



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

Life of
Sir James N. Douglass
F.R.S.

LIFE OF SIR JAMES NICHOLAS DOUGLASS, F.R.S.

(Formerly Engineer-in-Chief to the Trinity House.)

BY THOMAS WILLIAMS,

WITH PORTRAIT, AND VIEW OF THE DOUGLASS EDDYSTONE LIGHTHOUSE.

London: LONGMANS GREEN & CO. Price 3/6.

OPINIONS OF THE PRESS.

(Professional and Technical.)

"The life story of a man endowed with a remarkable personality and engaged in a work which, compared to our every-day tasks, borders on the romantic—a work full of hardships, difficulties, dangers, and isolation—can scarcely fail to be attractive. But Mr. Williams has made it doubly attractive by bringing to it a simple honest love for his master. . . . All these things are told, and well told, in the little volume before us. . . . A book which is worthy of many readers."—*Engineer*.

"No one could have been found better qualified for the congenial duty he has here discharged with such full appreciation and with so satisfactory a result. The author may, indeed, be warmly congratulated on the taste and ability he has brought to bear. . . . There is a glamour of romance over the whole narrative. . . . This highly delightful book."—*Engineering*.

"It is just such a biography as suits with the simple minded and practical character of the man who is the subject of it. . . . An interesting memoir of a remarkable man, who did some very remarkable work."—*Builder*.

"A very interesting and readable narrative."—*Building News*.

"Deserves to be popular."—*Architect*.

"The book is one we have read with much pleasure."—*Mechanical Engineer*.

"Very readable."—*Practical Engineer*.

"Worthy of a large circle of readers."—*Engineers' Gazette*.

"A book full of information, as well as a very readable story."—*Marine Engineer*.

"Exceedingly well told. . . . Quite stimulating. . . . Tells of many moving incidents."—*Shipping and Mercantile Gazette*.

"Well worthy of perusal. . . . The subject of lights and lighthouses is a very attractive one, and the reader will find interspersed throughout the work a number of details that are full of interest."—*United Service Gazette*.

(Literary.)

"Though this little volume deals mainly with the various lighthouses which Sir J. Douglass had to do with, interspersed with incidents connected with them, anecdotes about lighthouse-keepers, and a concise history of the Trinity House, with occasional references to occurrences in the career of Sir J. Douglass,—showing his courage and energy in perilous circumstances as a leader of his men, his powers of work, and his devotion to duty,—his character and private life are also delineated by the author, especially in the closing chapter, with a respectful and loving hand, as is natural in treating of a revered master whom he served for over thirty years. . . . These graphic descriptions of the methods of lighthouse construction, and of the sort of men who build and take care of them, will interest those unacquainted with such matters; and they will remind those conversant with the subject of many points they may have forgotten, and of the man who was one of the most successful constructors of lighthouses of the century."—*Athenæum*.

"An interesting record of a man who seems to have been as estimable as he was able."—*Spectator*.

"Interesting especially to persons who are conversant with the history of lighthouse construction."—*St. James's Gazette*.

[OVER.]

"Mr. Williams has told the story. . . . in just the modest, unaffected style in which, could the subject have chosen, he would have preferred to have had it done."—*World*.

"Cannot fail to act as a spur to every young engineer who reads it."—*Daily Chronicle*.

"Mr. Williams writes, as the subject of his biography worked, *con amore*. . . . This excellent biography."—*Publishers' Circular*.

"Mr. Williams . . . has something of an enthusiasm for his subject, and with this enthusiasm he infects those who peruse his interesting volume."—*Newcastle Daily Chronicle*.

"A simple but stirring record. . . . Will be read with interest alike by the school-boy and the engineer, and by those who, whether on business or pleasure, go down to the sea in ships. . . . Contains a mine of suggestion and illustration for the speaker and the teacher."—*Western Daily Mercury*.

"A pleasantly-written, unambitious piece of biography, detailing the career of one who, to slightly paraphrase Carlyle's words, knew what he could work at, and worked at it like a Hercules."—*Glasgow Herald*.

"Gives in an unassuming manner, though with an intimate knowledge, the story of his busy life."—*Daily Graphic*.

"It is a story of vivid interest, and an inspiring story too."—*Pall Mall Gazette*.

"It is a story of hard, dangerous and determined work . . . and Mr. Williams tells it interestingly and with tact."—*Illustrated London News*.

"An excellent and well-informed narrative. . . . If this little book has the reception it deserves . . ."—*Saturday Review*.

"Well-written and extremely interesting. . . . Very lucid."—*Westminster Gazette*.

"A volume of much charm. . . . A modest but excellent narrative. . . . Its value as a contribution to the literature of the lighthouse is another of the book's claims to a wide and ready acceptance."—*Newcastle Daily Journal*.

"Sir James' distinguished services as a lighthouse builder are well known. The glamour of his romantic occupation surrounds his 'Life.' . . . There is a sugar in biography that cloy; it is the product of a slavish consideration, 'Say nothing but good of the dead.' The sweet of this biography resembles the sweetness of an honest fruit rather than that of a refined sugar."—*Outlook*.

"Mr. Williams shows that his character was as notable a beacon, in its way, as any that he erected on dangerous reefs. Like Dr. Smiles' life of Smeaton, and Robert Stevenson's account of the building of the Bell Rock lighthouse, this little book illustrates the work of an ideal 'captain of industry.'"—*Manchester Guardian*.

"Tells succinctly the story of the monumental works by which his memory will be preserved."—*Aberdeen Daily Free Press*.

"Extremely interesting even to those who do not understand engineering."—*Bristol Times and Mirror*.

"Will be welcomed."—*Leeds Mercury*.

"Primarily a biography, the volume is also a contribution to the history of English lighthouses, being, therefore, doubly useful and valuable."—*Globe*.

"The book incidentally contains a good deal of interesting information about lighthouse construction and the lives of lighthouse-keepers."—*Literature*.

"In the extracts quoted we have drawn but lightly on the wealth of practical information about the building of lighthouses."—*West Briton*.

"Apart from its purely personal aspect, the volume is valuable as showing the improvements which were effected in lighthouse construction during the long period of Sir James Douglass' official connection with the Trinity House."—*Scotsman*.

