

Dynasty of Engineers

*The Stevensons and
the Bell Rock*

Roland Paxton

CELEBRATES THE
ACHIEVEMENTS OF THE
STEVENSON FAMILY OF
ENGINEERS

UNEARTHS NEW
INFORMATION REGARDING
THE CONSTRUCTION OF THE
BELL ROCK LIGHTHOUSE

CHRONOLOGY OF OVER
200 LIGHTHOUSES
COMPLEMENTED BY
NUMEROUS COLOUR
PHOTOGRAPHS

FASCINATING INSIGHT
INTO ROBERT LOUIS
STEVENSON'S EXPERIENCE
AS A RELUCTANT ENGINEER



Robert Stevenson – Founder of the Dynasty

Painted by John Syme, R.S.A. Engraved by Thomas Dick and dedicated by him to the Northern Lighthouse Commissioners [1834]. The gold medal was presented to Stevenson in 1829 by the King of the Netherlands for the innovative distinction of a flashing revolving light (A, 22; 2, 31). The original painting of c. 1833 is now at the National Portrait Gallery [PG 657].

Dynasty of Engineers:

THE STEVENSONS AND THE BELL ROCK

ROLAND PAXTON

NORTHERN LIGHTHOUSE HERITAGE TRUST
EDINBURGH

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TO THE MEMORY OF
THE LATE JEAN LESLIE (1916-2010),
ROBERT STEVENSON'S GREAT GREAT GRAND-DAUGHTER,
MY FRIEND AND SPIRITED CO-AUTHOR OF *BRIGHT LIGHTS*,
WHO WAS LOOKING FORWARD TO THE PUBLICATION
OF THIS BOOK

Illustrations

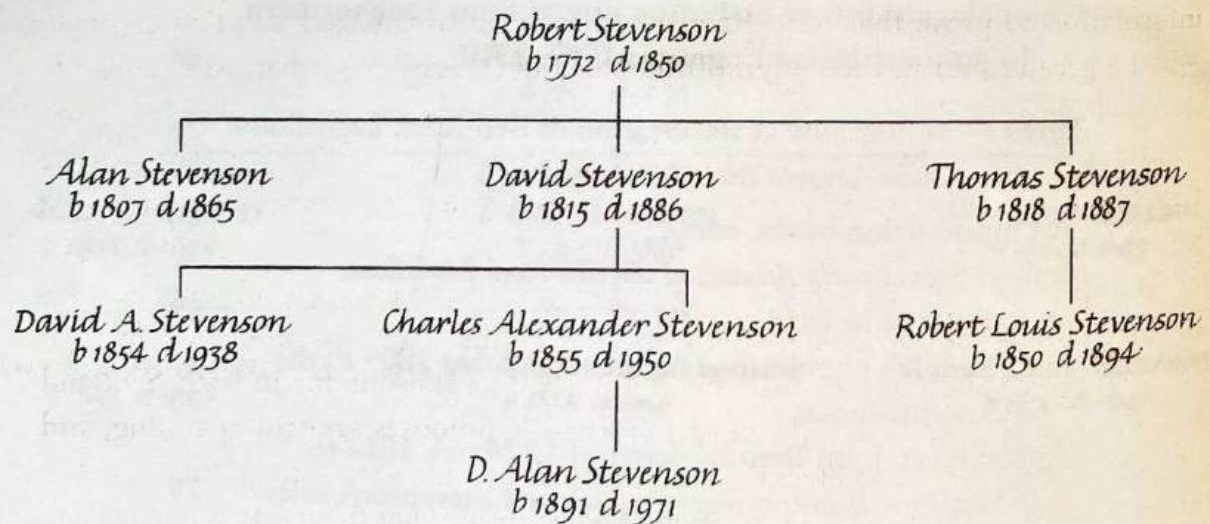
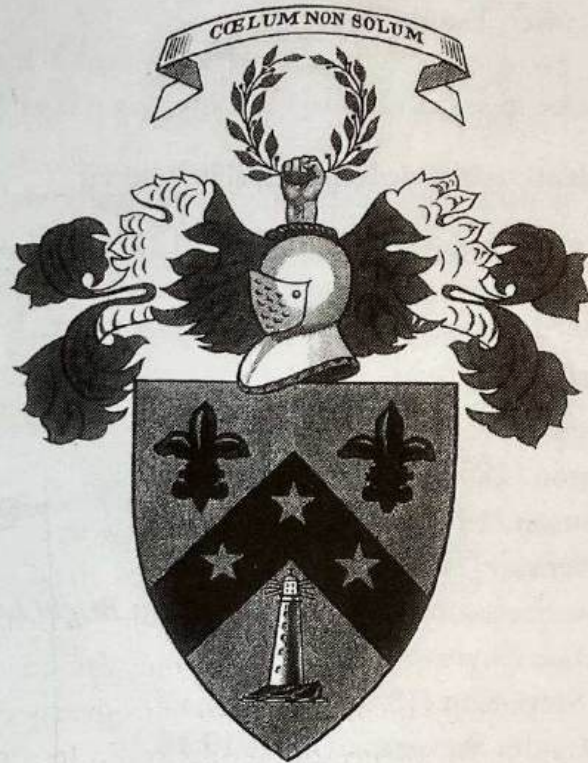
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The background illustration for the subtitle to each Part is of a view taken from the Lighthouse Yacht, in July 1810 by artist Alexander Carse, as later redrawn by George Cumming Scott (Stevenson's apprentice from November 1817) and engraved by William Miller (3, *pl. XVIII*).

