

Stevenson, David Alan (1854-1938), civil engineer, and his business partner, Charles Alexander Stevenson (1855-1950), sons of David Stevenson (1815-1886), civil engineer, and Elizabeth, *née* Mackay (1816-1871), were born in Edinburgh at 8 Forth Street and 20 Royal Terrace respectively on 21 July 1854 and 23 December 1855 and educated at Scott's Preparatory School, Edinburgh Academy, and Edinburgh University; David (usually known as David A. Stevenson) graduated BSc in 1875, and Charles likewise in 1877. Robert Louis Stevenson (1850-1894) was their cousin. Charles's son, (David) Alan Stevenson (1891-1971), civil engineer, usually known as D. Alan Stevenson, was born in Edinburgh at 9 Manor Place on 7 February 1891, educated at Edinburgh Academy and Edinburgh University, and spent most of his professional life working with his father and uncle.

Early work

David and Charles Stevenson began their rigorous engineering training in the offices of D. and T. Stevenson on the second floor of 84 George Street, Edinburgh, during school vacations in 1868 and 1869 respectively, and entered into their formal three-year apprenticeships in 1875 and 1877. From 1875 to 1880 the firm was engaged on lighthouses at the Isle of Man and Holy Island, Arran, and on harbour work at Port Seton, Boddam, St Monance, Burnmouth, Gourock, Findochtie, Anstruther, and Broadford in Skye. Other work included preparations for deepening the Clyde from Port Glasgow seawards to 18 feet at low water for the Clyde Lighthouses Trust, which, in addition to lighthouse responsibilities, had a navigational remit for this length of river. David was an able technical writer and read his first paper 'Dhu Heartach lighthouse' to a meeting at the Institution of Civil Engineers in 1876. This paper, based on the firm's reports and his teenage visits to the isolated rock during the lighthouse's construction, was awarded an institution Manby premium prize. In 1878 David and the firm's most able senior assistant for many years, Alan Brebner (1826-1890), were taken into the partnership; Charles followed in 1886.

During the 1880s the firm undertook sewerage, harbour works, inspection of water-supply schemes for the Board of Supervision, and maintenance of North Esk Reservoir in the Pentland Hills. It was involved in the preparation of a major Forth and Clyde ship canal scheme that was level between sea-locks via Loch Lomond and Loch Long, which was never implemented, and it opposed the proposed Forth Bridge, to ensure an adequate navigational height, and the original Manchester ship canal scheme. For the Northern Lighthouse Board, the Stevensons introduced Courtenay whistling and Pintsch gaslight buoys. The latter were developed by Charles in 1880-81 and were integral to important experiments on the relative merits of oil, gas, and electricity as illuminants. Other work for the board included the design and construction of the Ailsa Craig lighthouse and foghorns, new lights in Orkney and Shetland, the North Carr lightship, and the introduction of electric light at the Isle of May lighthouse. In 1884, with his brother David's retirement through ill health, Thomas Stevenson had become the board's sole engineer, but when his health began to fail in 1885 the younger David was appointed to act jointly with him. He was sole engineer from Thomas's death in 1887 until 1938.

D. and C. Stevenson, c.1890-1936

In 1890 the firm became D. and C. Stevenson and until the First World War it was involved with navigational improvements of the Lune, Forth, and Manchester ship canals, the Forth and Clyde canal scheme, Oban sewerage, the branch railway from Longniddry to Gullane, deepening the lower Clyde to 27 feet, and numerous harbours in Scotland. Work for the Northern Lighthouse Board included lighthouse stations at Fair Isle, Rattray Head, Sule Skerry, Stroma, Scarinish, Noup Head, Flannan Island, Tiumpnan Head, Bass Rock, Barns Ness, Killantringan, Hyskeir, Elie-Ness, Firths Voe, Neist Point, Rubha Reidh, Crammag Head and Maughold Head on the Isle of Man, and several lightships. Charles designed and implemented in 1910 at Platte Fougère, Guernsey, a remotely controlled and electrically operated acetylene light and foghorn installation—a precursor of the later lighthouse control

system. Other work included the installation of 'group flashing lights' at the Mull of Kintyre lighthouse and the provision of many minor lights. The introduction of Sir James Chance's incandescent burners to Scottish lighthouses in 1903 and the wireless activation of equipment in 1914 were innovations of considerable significance by the Stevensons that became widely adopted in the lighthouse service. Except when specifically requested, David restricted his horizon to the Northern Lighthouse Service while Charles dealt with the firm's other work, but they collaborated on reports. This combination of talents, with Charles concentrating on equipment innovation and river engineering and his brother on the board's work, worked well, and ensured the success of the firm until its dissolution in 1936. The brothers acted jointly as engineers to the Clyde Lighthouses Trust and the fishery board of Scotland.

