, they now recognize services to the Crown and to society, as well as international and intellectual achievements, military service, theatrical and sporting eminence and so on. New ones are usually awarded twice a year - at New Year and on the Sovereign's official birthday - as well as on the dissolution of a Parliament.

The most senior is the Order of the Garter, established in the 14th century, which has limited membership and is awarded by the Sovereign, personally. Next comes the Order of the Thistle, which is also limited. It was established in the 17th century and has a special connection to Scotland. In recent years, both Orders have admitted women members.

There was once a third member of this group, the Order of St. Patrick, connected to Ireland, but it has been discontinued.

Next comes the Order of the Bath - established early in the 18th century. It has three levels, two of which - the Knight Grand Cross (GCB) and Knight Commander (KCB) - are knighthoods. The third, Companion (CB), is not. This Order has military and civil divisions.

The Order of St. Michael and St. George followed in the early 19th century and is awarded principally to diplomats, members of the Colonial Service, and to citizens of the Empire/Commonwealth. Again, there are three levels: Knight Grand Cross (GCMG), Knight Commander (KCMG) and Companion (CMG).

The Royal Victorian Order was established in 1896 by Queen Victoria to recognize, in particular, services to the Crown. It has five levels, two of which are knighthoods (GCVO and KCVO) and three that are not.

The Order of the British Empire dates from 1917. It also has five levels, of which two are knighthoods (GBE and KBE) and three are not. It recognizes both military and civilian services. This Order admits lady "knights," who become Dames Commander (DBE). There is also a more junior British Empire Medal (BEM).

Two Orders at this level are now dormant: the Order of the Star of India and the Order of the Indian Empire.

The most junior, and the most populated level of knighthood, is the Knight Bachelor (Kt). Historically, it is the oldest form of British knighthood, having been awarded since the 11th century. Knights bachelor receive the accolade and a badge, and may put 'Kt.' after their names. Nowadays, they cover all kinds of achievements and services and are quite often also holders of earlier junior awards in the Orders of the Bath, St. Michael and St. George and the British Empire.

The Distinguished Service Order (DSO) was established in 1889 to recognize military bravery, and is not a knighthood. Neither are the Order of Merit (1902) nor the Companion of Honour

(1917). The former is awarded by the Sovereign for services to the Crown, the latter for services to the arts, sciences, industry and religion. It has also been called 'the poor man's knighthood.' The Imperial Service Order has, since 1902, recognized faithful service to the Crown through public service.

## The 19th Century

Now to the British engineering knights, baronets.....and peers.....of the 19th and 20th centuries. There have been so many of them - over a hundred at any one recent point in time - that I will summarize the careers of only a handful, but will list a larger number of others, and will mention in passing some well-known and distinguished engineers who have *not* become known as 'Sirs.'

For example, well-known British engineers whose careers were principally in the late 18th and early 19th centuries and who were not among those receiving knighthoods or baronetcies include: Joseph Bramah, Henry Maudslay, James Nasmyth, John Rennie the Elder, George Stephenson, Thomas Telford and James Watt.

Three of the eminent British engineers who *were* honoured later in the 19th century included Joseph Whitworth, Joseph Bazalgette and Thomas Bouch.

Whitworth has been called by a biographer "the world's best mecanician." He received a baronetcy in 1869. Born in Stockport, Lancashire, in December 1803, the elder son of Charles Whitworth, a cottonmill worker and later a Congregational minister who abandoned his family after the death of his wife several years later. Joseph was 'fostered' at the age of 12 and for the next five years. By then he had acquired an interest in machinery and machine tools, largely from reading. He found a job in Manchester as an apprentice and served three companies in this capacity. Time-served, competent and confident, he then went to London where he found employment with Henry Maudslay, who already had a great reputation for his mechanical engineering ability and leadership. Under him, Whitworth acquired great personal skills as a mechanic and machine designer. But ever a seeker after new work experience, he changed companies twice more before he left London in 1833 to return to Manchester to start his own business.

Both Whitworth and his factory, the Chorlton Street Works, became world famous for the quality, accuracy and general standards of workmanship put into the lathes, milling, boring, screw-making and other machine tools that were their principal products. Whitworth popularized the method of producing accurate flat surfaces which led to the development of more precise instruments. He devised the standard system for screw threads that bears his name, which later became the first internationally-recognized British Standard thread. He was asked to develop a replacement for the Enfield rifle currently in use in the British Army, which he did, but it was adopted by the French Army and not the British. He also designed a large rifled breech-loading artillery piece that fired a 12 pound spirally-grooved projectile a distance of six miles. This,

again, was rejected by the British Army but was used during the American Civil War. He patented a process for casting steel under pressure and built a new plant near Manchester to make it. Whitworth's strongest competitor, especially in the military equipment, was Sir William Armstrong's company. After Whitworth's death, their two companies were merged.