"Furnishes much information of an interesting and a stimulating kind. . . . Many amusing anecdotes and notable incidents . . . are here related."—*Daily News*.

"Recalls many remarkable incidents."—*Nottingham Daily Guardian*.

"Some of the stories of hair-breadth escapes must be read in these pages—it is not fair to quote them."—*Western Morning News*.

"A fascinating narrative."—*Cornishman*.

"A science."—*Dundee Advertiser*.

H. M. Rogers, Esq:
with the
author's regards,

(2)



Frederick Douglass

LIFE OF
SIR JAMES NICHOLAS DOUGLASS

F.R.S., &c., &c.

(Formerly Engineer-in-Chief to the Trinity House.)

BY

THOMAS WILLIAMS

WITH PORTRAIT

LONGMANS, GREEN AND CO.

39, PATERNOSTER ROW, LONDON

NEW YORK AND BOMBAY

1900

100

101

102

“The latest gospel in this world is, know thy work and do it.
Know what thou canst work at, and work at it like a Hercules.”

Carlyle.

“So nigh is grandeur to our dust,
So near is God to man,
When Duty whispers low, ‘Thou must,’
The youth replies, ‘I can.’”

Emerson.

“What makes a hero?—an heroic mind,
Express’d in action, in endurance proved.”

Sir Henry Taylor.

“No trustier service claimed the wreath
For Sparta’s bravest son ;
No truer soldier sleeps beneath
The mound of Marathon.”

O. W. Holmes.

to
LADY DOUGLASS,
THE FOLLOWING BIOGRAPHY
OF HER DISTINGUISHED HUSBAND,
BY ONE
WHO, FOR MORE THAN THIRTY YEARS,
HAD THE PRIVILEGE OF SERVING UNDER HIM,
IS,
WITH THE AUTHOR'S SINCERE REGARDS,
RESPECTFULLY INSCRIBED.

CONTENTS.

CHAPTER I.

Birth; early years; father's misfortune in business and entry into the Trinity House service; education; practical advantages of a roving life; mother's character; apprenticeship; the Scilly Islands; assists his father in building the Bishop rock lighthouse; structure swept away; second lighthouse commenced; father's qualities; Mr. James Walker and his assistants	PAGE I
---	-----------

CHAPTER II.

An early adventure; "Cap'n Jim" at the Bishop; life on Rosevear; story of Sir Cloudesley Shovel; Cornish superstition; James' intrepidity; an instance of chivalry; versatility as a craftsman	13
--	----

CHAPTER III.

The granite blocks; leaves the Bishop to improve his position; love of independence; manager of railway carriage works; succeeded at the Bishop by his brother; completion of the lighthouse; the life of a light keeper; marriage; re-enters the Trinity House service; faithful performance of duties; the Gunfleet lighthouse and Runnelstone beacon; self-defence	21
---	----

CHAPTER IV.

Resident engineer at the new Smalls lighthouse; the old building; private ownership in lighthouses; a tragic incident at the first "Smalls"; the new tower; resident engineer's indomitable zeal and energy; an historical gale; fatal accidents	32
--	----

CHAPTER V.

Process pursued in building the new Smalls lighthouse; exhausting and dangerous nature of the operations; "the post of honour"; reminiscences by a former light keeper; the resident engineer's great capacity for work	41
---	----

CHAPTER VI.

Description of the new Smalls lighthouse; ancient beacons; coast illumination; Messrs. Chance Brothers & Co.; Dr. John Hopkinson, F.R.S.; popularity of Mr. Douglass; interest in the welfare of his workpeople; a dream and its fulfilment; the art of catching crabs; elected a member of the Institution of Civil Engineers; appreciation by the Trinity House, and appointed resident engineer for the Wolf rock lighthouse; colour of lighthouses; departure from Solva; description of that village and its inhabitants; the beacon on the Wolf; commencement of the lighthouse thereat; death of Mr. Walker; succeeds him as chief engineer to the Trinity House; chance "favours the prudent"	PAGE 50
---	------------

CHAPTER VII.

The Trinity House; eminent men connected therewith; its charters; referred to in Pepys' diary; duties and jurisdiction; light dues; an ancient City guild; the Elder Brethren; works of art in the building	67
---	----

CHAPTER VIII.

Mr. Douglass organizes his department; designs and constructs new lighthouses and other works; the Trinity House engineering workshops at Blackwall; Mr. G. H. Slight; the Wolf lighthouse a difficult enterprise; Professor Tyndall's investigations on the subject of the loss of light by passing through red glass; Mr. Michael Beazeley succeeds Mr. W. Douglass at the Wolf; an exciting Christmas Day; the lighthouse finished; presentation to the engineer	74
---	----

CHAPTER IX.

The Great Basses reef; first attempts to erect a lighthouse thereon; the proposal temporarily abandoned; the Trinity House consulted; Mr. Douglass' design; a masterly scheme; Mr. W. Douglass appointed executive engineer; special appliances; operations; exhibition of the light; very moderate cost of the work; the Little Basses lighthouse; its erection and lighting; pre-eminent fitness of the brothers Douglass for such enterprises; Mr. W. Douglass appointed engineer-in-chief to the Commissioners of Irish Lights; old and new Longships lighthouses; other works	81
--	----

Contents.

ix

CHAPTER X.

PAGE

Smeaton's Eddystone lighthouse doomed; Winstanley's lighthouse; an ingenious practical joker; the unsuitability of his building for such a position; its total destruction; a remarkable coincidence; Rudyard's lighthouse; admirably conceived; destroyed by fire; an extraordinary incident; Smeaton's lighthouse; ineffectual attempts to ensure its stability; a proposal to blow away the Eddystone reef; description of the rocks; site of the Douglass lighthouse	90
--	----

CHAPTER XI.

Arrangements for building the Douglass Eddystone lighthouse; old and new methods; the work commenced; preliminary operations; first and last stones laid by the Duke of Edinburgh; lessons from Nature; criticisms on the Douglass design; description of the new tower, in comparison with Smeaton's lighthouse	100
--	-----

CHAPTER XII.