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The Stevenson Family of Engineers



Stevenson Engineers Family Tree

For the purposes of this book,
Thomas Smith (1752–1815) – Robert Stevenson’s step-father and
father-in-law – has also been included.

The dynasty was founded under Smith’s patronage.

Foreword

by Lord Boyd of Duncansby

Chairman of the Northern Lighthouse Heritage Trust

The Northern Lighthouse Heritage Trust is pleased that this – the first book it publishes – should mark the bicentenary of the completion of the Bell Rock Lighthouse. In doing so, it celebrates the achievements of the Stevenson family of engineers. One of the main objectives of the Trust is to help promote awareness of the lighthouse heritage in Scotland and the Isle of Man, and I have no doubt that this book will achieve that.

Professor Roland Paxton's preface summarises the contents of the book. Part I is essentially factual, bringing to a wider audience the detailed biographies of the family which he wrote for the *Oxford Dictionary of National Biography* (2004), together with a fascinating insight into Robert Louis Stevenson's experience as a reluctant engineer. Part II should be of interest to both the specialist and the general reader, as it brings to a wider audience the results of Professor Paxton's researches into the design and building of the Bell Rock Lighthouse. Professor Paxton uses new information to prove that John Rennie – the very distinguished Scottish engineer – had a greater part in the design of the Bell Rock Lighthouse than was originally acknowledged by Robert Stevenson. During the nineteenth-century, the Stevenson and Rennie families had a number of fierce public disputes on this issue, and we hope that this book will settle the argument with recognition that both great men were responsible.

The final part of the book is a reminder that the Stevenson inheritance lives on, and provides an up-to-date list (provided by the Commissioners of Northern Lighthouses) of lighthouses that the family were responsible for in both Scotland and the Isle of Man. Virtually all of the listed lighthouses are still operating, and from their eighteenth, nineteenth, and twentieth-century structures. Although now all unmanned, twenty-first century technologies ensure that the lights still shine for, in the words from the Commissioners motto, *In salutem omnium* (i.e. the safety of all).

The Trust is enormously grateful to Professor Paxton who, as both author and editor of this book, has given freely of his time and his vast knowledge and experience of engineering and the Stevenson archives. We gratefully acknowledge the support of the OUP who allowed us to reprint Professor Paxton's biographies from the

Oxford DNB. We also thank Professor Paxton and the heirs of the late Mrs Jean Leslie, authors of *Bright Lights: the Stevenson Engineers* (1999), for allowing us to use excerpts and illustrations from this fascinating history of the Stevenson family. We are honoured too that the President of the Institution of Civil Engineers has written such a positive introduction to this celebration of the achievements of past members of the Institution.

If this book helps to remind the world of those achievements, the Trust will be content.

Lord Boyd of Duncansby

October 2010

Introduction

By *Professor Paul Jowitt*

President of the Institution of Civil Engineers

Civil engineering is the art of directing the great forces in nature for the use and convenience of man. This definition is nowhere better exemplified than in the 1807–11 erection of what is now the world's oldest continuously operational rock lighthouse on the Bell Rock, situated 11 miles off Arbroath. Its achievement by the eminent John Rennie and the relatively inexperienced Robert Stevenson (under the watchful auspices of the Northern Lighthouse Commissioners), against the seemingly impossible difficulties of an exposed site 15 feet below high water, led to a wonder of the engineering world. The project also enabled Stevenson to gain valuable experience and establish, within a decade, the private practice in which, with changes from time to time, the members of the dynasty of engineers flourished for 151 years (165 years if Smith is included). I am pleased to record that all the Stevenson participants were members of the Institution, starting from 1828.