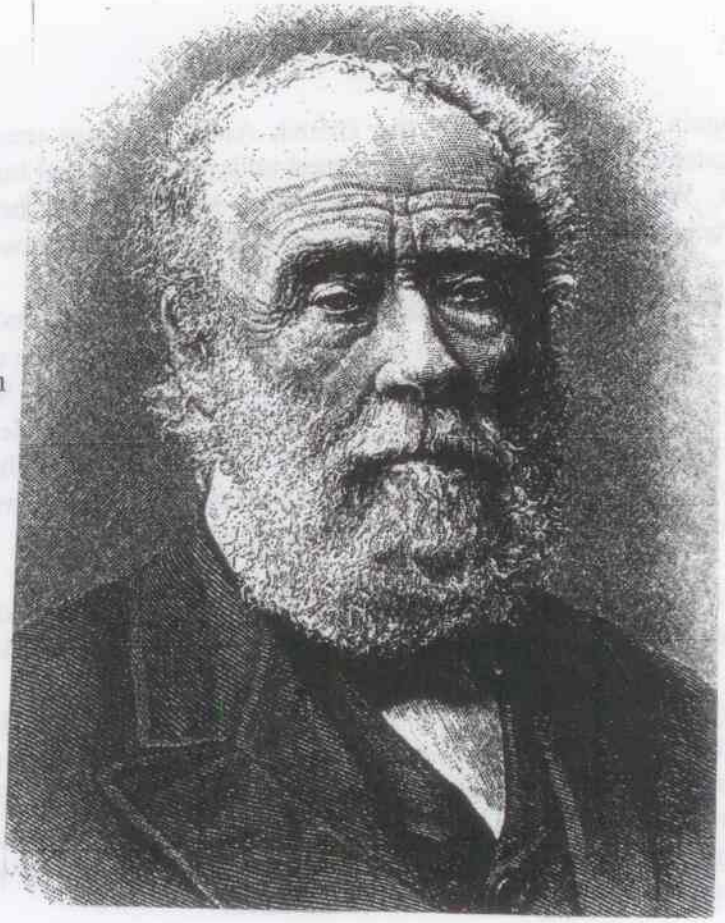
Whitworth travelled widely. For example, he toured, and reported on, American industrial sites. He took a prominent part in the affairs of the Institution of Mechanical Engineers, serving a term as president. He was elected to fellowship in the Royal Society of London. He was prominent in the promotion and support of technical education. He supported the Mechanics Institute in Manchester (which later became UMIST). In 1868 he founded the Whitworth Scholarship, which helped generations of British mechanical engineers complete their education. And he took an interest in hospitals and medical charities.

Sir Joseph Whitworth died at Monte Carlo, while abroad seeking better health, in 1887. Having no male heirs, the baronetcy died with his widow, Lady Mary, in 1896.

By the middle of the 19th century, the River Thames flowing through the English capital city was an open sewer and a dangerous health hazard to the people who lived there. The man who changed this was Joseph Bazalgette, one of the first public health engineers. Born in 1819, of French descent like his friend I.K. Brunel, he was the son of a naval officer. He learned his civil engineering in railways, land drainage and reclamation under Sir John MacNeill and set up his own practice in Central London in 1842.

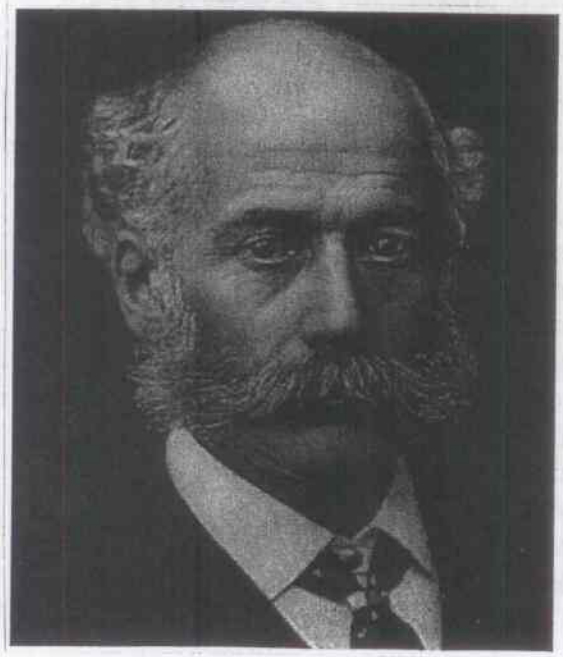
By 1848, as London's sanitary waste system was breaking down with the explosion of the city's population, as well as with the rash of newly-installed water closets, the Metropolitan Commission on Sewers ordered cesspits closed and house drains connected to open sewers that emptied into the Thames. The pollution of the river worsened dramatically and gave rise to a cholera epidemic that killed over 14,000 people in 1849, the year Bazalgette was appointed assistant surveyor to the Commission. He became chief engineer in 1852 and retained this position when the Commission became the Board of Works. However, there was a second epidemic in 1853 that killed 11,000. And 1858 became known as 'the year of the Great Stink.'