Masonry of the new Eddystone tower; different methods of dovetailing; Mr. Nicholas Douglass' invention; Mr. W. T. Douglass and the new lighthouse; a providential escape; Smeaton's tower transferred to Plymouth Hoe; the difficulty of writing history; opening of the new lighthouse by the Duke of Edinburgh; the Duchess' great knowledge of lighthouse matters; the new tower completed much below the estimate; Mr. Douglass receives the honour of knighthood; a well-merited reward	111
--	-----

CHAPTER XIII.

Proposal to erect a lighthouse on Minicoy island; survey made by Mr. T. Matthews, and work carried out by Mr. T. Edmond; description of the island and its inhabitants; Sir James present at the opening ceremony; entertained by the Amin; inspection of the Basses lighthouses . . .	120
--	-----

CHAPTER XIV.

Violent seas at the Bishop rock; the lighthouse strengthened; practical re-building of the tower; dangerous nature of the operations; power of the new light; Mr. W. T. Douglass; Sir James frequently consulted by foreign Governments, &c.; his various inventions; lighthouse lanterns; the Douglass burners; fluted carbons for the electric light . . .	130
--	-----

CHAPTER XV.

	PAGE
Miscellaneous duties of the Trinity House engineer; Sir James' experimental work; types of fog signals; important investigations at the South Foreland; description of the "Siren"; Mr. Slight's improvements therein; importance of individualising fog signals	143

CHAPTER XVI.

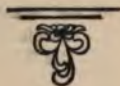
Experiments with lighthouse illuminants; the electric light; the Wigham gas system; the Douglass oil burners; result of the investigations; Professor Tyndall's attitude; experiments for determining the actual powers of lights; phases of 'Sir James' personality	155
--	-----

CHAPTER XVII.

Member of various Scientific Institutions; visit to Canada with the British Association; the Canadian Pacific Railway; impressions of the country; visit to the United States; governor of Dulwich College and University College, London.	169
--	-----

CHAPTER XVIII.

Retirement from official position, through illness; patience in affliction; home life; closing years; death; qualities and character; a good and faithful public servant; the "bondman" of Duty; some of his critics answered; his abundant labours and inspiring example	181
---	-----



NOTE.

TO Captain George Rawlinson Vyvyan, Deputy Master of the Trinity House, for permission to consult all necessary official documents ; to Mr. Charles A. Kent, Secretary, Mr. T. Matthews, Engineer-in-Chief, and Mr. E. Price Edwards, one of the Principals, of that Department, for valuable suggestions and assistance during the passing of this work through the press ; to the Editors of the "Daily News," the "Engineer," "Cassell's Magazine," and the "Boys' Own Paper," for the privilege of utilizing, in the following pages, portions of articles which I had previously contributed, on lighthouse matters, to those journals ; and to the Council of the Institution of Civil Engineers, for leave to re-produce, from the Minutes of Proceedings of that body, the accompanying engraving of the new Eddystone lighthouse, my grateful acknowledgments are due.

T. W.

CHAPTER I.

JAMES NICHOLAS DOUGLASS was born on the 16th of October 1826 at Bow, Middlesex, where his father, Mr. Nicholas Douglass, who came from a well-known and highly-respected Northumbrian family, was then in the service of the still existing firm of Messrs. Hunter & English, engineers &c., of that place. When quite young he was sent to Blaydon-on-Tyne, his parents' native town, to be educated. Here he remained for about five years, during which time he resided with an aunt; and is still remembered as a frank, intelligent lad, a favourite with his playmates, his relatives, and his master. James had, however, returned home before the date of the occurrence which will now be described. When the boy was about twelve years of age his father embarked in an engineering and shipbuilding venture on the Thames, putting all his little capital into the business. The first steamers that ran on that river were constructed by the firm with which he was thus connected; but lo! on one eventful day, his partner absconded, leaving Mr. Nicholas Douglass to

meet all the liabilities of the concern. The poor man, brave as a lion to face any ordinary danger, but not debt and dishonour, was overwhelmed. The fortunes of the little household had, indeed, never been darker. There was absolutely no money left, not even to pay for the two lads' schooling; but James' master, noting the boy's promise, and especially his love for mathematics, generously insisted on teaching his pupil gratuitously; and other help was, fortunately, not withheld in this the hour of need. In particular, the crisis made a man of the elder son James. His mother afterwards said that no one could have been more helpful, or have cared for her with greater tenderness, than he in this bitter trial.

In 1839 Mr. Nicholas Douglass entered the service of the Honourable Corporation of Trinity House as a constructive engineer,—rising eventually to be their superintending engineer,—and James, together with his only brother William, who is now, and has been for many years, engineer-in-chief to the Commissioners of Irish Lights, eventually accompanied their parents to several of the places where the exigencies of the

father's rather exacting calling compelled him to live,—residing at Cardiff during the erection of the Monkstone rock beacon; at Flatholm during the construction of a landing place on that island; at Newton, near Bridgend, during the building of the Tuskar rock beacon; at Tenby during the erection of a similar structure on the Woolhouse rock; at the Land's End during the construction of the Runnelstone rock beacon, &c. This wandering mode of life was, probably, a little unsettling to the boys' education; but the parents took care that their sons attended school wherever possible; and, during the period of about a year that they resided at Newton, the lads had the advantage of being placed, as weekly boarders, under the tuition of the Rev. J. E. Jones, Unitarian minister, of Bridgend, a man of brilliant mathematical attainments, one of whose pupils at the time was Richard Price-Williams, now the well-known engineer, and for the last thirty years of James Douglass' life his intimate and attached friend. Another pupil of Mr. Jones was the late Wyndham Harding (son of the rector of the parish) who was afterwards even more

famous as a mathematician than his teacher; and, having been articled to Robert Stephenson, ultimately became, also, an engineer of great distinction.

"As regards my recollection of Sir James during his school-days at Bridgend," writes Mr. Price-Williams, "I may state that what impressed me most was his splendid temper, his lovable nature, his earnest application to his studies, and the marked ability he showed even then. He was, as I am sure Mr. Jones would have testified were he alive, one of his best, if not the very best of his pupils." "Sir James has often admitted to me," adds Mr. Price-Williams, "that the training he got at Mr. Jones' school was of the greatest service to him in his professional career."