In 1875 the most powerful light on the Scottish coast was of 44,500 candlepower. By 1901 there were several lights of over 100,000 candlepower, and the Isle of May electric light was of 3,000,000 candlepower. This increase in power was achieved by means of long focal distance apparatus that the Stevensons designed together and the introduction of Charles's equiangular prisms which condensed the light into a narrower and more brilliant beam than previously. Before the turn of the nineteenth century David and Charles Stevenson had become leading authorities in their field, and during their partnership they acted as consulting engineers to several colonial and foreign lighthouse authorities.

During the same period Charles Stevenson pioneered the development of wireless communication and corresponded with Oliver Heaviside, Sydney Evershed, and other experimenters. In 1893-4 he conducted experiments in telephonic communication by electrical induction using coils, in which he successfully received speech over a distance of about half a mile at Murrayfield, Edinburgh. These experiments were carried out with a view to establishing a communication between Muckle Flugga lighthouse and the Shetland mainland, but the need for this was questionable and it was never implemented. Charles is said to have anticipated Marconi, Heaviside, Preece, and others in wireless transmission of speech. The apparatus did, however, have the drawback of being inconvenient to use because of the large diameter of the coil layout required (200 yards to transmit over half a mile) and its limited range. Charles Stevenson also invented the 'leader cable' for guiding vessels by means of an electric submarine cable laid on the ocean bed, a system eventually developed and installed at several large ports in Europe and the USA; it was used during the First World War in the North Sea off Harwich to guide vessels through minefields, and both these inventions formed the subject of papers read to the Royal Society of Edinburgh in 1894 and 1893 respectively. He also invented the automatic acetylene fog-gun signal.

Among Charles Stevenson's later innovations, jointly with his son, was the 'talking beacon' for use by ships in fog, which enabled the position of a ship to be plotted on board from synchronized radio and sound signals through the air. The radio signal provided the direction of the beacon and the distance from it was obtained by measuring the sound travel time from hearing a fog-signal detonation at the beacon on the ship's radio to its time of arrival at the ship through the air. The equivalent distance was stated on the radio in miles and cables at every cable (one-tenth of a nautical mile). This precursor of modern radar and satellite navigation was developed for the Clyde Lighthouses Trust and installed at the Cumbrae and Cloch lighthouses in 1929 and 1939 respectively. In 1931 this invention earned father and son the Thomas Gray award of the Royal Society of Arts.

In 1914, after having graduated with a BSc degree at Edinburgh University and serving his apprenticeship under his father, (David) Alan Stevenson became an assistant in the firm. In 1919 he was taken into partnership. By the 1920s the period of great development of harbours, lighthouses, and navigational river deepening in Britain had passed, and the nation was in the throes of economic recession. Nevertheless, the firm still kept busy in a smaller way on such works as further deepening the lower Clyde, sewerage and water supply projects, and, more particularly, on the maintenance of lighthouse stations and modernization of equipment.

In 1926–7, for the government of India, Alan Stevenson inspected more than one hundred lighthouses and advised on the organization of a centralized lighthouse service. In the 1930s, then the most physically active member of the firm, he skilfully superintended the deepening of the Clyde from Port Glasgow westwards, which enabled the *Queen Mary* to go to sea in 1936. This year turned out to be a fateful one for the family firm. According to Charles's granddaughter Jean Leslie, Alan Stevenson had grown impatient with the uncertainty of obtaining the post of engineer to the Northern Lighthouse Board still held by David Stevenson, then aged eighty-one. This led to a difference that resulted in David Stevenson's withdrawal from D. and C. Stevenson, thus ending the firm's long-standing association with the board.