This re-examination of the design and construction of the Bell Rock Lighthouse – based on little-known contemporary evidence – provides an authoritative account, with great images of the innovative temporary works that facilitated its erection. It also confirms Rennie's key role in the lighthouse's as-built design and overall direction, the credit for which is still generally attributed to Stevenson. The author is to be congratulated on his findings, from painstaking investigation as part of a PhD thesis (for which I was his supervisor) (12). He discovers that, both in terms of design and execution, this sustainable marvel of lighthouse engineering was essentially a masterpiece of joint achievement by Rennie and Stevenson in the best tradition of the chief engineer/resident engineer relationship.

The useful chronology of more than 200 lighthouses erected by the Stevensons for the Northern Lighthouse Board, enhanced by a selection of modern images, represents a legacy of which the Board and society in Scotland can be proud.

The Northern Lighthouse Heritage Trust is to be congratulated on publishing this fascinating and useful complement to the Bell Rock Lighthouse bicentenary.

Paul Jowitt

October 2010

Preface

The bicentenary of the Bell Rock Lighthouse, an engineering wonder of the world situated 11 miles off Arbroath, has created the opportunity with this book (and the generous consent of Oxford University Press), to furnish a handier version of my articles from the *Oxford Dictionary of National Biography* [ODNB]. These articles cover a truly remarkable dynasty of engineers.

Part I of the book comprises the biographies of the eight members of the family who, over five generations from 1786 to 1952, contributed significantly to the nation's transport infrastructure and international lighthouse engineering, particularly during the nineteenth-century. The biographies are, with minor editorial changes, as published in the *ODNB* (2004). They have been complemented with contemporary illustrations and my biographical essay on Robert Louis Stevenson's three and a half years as a reluctant trainee civil engineer, written for *Bright Lights: the Stevenson Engineers* (2).

Part II of the book comprises two little-known contemporary sources uncovered during my Stevenson researches which, with images and comment, shed new light on the design and erection of the Bell Rock Lighthouse and the work of its engineers. These are, following an introduction:

- A fascinating account by Robert Stevenson written in 1812 and published in 1813, which includes a fuller acknowledgement of John Rennie's part in the execution of the lighthouse undertaking than has been generally appreciated.
- A previously unpublished report by Rennie of 2 October 1809 to the Northern Lighthouse Commissioners, in which his planning and overall superintendence of the as-built lighthouse is exemplified.

Part III comprises an illustrated chronology of the Smith and Stevenson lighthouses legacy in Scotland and the Isle of Man, enhanced by Ian Cowe's fine images.

Roland Paxton

Metric equivalents

Imperial measurements have been generally adopted as this was the system used in the design and construction of the various works described.

The following are the metric equivalents of Imperial units used:

Length

1 inch = 25.4 millimetres

1 foot = 0.3048 metre

1 yard = 0.9144 metre

1 mile = 1.609 kilometres

Area

1 square inch = 645.2 square millimetres

1 square foot = 0.0929 square metre

Volume

1 gallon = 4.546 litres

1 cubic foot = 0.0283 cubic metre

1 cubic yard = 0.7646 cubic metre

Mass

1 pound = 0.4536 kilogram

1 Imperial ton = 1.016 tonnes

Acknowledgements and abbreviations

Mary Bergin-Cartwright, Birmingham City Council Archives, Ronald Birse, Lord Boyd of Duncansby, Lorna Hunter, Institution of Civil Engineers [ICE] Library, Willie Johnston, Professor Paul Jowitt, the late Jean Leslie, Peter Mackay, Roger Lockwood, Sheila Mackenzie, Virginia Mayes-Wright, Neil Miller, Alison Morrison-Low, the Trustees of the National Library of Scotland [NLS], National Archives of Scotland [NAS], National Museums of Scotland [NMS], National Portrait Gallery [NPG], Northern Lighthouse Board [NLB], Oxford University Press, Ann Paxton, Royal Commission on the Ancient and Historical Monuments of Scotland [RCAHMS], Royal Society of Edinburgh [RSE], School of the Built Environment, Heriot-Watt University, David Taylor, Whittles Publishing, the Wick Society and John Williamson.