Besides,—moving about, as the two brothers did, from place to place, and being bright, observant youths, they acquired a good deal of valuable miscellaneous knowledge which books are often powerless to convey. What says the poet?

"Deign on the passing world to turn thine eyes,
And pause awhile from letters to be wise."

Moreover, living as they had to do, at the sea-side,—often on wild and desolate coasts,—

and witnessing, or hearing of, the deeds of daring performed by their brave father and his sturdy workmen, they early learned to swim, to row, to sail a boat, to despise danger, to endure hardness,—all such excellent preparations for the life of strenuous enterprise that lay before them.

An admirable woman, too, was the mother,—prudent and capable, a wise counsellor, a loving guide. No! the lads were not getting such a faulty education, after all.

On leaving school, James was apprenticed as an engineer to his father's old firm, Messrs. Hunter & English, in whose service his conduct appears to have been in every respect praiseworthy; and, besides being a diligent learner by day, he devoted his evenings,—often until late at night,—to mechanical drawing, and technical studies generally, thus seeking to attain the "prime wisdom" of knowing that which before him lay "in daily life". His apprenticeship completed, he was employed for a while under Messrs. Seaward & Capel, engineers, Isle of Dogs.

This record now brings us to the year 1847, when Mr. Nicholas Douglass was

selected by his employers to erect a lighthouse on the Bishop rock, Scilly Isles; and James, then in his twenty-first year, was appointed to accompany him thither as assistant.

The Scilly Isles are situated about forty miles from Penzance (the usual port by which the visitor reaches their capital of St. Mary's) and about twenty-five miles west by south of the Land's End. The Cassiterides, or Tin Islands, which long held commerce with the Phœnicians, have an interesting history, with which, however, this narrative has no concern, except for the fact that they had long been the scene of terrible shipwrecks. It was on the Gilstone, one of the rocks of this group, that, in 1707, several ships of the British squadron under the command of the gallant Sir Cloudesley Shovel, when returning from an expedition against Toulon, were wrecked, and two thousand men, including the Admiral himself, drowned; and here, also, as lately as 1875, occurred the sad loss of the Hamburg mail steamer "Schiller," when three hundred and thirty-one persons perished. Since the

latter catastrophe an additional lighthouse, showing a very powerful red flash, has been established on Round Island, situated at the northern end of the Scilly group; but, before the Bishop rock was illuminated, the only local lighthouse was the one at St Agnes, where, in 1680, was built a stone structure, from the top of which an open coal fire was shown until so recent a date as 1790, when it was replaced by the first revolving reflector light established in Great Britain. The Bishop rock, which is thought to derive its name from its resemblance to a bishop's mitre, lies at a distance of about seven miles from St. Mary's, is covered at high-water, ordinary spring tides, and affords only just sufficient base to receive a stone tower of adequate strength to withstand the tremendous Atlantic billows which break over it. It was not, however, a stone tower at all, but an open structure of wrought and cast iron that Mr. Nicholas Douglass and his son had gone to erect,—a building designed by Mr. James Walker, F.R.S., who, besides filling the post of engineer-in-chief to the Trinity House, had an extensive private practice, chiefly as a dock

and harbour engineer, having indeed, since the death of the illustrious Telford in 1834, stood at the very head of his profession, and been for nearly eleven years, ending 1845, President of the Institution of Civil Engineers.

The work of cutting and blasting the rock for receiving the cast iron pillars of the lighthouse was proceeded with as vigorously as the exposed nature of the site, and the great difficulty of landing on it, admitted. During the second and third years the columns and their supports were got into position; and, at the end of the working season of 1849, the building was nearly completed, being, indeed, ready to receive the lantern and optical apparatus. In this state it was left until the opening of the fine spring weather of the following year should permit of these latter being erected in place, and the light shown. But, alas! during a terrific storm on the night of the 5th of February 1850, the structure was entirely swept away. The sea was too rough to admit of the rock being approached until ten days afterwards, when Captain Hugh Tregarthen, the Trinity House local

agent, got as near to it as he safely could (Mr. Nicholas Douglass was in London at the time) and reported, next day, to his Board that there was practically nothing of the former building left. "Bad indeed! but, as you say, might have been worse," wrote Mr. Walker informally, on the 9th of that month, to Mr. Jacob Herbert, then secretary of the Trinity House. It would, certainly, have been *worse* had the casualty occurred after the tower was completed and inhabited by the keepers. "I have seen the Deputy Master," continued Mr. Walker; "not in the best spirits as you may suppose, but calm and *equal* as usual. No reproach, but rather the reverse, by referring to my not having confidence &c." Well, if the authorities of the Trinity House, as thus represented by its Deputy Master (Captain Sir J. H. Pelly, Bart., who had filled that honourable and dignified position since 1834) had thus full confidence in the engineer of the ill-fated structure, that feeling was equally entertained by them towards its builder. Accordingly, steps were at once taken with a view to the erection of a granite tower, in lieu of

the previous one of iron; and, during the ensuing summer, Mr. Nicholas Douglass and his son James were hard at work upon this new, and much more difficult, undertaking. To no better hands, indeed, than those of Mr. Nicholas Douglass could a project of this nature have been entrusted. A few words now respecting him. A man of immense stature and build, he stood a very tower of strength; his keen, glittering eye, and firm, determined mouth being, indeed, indicative of that courage, that tenacity, that masterfulness, which were his leading characteristics. Not highly trained in the *science* of his profession, he, in the practice of it, arrived, as by an unerring instinct, at those correct results which engineers of far greater theoretic attainments often fail to reach. He would have sorely tried, however, a little-minded chief under whom it might have been his misfortune to serve; for he was "stiff in opinion," and accustomed to employ, no matter whom he addressed, a quaker-like bluntness and brevity of speech. But Mr. Walker was quite above being

influenced by any such trifles. He knew, and rightly appreciated, the sterling worth of this excellent officer, and took every suitable occasion of testifying to it. A brave, capable leader, Mr. Nicholas Douglass completely won the confidence of his men, who followed him loyally.