Learned societies, personal life, outside activities

In 1886 and 1891 respectively David and Charles Stevenson became members of the Institution of Civil Engineers, at which in 1887 David Stevenson read a paper on the Ailsa Craig lighthouse station, winning him a Telford premium prize. He also addressed the Institution of Mechanical Engineers on the installation of electric light at the Isle of May. The following year he and Charles Stevenson revised, updated, and published the third and most comprehensive edition of their father's influential textbook *Canal and River Engineering*. From 1894 to 1897 David Stevenson was an extramural examiner at the University of Edinburgh. He also gave evidence before royal commissions, parliamentary committees, and in important legal cases.

Charles Stevenson became a regular correspondent to *Nature* and other scientific periodicals on such diverse matters as the 1880 earthquake in Scotland, seismography, river discharge formulae, wind velocity, and dioptric lenses. In 1887 and 1888 he read papers on dredging the Clyde and on a dipping or fog apparatus for electric light in lighthouses to the Institution of Mechanical Engineers and the Institution of Civil Engineers respectively. To the latter in 1894, he read a paper on his important innovation of equiangular prism refractors for brightening dioptric lights. David and Charles Stevenson were elected fellows of the Royal Society of Edinburgh in 1884 and 1886 respectively. They were also members of the Royal Scottish Society of Arts and the Highland and Agricultural Society. In 1893 Charles Stevenson became an associate member of the Institution of Electrical Engineers. In 1919 Alan Stevenson continued in the family tradition by being elected a fellow of the Royal Society of Edinburgh, and in 1925 a member of the Institution of Civil Engineers.

Charles Stevenson married, on 19 January 1889, Margaret (1863–1945), daughter of Lieutenant-General John P. Sherriff. On 21 January 1892 David Stevenson married Dorothy Anne Roberts (c.1862–1945). The brothers' outside interests included golf, archery with the Royal Company of Archers, and skating with the Edinburgh Skating Club, for whom Charles Stevenson wrote the article 'Statics and dynamics of skating' in *Nature* (20 January 1881), which is also believed to have been separately printed as a pamphlet. The second edition of a booklet entitled *Skating Diagrams: Drawn by Charles A. Stevenson, C.E.* was published in 1881 at the expense of the Glasgow Skating Club. Later, Alan Stevenson also took up these interests and became the last secretary of the Edinburgh Skating Club. He was also a fellow of the Royal Scottish Geographical Society and served as its honorary treasurer. He married Jessie Laura Margaret MacLellan (1897–1975) on 5 June 1923.

Conclusion

D. and C. Stevenson was reformed in 1936, as A. and C. Stevenson, at 90A George Street, Edinburgh. The new firm's workload was much reduced, relying principally on the family commission as joint engineers to the Clyde Lighthouses Trust. Four years later Charles Stevenson retired, after which Alan Stevenson continued to act solely as the trust's engineer. His retirement in 1952 marked the end of nearly a century and a half of continuous service by Stevenson engineers to the trust. In 1945 he read what is

now a historically valuable paper on the engineering work of the trust to the Institution of Engineers and Shipbuilders in Scotland.

David Stevenson continued to serve as engineer to the Northern Lighthouse Board until his retirement on 31 March 1938, ending 151 years of family service. He died on 11 April 1938 at his home, Troqueer, Kingsknowe, Edinburgh, and was buried in the Dean cemetery, Edinburgh. Charles Stevenson, the most inventive member of the family with the possible exception of Thomas Stevenson, was described by his Royal Society of Edinburgh biographer as:

a man of great intellectual acumen, but for work of this sort [engineering] he had a very special natural aptitude—a sort of instinctive grasp of how nature would work in the waves and winds and tides. His personal character had a great charm. Kindliness, gentleness and tolerance are characteristics that come to one's mind in recalling him, and permeating them all there was a natural unaffected simplicity and absence of sophistication. (Johnstone)

He died on 9 May 1950 at his home, 29 Douglas Crescent, Edinburgh, and was also buried in the Dean cemetery.