Although the theory that cholera was spread by contaminated water was not generally accepted at the time, Bazalgette's proposal to revolutionize the sewer system using enclosed sewers to remove the smell and reduce cholera was accepted. Its colossal expense was supported by Parliament. He proposed to construct hundreds of miles of underground main sewers of brick to intercept sewage outflows, as well as about the same length of street sewers to intercept raw sewage. The outflows were then to be diverted downstream of the city and dumped, with the aid of pumping stations but still untreated, into the river. Only decades later were sewage treatment facilities added to the system. It was built under Bazalgette's supervision, opened in 1865, and completed in 1875. The stink disappeared, and cholera was virtually eliminated. The most identifiable part of the system within the city was the Victoria Embankment, from Chelsea to Blackfriars. Bazalgette's foresight in its design has been evident right up to the present time.



Sir Joseph Whitworth

Sir Joseph Bazalgette



Sir Thomas Bouch

In addition to this massive project, over his career Bazalgette was involved in several others of significance in England and abroad - for example, the Broadway Bridge over the Medway at Maidstone. He also redesigned and rebuilt London's Battersea, Hammersmith and Putney Bridges. As a younger man, Bazalgette was awarded a CB. He was knighted in 1874, retired in 1889 - still chief engineer of the Water Board - and died two years later.

The third 19th century British engineer included in this section of the paper is Thomas Bouch. He became known famously for the design and construction of Scotland's first Tay Bridge, for which he was knighted in June 1879 by Queen Victoria, who had just crossed the bridge, and infamously for the same bridge after part of it collapsed in a storm in December, with the loss of 75 lives. Six months later, and after the disaster enquiry had reported, he lost his employment with the North British Railway Company. He died in October 1880.

Born in 1822 near Carlisle in northwest England, the son of a sea captain, Bouch spent much of his life in Scotland, and in the railway engineering business. After his father died in 1838, and an abortive attempt at a mechanical engineering apprenticeship in Liverpool, he began railway work, surveying routes in Lancashire and the Lake District and, later, in Yorkshire. At the age of 26 he was appointed engineer and manager for the Edinburgh & Northern Railway, which crossed the Forth and Tay estuaries by ferries. For these, he enhanced his reputation by designing the world's first roll-on-roll-off rail ferries.

In 1851, Bouch left the company and established himself as a consultant. From his Edinburgh office, and using engineering, mathematical and economic know-how he acquired from colleagues Edward Sang and Robert Bow, he developed elegantly simple and economical plans for a whole series of railways and branch lines in Scotland and northern England, including some remarkable bridges. For example, he helped extend the famous Stockton and Darlington Railway across the Pennine chain of mountains. One of his lines included the highest viaduct of the time in England, and opened in 1857.

While his colleague and competitor, Robert Stephenson, had made solidity a watchword in his bridge construction - for example, in the Britannia Bridge in Wales and the first Victoria Bridge at Montréal - Bouch sought the same end result with greater lightness and economy. In 1870, he was given the opportunity to design a bridge for the River Tay, which would replace the train ferry and would have a high central girder section to allow for clear navigation below. However, some last-minute changes were required when the river bed was found to be unexpectedly gravelly. At first, these changes to the two-mile-long, single track bridge appeared successful, although a 25-mph speed limit was imposed on the trains, after an inspection. It was formally opened in May 1878. The *Times* of London commented that "as a triumph of engineering skill and well-directed energy and perseverance, it was worthy of, as indeed it has already attracted, very general attention." However, while train passengers appeared to marvel at the bridge's slender lines, locomotive people began to note that it swayed alarmingly on occasions. An inspection also found some loose ties.

Meanwhile, Thomas Bouch was in the planning stage of an even more ambitious project - for a