It was remarked, in one of the biographical notices which appeared of Mr. Walker soon after his decease, that "he was fortunate in attracting to him a number of men who have since risen to eminence in the profession." This statement does not do him justice. Surely *they* too were fortunate in serving under one who, as was once well said of him, had "as much skill in the engineering of men as of matter," and always succeeded in evoking what was best in them. Of those who are referred to in the biographical notice in question, besides James and William Douglass, may appropriately be mentioned in these pages, first, Mr. John McConnochie, who, from the death of Mr. Walker until his own decease in 1889, was engineer-in-chief of the Bute Docks, but who, during the year 1855, assisted Mr. Nicholas Douglass at the

erection of the stone tower on the Bishop rock; secondly, his younger brother Mr. James A. McConnochie, who prepared, under Mr. Walker's directions, the drawings for many of the most important lighthouses that were designed by the latter, and who eventually became engineer of the Surrey Commercial Docks and the Port Talbot Railway and Docks Company; and, lastly, Mr. Thomas Ormiston, who, for thirteen years ending 1877, held the highly responsible position, in which he greatly distinguished himself, of engineer-in-chief to the Bombay Port Trust, but who had formerly assisted Mr. Walker on lighthouse work generally, was resident engineer at the erection of the Needles rock lighthouse, (completed in 1859) and designed and constructed, while at Bombay, a lighthouse on the Prongs, a dangerous reef at the entrance to the harbour thereat, as also the lighthouse on the Sunk rock in the same locality.

CHAPTER II.

JAMES DOUGLASS was a worthy son of his intrepid father. It has already been pointed out how the roving, romantic life which he and his brother led, when lads, was calculated to foster those qualities which would stand them in good stead during the stirring years that were before them. But the children really *inherited* the pluck and endurance which they afterwards so conspicuously showed. Of James it has been related that, when only two years of age, his father saw him "running over a plank laid across a giddy height. The workmen were about to cry out in horror, but Mr. Douglass sternly ordered silence, and the baby reached his father safely, without any sign of fear."

At the Bishop, James, though always ready to defer to his father's superior judgment in the *direction* of the rock operations, took the chief part in their *execution*, for Mr. Nicholas Douglass was now about fifty years old, and, while still

wonderfully energetic for his years, was naturally not so active as his equally brave son. So "Cap'n Jim," as the workmen called him,—Cornish people are very generous in the bestowal of that prefix,—was the life and soul,—bore much of the brunt,—of this difficult enterprise.

During the summer months the supervising engineers and the working staff resided on Rosevear, an otherwise uninhabited island or rock, of small area. Here they were within a couple of miles of the Bishop, could clearly see, in ordinary states of the atmosphere, what probability there was of effecting a landing thereon, and quickly reach that site when there proved to be the least chance of working there. But the life on Rosevear was often one of extreme discomfort and misery. Frequently, for considerable periods, the lighthouse builders were shut off by rough weather from all communication with the other islands; and, on more than one occasion when their provisions gave out, were glad to satisfy the cravings of hunger by eating raw limpets. In fine weather, however, they caught plenty of fish, generally in

nets set at night, and at suitable seasons of the year had abundance of wild birds', — chiefly puffins', — eggs; while the vegetables which they grew in the crevices of the rock were noted for their size and excellence. There was, sometimes, a little festivity too. On one memorable occasion invitations were received, by dwellers on the other islands, from the officers and men at Rosevear, to a grand ball. The sheds were all cleared of their contents, brilliantly illuminated, and decorated with bunting, and, at the expected hour, the visitors arrived in innumerable boats. Dancing was kept up until early morning (when the guests rowed back in the moonlight) to the accompaniment of the barrack band, led by James Douglass, who played well on the flute, and could tame the wild birds by getting on to a ledge of rock and performing on that instrument. There was to him, moreover, *this* advantage, that, during the lonely period of his sojourn at Rosevear, he had plenty of opportunities for study; and these he turned to excellent account, devoting most of his spare time to engineering reading and mathematics.

It is well known that the Celtic races are very superstitious ; and, even until a comparatively recent date, there was, according to William Bottrell, that delightful narrator of Cornish myths and legends, a tradition at the Scilly Isles that the sad fate which overtook Sir Cloudesley Shovel was due to the maledictions of one of his sailors. This man,—so goes the story,—was a native of Scilly, and, from his acquaintance with the locality, knew that the course which the ship was steering would inevitably take her on to the rocks ; which view he represented to the Admiral with such persistence that Sir Cloudesley and his officers at last condemned the unfortunate sailor to death for “insubordination and endeavouring to excite a mutiny.” “When,” says Mr. Bottrell, “the poor fellow was tied to the mast, preparatory to his being suspended by his neck from the yard-arm, he begged, as a last favour, that a Psalm might be read before his execution. His request being granted, he selected the 109th, and repeated certain imprecatory portions of it after the reader ; and the last words he uttered were to the effect that

Sir Cloudesley Shovel and those who saw him hanged should never reach the land alive." The death-sentence had scarcely been carried out, when the ship struck on the Gilstone, and, in a few minutes, went down with all her crew, except one seaman, who is supposed to have furnished the particulars of this ghastly tale.

The workmen, — mostly Cornish, — who lived on Rosevear had all the superstition of their race; and scarcely one of them, though he would have faced, bravely enough, any tangible danger, cared to stay alone on the island, for fear of ghosts. On one occasion a blacksmith, who had been obliged to do so, heard strains of beautiful music, and looked for the boats which he at first thought must be bringing his comrades back, but none were visible; whence he knew that the music was not of this world.