By the time of his retirement in 1952 Alan Stevenson had become increasingly involved in research for various historical pursuits, an interest which can be traced back to his article 'Early Scottish lighthouses' in *Chambers Journal* in 1917. In 1949 he published his first full-length book—an account of Robert Stevenson's English Lighthouse Tours, 1801, 1813, 1818. This was followed in 1950 by his definitive work, *The Triangular Stamps of Cape of Good Hope*, for which he was awarded the Crawford medal of the Royal Philatelic Society and, in 1959, by his authoritative *The World's Lighthouses Before 1820*. Alan Stevenson is now remembered not so much for his engineering achievements but as a diligent custodian of the family's business records from about 1800, now at the National Library of Scotland (MS acc. 10706), and as the nation's, if not the world's, foremost lighthouse historian of his day. His detailed unpublished notes and articles relating to the life and work of his engineering forebears proved an invaluable source of information to his biographers (Mair, Leslie, and Paxton). It was said of Alan Stevenson by the general manager of the Northern Lighthouse Board that:

His was a life dedicated to lighthouses; his interest in them never flagged and a visitor to his bedside during his last illness will always remember his keen desire to discuss the latest developments. We in the Lighthouse Services of the world have lost not only an acknowledged authority but a true and staunch friend. (Robertson)

He died on 22 December 1971 at 25 Belgrave Crescent, Edinburgh, and was buried in the Dean cemetery.

With Alan Stevenson's death the family dynasty of civil engineers came to an end. It had begun with the appointment of Thomas Smith as engineer to the Northern Lighthouse Board in 1787 and spanned five generations and 165 years of professional practice. The family's main contributions to society were the improvement of maritime safety, the facilitation of trade by means of the design and erection of more than 200 lighthouses, improving the illumination of many of the world's lighthouses, and navigational or drainage improvements to numerous British harbours and most major rivers from the Ouse northwards to the Dornoch Firth. The firm's private work played a major part, as can be gauged from the fact that at the height of its success in the third quarter of the nineteenth century only about one-quarter of its profits were attributed to Northern Lighthouse Board work.

Seven of the Stevenson engineers had the remarkable distinction of being members of both the Institution of Civil Engineers (1828–1971) and fellows of the Royal Society of Edinburgh (1815–1971). Their innovative work was often at the frontiers of technology and practice, and collectively they produced

more than 200 professional publications including several influential textbooks. Overall, it was an outstanding achievement for a small firm, and one that has earned the Stevensons a place among the nation's most notable civil engineering families. Robert Louis Stevenson's eloquent family reminiscence of their beacons and towers around the coast forms a fitting finale:

In the afternoon of time
 A strenuous family dusted from its hands
 The sand of granite, and beholding far
 Along the sounding coast its pyramids
 And tall memorials catch the dying sun,
 Smiled well content.
 (Poems, 'Underwoods', XXXVIII, c.1885)

Roland Paxton

Sources

J. Leslie and R. Paxton, *Bright lights: the Stevenson engineers, 1751–1971* (1999) · C. Mair, *A star for seamen: the Stevenson family of engineers* (1978) · J. D. Gardner, *Proceedings of the Royal Society of Edinburgh*, 58 (1937–8), 280–82 · R. W. Johnstone, 'Charles Alexander Stevenson, BSc, MICE', *Year Book of the Royal Society of Edinburgh* (1950–51) · A. Robertson, *International Lighthouse Authority Bulletin* (April 1972) · C. Mair, *David Angus: the life and adventures of a Victorian railway engineer* (1989) · private information (2004) [family] · d. cert. · d. cert. [Charles Alexander Stevenson] · d. cert. [(David) Alan Stevenson]

Archives

NA Scot., Northern Lighthouse Board records · National Monument Record of Scotland, R.C.A.H.M.S. · NL Scot., business records of Robert Stevenson and sons, civil engineers, MS Acc. 10706

Likenesses

photograph, c.1920 (Charles Alexander Stevenson), repro. in Leslie and Paxton, *Bright lights* · photograph, c.1932 ((David) Alan Stevenson), repro. in Leslie and Paxton, *Bright lights* · photograph, repro. in Mair, *Star for seamen* · photograph, repro. in Leslie and Paxton, *Bright lights* · photograph (Charles Alexander Stevenson), repro. in Mair, *Star for seamen* · photograph ((David) Alan Stevenson), repro. in Mair, *Star for seamen*

Wealth at death

£160,444—(David) Alan Stevenson: confirmation, 1972, NA Scot., SC 70/1/2029/54–60

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