References

[excluding those self-contained in the *Oxford DNB* text and elsewhere]

- (1) Stevenson, A., *Biographical sketch of the late Robert Stevenson*. Edinburgh, 1861, 10: Stevenson, D., *Life of Robert Stevenson*. Edinburgh, 1878, 21–22.
- (2) Leslie, Jean and Paxton, R., *Bright Lights: the Stevenson Engineers*. Edinburgh, 1999.
- (3) Stevenson, R., *An Account of the Bell Rock Light-house, including the Details of the Erection and Peculiar Structure of that Edifice ... By Robert Stevenson, Civil Engineer*. Edinburgh, 1824.
- (4) Stevenson, A., *Account of the Skerryvore Lighthouse, with notes on the Illumination of Lighthouses*. Edinburgh, 1848.
- (5) Stevenson, R. L., *Memories and Portraits*. London, 1887, 134–135.
- (6) Engraving by W. & D. Lizars from a drawing by Stevenson's assistants W. Lorimer & J. Steedman. [In] Stevenson, R., 'Bell Rock Light-house during the gale'. *Encyclopaedia Britannica, Supplement to Fourth, Fifth and Sixth Editions*. II, 253–258. pl. Edinburgh, 1824. First published December 1816.
- (7) Stevenson, D. A., *The World's Lighthouses Before 1820*. Oxford, 1959.
- (8) Paxton, R., 'Account of a Visit to the Bell Rock Lighthouse on 19th–20th August 1986'. [In] 'Institution of Civil Engineers' *PHEW Newsletter*, No. 32, December 1986, 4–10.
- (9) Ballantyne, R. M., *The Lighthouse: Being the Story of a Great Fight Between Man and the Sea*. London, 1865, facing 358.
- (10) Paxton, R., 'ICE President unveils Robert Stevenson plaque in Edinburgh'. [In] 'Institution of Civil Engineers' *PHEW Newsletter*, No.102, June 2004, 32, 4–10.
- (11) Birmingham City Council Archives. MS. 3782/13/49/77. Letter: John Rennie to Matthew Boulton (Soho). 12 March 1814.
- (12) Paxton, R., 'An assessment of aspects of the work of the Stevenson Engineers 1786–1952'. Ph.D. Thesis, Heriot-Watt University, 1999. Copies: ICE, NLS.
- (13) Paxton, R., 'The sea versus Wick Breakwater 1863–77 – an instructive disaster'. Proc. ICE 9th Intl Coasts, Marine Structures and Breakwaters Conf. 2009.

A note on the author and editor

Professor Roland Paxton, chartered engineer and engineering historian, is a Fellow of the Institution of Civil Engineers and a Fellow of the Royal Society of Edinburgh. He was educated at Manchester College of Science and Technology and Heriot-Watt University obtaining an MSc, PhD and an honorary D.Eng. He is vice-chairman of the Institution of Civil Engineers' Panel for Historical Engineering Works (chairman 1990–2003), a trustee of the James Clerk Maxwell Foundation, chairman of the ICE Scotland Museum, and chairman of the Forth Bridges Visitor Centre Trust.



Since 1990, after an engineering career in local government, he has taught and researched in engineering history and conservation at Heriot-Watt University as an Honorary Professor, lecturing as far afield as Scandinavia, Japan, Eastern and Central USA and California. His awards include an MBE, the Institution of Civil Engineers' Garth Watson Medal and Robert Alfred Carr Prize and the American Society of Civil Engineers' History and Heritage Award. He was named Association for Preservation Technology International's 'College of Fellows Lecturer for 2000'.

In 1996 he was instrumental in saving from collapse the world's oldest viaduct on a public railway near Kilmarnock after negotiating its purchase for £2. In 2002, with *Radar World*, he laid to rest a Highland legend by locating horse and cart remains accidentally entombed in a concrete pier of Loch-nan-Uamh Viaduct on the West Highland Railway during its construction. From 1992–2002 he served on the Royal Commission on the Ancient and Historical Monuments of Scotland.

Of more than 100 publications those most relevant to the Stevensons are, his biographical articles for the *Oxford Dictionary of National Biography*; *Bright Lights* (with the late Jean Leslie); *Civil Engineering Heritage Scotland Highlands and Islands* and *Lowlands and Borders* (with Dr Jim Shipway); and his Wick Breakwater failure findings (13). Other related activities have included, organising a Stevenson plaque on the Melville Column, Edinburgh, taking part in conferences and media documentaries, and serving on Bell Rock 200 anniversary committees.