But, if there were hardships and miseries to endure on Rosevear, there was danger as well to face on the Bishop. Throughout the early stages of the work, there was no shelter whatever from the heavy seas which, often quite unexpectedly, swept over the rock, the men at such times throwing themselves

down and clinging to one another, for support, with a grip so intense as sometimes to cause flesh wounds. To get *on* to the rock was generally difficult, and, to get *off*, frequently more so, many of the company being often detained there until late at night before they could board the boats, and James Douglass being always the last to leave, as he had been the first to land. "When embarking was dangerous," says a survivor of those who were engaged at the Bishop, "Cap'n Jim would give the men his watch, boots, &c., see all the others in the boats, cast off the ropes, and swim through the surf." Then, after the building operations were commenced, there was a particular gully in which a party of masons,—led, of course, by a Douglass,—had to set the lowest stones of the work; when someone placed above them on watch would shout out that there was a big sea coming; and, suddenly, would burst upon them a tremendous wave by which they were immersed to a depth of a dozen feet, they clinging, meanwhile, to iron stanchions fixed in the rock, and emerging at last breathless, and sometimes utterly exhausted, with the prospect of a

similar experience shortly afterwards. Often, too, one or more of the working staff,—not all of whom could swim,—would be washed out into the boiling surf, at which times James Douglass was sure to be among the first to rush to the rescue; and the life of *one* drowning man, in particular, was saved at the risk of his own. Nor was he only capable of heroic deeds in moments of excitement, but could display a fine chivalry in times of comparative calm, as the following incident proves. He was engaged for a while, during the intervals of working at the Bishop, in erecting a beacon on the Woolpack rock, Scilly; and, one very rough day, when he was at the latter site with only one workman, there was some mistake about the arrangements for conveying them on shore. No means were available for the purpose, and it appeared probable that the two would have to remain, in a standing position, until the next tide. In this dilemma a small boat passed, and offered to try and take off “the master”,—not the man, for whom she could not find room; but the former refused to go, without his assistant (who would not, however, have been in any

danger had he been left) feeling that, to do so, would be a breach of good-comradeship.

On the rock, when not occupied in directing others, he would turn his hand to anything. The late Captain John Fulford Owen, an Elder Brother of the Trinity House, once said, speaking from his own personal knowledge : " Mr. Douglass was not only an engineer, but he was a blacksmith, a carpenter, and a mason in his own person, as well as a seaman."

CHAPTER III.

THE granite blocks for the Bishop tower were supplied in a rough or scappled state from Carnsew and Lamorna quarries, Cornwall. They were dressed in a workyard at St. Mary's, and conveyed to the rock, during the early stages of the erecting operations, by the "Billow" sailing tender, and afterwards in barges towed by a steam tug (the "Bishop") which was named after the station.

At the end of 1852,—forty-four stones having then been laid in the lower courses,—James Douglass temporarily severed his connection with the Trinity House. He had been engaged for more than five years in lighthouse-building, and was desirous of obtaining some fresh engineering experience, which he now saw he could do, without detriment to the work that had so benefited by his assistance in the past ; for his brother William, having served an apprenticeship with the well-known engineering firm of Messrs. R. Stephenson & Co., of Newcastle-on-Tyne, had since been helping informally

at the Bishop, and was already showing unmistakable promise of that high capacity which has long placed him in the foremost rank of the world's lighthouse engineers. Besides, James felt that the time had come when, in justice to himself, he ought to be improving his temporal affairs; for then, as in after life, he held it to be the duty of a young man to endeavour, by all honest means, to make his way in the world,—to secure at least a modest competence,—and this even for his *own* sake, though others might not be dependent on him; being wise enough to know that position, like knowledge, is power, and that subversive of all proper self-respect are the shifts of the culpably needy. But, while he was thus eminently practical, justly scorning the Micawber-like attitude of “waiting for something to turn up,” his duty to himself in this connection was always subordinated to higher considerations. Some words which he wrote, not long before his death, to his youngest son, Alfred, correctly describe the principles by which his own conduct had ever been actuated: “Do your best as before, and

let no one be able to say that better could be done"; and again: "Do not be in any hurry to make *money* for money's sake, but strive to make yourself useful in this world as your duty lies." And yet he could not help seeing, as no shrewd observer can, that a man's *usefulness* is often crippled by his poverty, and that, even in regard to mere mundane affairs, there are just limits to self-abnegation. Hence, though he never read much poetry, and seldom quoted it, there was one verse, from the "Epistle to a young friend" by the bard of Scotia, that he liked to repeat for the benefit of those about to engage in the battle of life :

"To catch dame Fortune's golden smile,
Assiduous wait upon her;
And gather gear by every wile
That's justified by honour;
Not for to hide it in a hedge,
Nor for a train attendant,
But for the glorious privilege
Of being independent."

Having, however, in his own case, attained that happy end, he was always ready to use, for the benefit of others less fortunate, the

means which his self-denying industry had secured.

Accordingly, to the regret of the entire working staff, who signified their admiration and regard for their young leader by a graceful presentation, he applied for, and was successful in obtaining, the post of manager of Messrs. R. J. & R. Laycock's railway carriage works at Stella, about five miles from Newcastle-on-Tyne, and, on the 24th of December, left Scilly for London, to take leave of Mr. Walker and assume his new duties, being succeeded at the Bishop by his brother William, who, season after season, co-operated with his father in pressing towards completion the new tower until, in September 1858, that "magnificent" building,—to quote a phrase which was applied to it by the Royal Commissioners who were then prosecuting their laborious enquiry on lights, buoys, and beacons,—was illuminated with a powerful dioptric apparatus.

The Corporation of Trinity House took the earliest opportunity of recording the high sense they entertained "of the good

services rendered by every person engaged in this difficult operation," and of expressing their warmest appreciation of the labours of Mr. Nicholas Douglass (whom they presented with a handsome sum of money) "to whose intrepid courage and energy, combined with the coolest judgment and forethought, may be ascribed the successful termination of a work carried on during a period of eight years under circumstances at all times dangerous, and frequently of great peril, without loss of life, or the occurrence of any accident of a serious nature." The cost of this enterprise was £34,560, and that of the iron structure which was destroyed, £12,500.

There was some difficulty, when the tower was nearly ready for lighting, in finding keepers to inhabit it; but the dilemma was met by two of the best of the workmen who had been employed in erecting the building volunteering, and being accepted, for the duty. The fact is, the spot was known to be, on the whole, perhaps the roughest of any lighthouse station in the world, and then there was

the memory of the disastrous fate of the first structure to scare even the ordinarily brave; or else such an incident is quite exceptional in official experience, light keepers readily going anywhere under orders. All honour to them! They are a worthy body of men, the value of whose services to the general weal is not sufficiently understood by the public.

The reader has possibly had the curiosity to visit, during a holiday at the seaside, some shore lighthouse, such as Dovercourt, or North Foreland, or Bull Point. Looking over the nicely kept establishment, and seeing the pleasant dwellings (with their trim gardens) in which the keepers and their families reside, he has perhaps thought, if he hasn't said: "A very comfortable life such men must lead. I wouldn't mind being a light keeper myself." O yes! we are all so quick to see the advantages of other people's lot, and the disadvantages of our own. But don't you know, reader,—and if you don't it is time you should,—that there is not one of these keepers who, before he became eligible for his present comparatively agreeable post on shore,

has not had to serve for a long term of years at a rock station, and, unless he has done so more than once, may not have to endure a similar experience again? And the life of a keeper at a rock station, such as the Eddystone, the Wolf, the Smalls, or the Bishop, is, indeed, very far from an enviable one. Separated from his family and friends, and from all human society, save that of his two colleagues, he is deprived of the pleasures of communication with, or intelligence of, the great outer world, except when the long-wished-for monthly relief comes round, which, at least, brings him letters and news from home, though his turn to go on shore for a short time may not have arrived. But, during the winter months, his lot is rendered increasingly irksome by his being prevented, often for days and weeks together, from quitting his dwelling, and venturing down to the rock on which his house stands. Confined within the straitened dimensions of his prison, which trembles with each shock of the monster waves that dash themselves against its massive walls and break in foam over its lantern,—the wild sky above,

the wilder waste of waters around,—the man has need to be upborne by, at least, the *occasional* thought of the benevolent mission in which he is engaged,—viz: that of guiding to her destined haven the ship

“That bears the sailor to his wife,
And travelled men from foreign lands,
And letters unto trembling hands;”

he has need to be upborne by, at least, this *occasional* thought,—in order not to sink into the lowest depths of gloom and despair.

In June 1854 James returned to Scilly, and married Mary, the second daughter of Captain James Tregarthen, shipowner, of St. Mary's, and brother of the Trinity House agent already mentioned. The wedding took place on the 6th of July, amid general rejoicings; for the bride, both attractive and accomplished, was a member of one of the most highly respected local families, and the bridegroom immensely popular. As this biography will deal only slightly with the home life of its subject, it may here be stated that, making allowance for those bereavements and sorrows which, alas! are the common lot of mortals, this union proved to

be one of singular felicity ; so that, when Mr. Douglass' eldest daughter was about to be married, he felt he could not express a better wish for her than that her wedded life might prove as happy as that of her parents had been.

Mr. Douglass and his young wife remained at Stella only until the spring of 1855, when he re-entered the service of his old employers. The comparatively routine work of his recent post was, doubtless, uncongenial to a man of his temperament and training, though, however distasteful the duty which he had to perform at any time, he could always be relied on to do it thoroughly and well ; so much so, that of him, as of the great Lord Brougham, it was true that, had he been a shoeblack, he would have sought to become the best shoeblack in England. Thus, he ever showed his fitness for more responsible duties, not by despising and shirking the work that was prosaic, or even mean, but by so performing the commonest task as to raise it to the dignity of a fine art. Truly has it been said : "A man that will not do well in his present place, because he longs to be higher, is fit neither to be where he is, nor yet above

it ; he is already too high, and should be put lower." As a matter of fact, Mr. Douglass' working hours on the Tyne,—such was the zeal that he displayed,—averaged from five in the morning until eight at night ; and he won golden opinions from all around him. But, besides the *general* attraction of his former life of high and hardy endeavour, there was, just then, a particular bait to lure him back to the work he loved so well ; for the project of erecting a new granite lighthouse upon the Smalls rocks was, at that time, under contemplation by the Trinity House, and who more fitted than he to be entrusted with the carrying out of that important enterprise ? Meanwhile, he took charge of the construction of the screw pile lighthouse on the Gunfleet sands, erected a beacon on the Runnelstone rock, and then was ready for his new post.

With reference, however, to the remark that has been made as to his work, while on the Tyne, being of a routine nature, it may here be said,—though at the risk of digression,—before that part of his life is finally lost sight of, that there was, at least, *one* element of adventure in it. Mr. Douglass,

every Friday evening, had to fetch from the counting house (two miles off) the money for the weekly wages. His walk lay across a desolate hill where a murder had recently been committed, and in that mining district rough people abounded. He always, at such times, carried a revolver; but, on the dark nights of winter, the poor wife's anxiety, until his return, was naturally great. When he was at Solva, engaged in erecting the new Smalls lighthouse, he never failed, also, to arm himself with a similar weapon on his journeys by trap to Haverfordwest,—a distance of about twelve miles along lonely roads,—to draw money from the bank. But, though he deemed it best, as a prudent man, thus to guard himself against attack, he really never knew what fear was. Once, for example, on the Smalls rock a big bully of a workman, who fancied he had a grievance, squared up to him in a threatening manner, but soon had cause to regret his temerity,—quickly finding his opponent more than his match in the game of fisticuffs.

CHAPTER IV.

IN the summer of 1856, Mr. Douglass received his first really important appointment under the Trinity House, viz: that of resident engineer at the erection of the new Smalls lighthouse, and, on the 16th of August, accompanied by the first contingent of his working party, consisting mainly of Cornish miners, smiths and seamen, arrived, in the "Buoy Yacht" sailing tender from Cowes, at the little village of Solva (near the ancient city of St. David's, Pembrokeshire) where the workyard was to be established.

The dangerous group of rocks called the Smalls is situated about eighteen and a half miles off Milford Haven, and on it had existed, since 1776, what has been aptly styled a "strange wooden-legged Malay-looking barracoon of a lighthouse". This structure was originally intended to be erected on cast iron pillars, but these were soon abandoned for eight of English oak, the latter material being, in such a position, more elastic and trustworthy than metal, safely yielding, as

it did, to the shock of the waves. The vibrations of the building, however, were somewhat alarming in rough weather, being sufficient to cause a bucketful of water, placed in the living-room, to spill half its contents, and to affect with sea-sickness a light-keeper unused to the motion. The approach to the habitable part of the structure was by means of a rope ladder, which, as the visitor ascended, swayed in the wind to a perilous extent. Arrived at the top, he pushed open a trap-door, and, entering, found himself in the only living-room which the house contained,—an apartment so low that the principal light-keeper (a tall man) was unable to stand upright in it.

This quaint and curious building was originally projected by Mr. John Phillips, a merchant and shipowner of Liverpool, as "a great holy good to serve and save humanity." It was designed and erected by Mr. Henry Whiteside, who, though a born engineer, had previously chiefly distinguished himself in the construction of violins, spinets and upright harpsichords. "His undertaking",—to quote from an interesting little pamphlet, published in

1858 by Ivor Emlyn, a gentleman who was connected by marriage with the family of this enterprising lighthouse builder,—“was a sudden transition from the sweet and harmonious sounds of his own musical instruments to the rough surging of the Atlantic wave, and the discordant howling of a maddened hurricane; and from the fastening of a delicately formed fiddle to the fixing of giant oaken-pillars in a rock as hard as adamant.” And Mr. Whiteside’s very first visit to the Smalls, with his workmen, must have forcibly impressed this contrast on his mind; for, says Mr. Emlyn: “they had only time, after landing, to fix some three or four feet of one of their long iron bars into the rock, before a sharp breeze from the southward gave rise to an ugly sea, completely covering the rock at intervals, and compelling their vessel to forsake her cruising ground, leaving the hapless occupants of the rock to save themselves from being washed off, by clinging, *en masse*, to the half-secured iron rod. During the night, several of them were nearly carried away by the force of the sea, and were found on the third day,—by the crew of the vessel who

had been able to land,—in a very exhausted state.” The gallant engineer and his trusty operatives were, however, not to be daunted by the difficulties and dangers of their arduous task; but, in spite of all obstacles, persevered with their great undertaking until, at the end of the third season, the lighthouse was successfully completed. And, that the structure was well and substantially built, is shown by the fact that it safely stood during the long term of eighty-five years, when it was demolished on the completion of the present granite tower. Mr. Whiteside’s building was erected in the days of private ownership in lighthouses, on which subject a few words may here be not irrelevant.

The first light under the management of the Trinity House was established in 1680; all lighthouses in this country previous to that time, and many that have been built since, having been put up by private persons, who, under patents obtained from the sovereign, levied dues on passing ships, and frequently derived considerable fortunes therefrom. “A speculative man,” says an eminent modern writer, “would propose to erect a lighthouse, just as he might propose

to sink a coal mine. If there was a dangerous rock at sea, in front of a seaport, any man might propose to the Trinity House to erect a building there, for the purpose of guiding ships, in which case he was allowed to levy dues on the ships that passed. Or, if he had political influence, he might use it for the purpose of obtaining a lighthouse." It is only, indeed, since 1836 that private ownership in lighthouses has been abolished by Act of Parliament; and some idea of the wealth which must have accrued from such property may be gathered from the fact that, for the proprietorship of the antiquated and rickety old building on the Smalls rocks, no less a sum than £170,468 had to be paid by the Corporation of Trinity House.

It was at this lighthouse,—by the way,—that, in 1802, occurred the tragic incident, so well known, of one of only two light keepers then stationed there being taken ill, and in a few weeks dying, and the survivor, Thomas Howell, being, for the long period of three additional weeks,—during which time the weather was too rough to admit of a landing, as, indeed, it had been for three months previously,—left alone with the

corpse, which he feared to bury in the sea, lest, as a narrator of this story has picturesquely remarked, "those on shore should question him, as Cain was questioned for his brother, and he, failing to produce him, should be branded with Cain's curse and meet a speedier fate." Howell gallantly kept the light burning every night, throughout the terrible six or seven weeks that elapsed from his comrade's first illness until relief arrived; but, when he came on shore with his dead colleague, his "attenuated form," says Mr. Emlyn in relating this sad tale, "demonstrated the sufferings, both mental and physical, he had undergone; his friends, in some instances, failed to recognise him on his return home. Four months in such a place, and under such circumstances, what would it not effect?"

The new tower, which was designed by Mr. Walker, to supersede this singular old building was of granite, which came, in a rough state, from the De Lank quarries, near Bodmin, Cornwall, and was dressed in the workyard at Solva. Mr. Douglass effected his first landing on the rock, with his executive staff, on the

2nd of September 1856; the work of cutting and blasting the foundation was completed by, and the first stone of the structure laid on, the 26th of June 1857; at the end of the working season of that year the third course was completed; the seventeenth course at the end of the season of 1858; the forty-eighth course at the end of the season of 1859; and the light was exhibited on the 7th of August 1861, a dioptric apparatus of the first order taking the place of the catoptric one,—consisting of twenty-seven argand burners and twenty-one inch parabolic reflectors,—with which the old lighthouse was illuminated. The work was completed at a cost of £50,125, being about twenty-four per cent. under the amount of the lowest of the tenders that had been obtained from contractors for its execution. This highly successful result was mainly due to the indomitable zeal and energy of the resident engineer, who, instead of delegating his duties to foremen or others, never failed, says one who was employed under him during the greater part of the five years that the “Smalls” was in course of building, to accompany

the working party to the rock, where, as at the Bishop, he was always the first to land and the last to leave, seeing his men safe in the boats before he himself followed. The erection of this lighthouse was attended with many difficulties and dangers; and the resident engineer, with the whole of the rock party, forty-two in number, once narrowly escaped foundering with their vessel, viz.: on the occasion of the historical gale, which commenced on the 25th of October 1859, when the "Royal Charter" went down, off the coast of Anglesea, with four hundred and fifty-nine lives.

As it *was*, there were two accidents that proved fatal. In May 1860 a stone-mason (who, with others, was then living in the granite tower completing the interior) while crossing from the old to the new lighthouse, was struck by a sea that rebounded from the latter building, and carried him off the rock. Every effort was made to save him with a life-buoy and lines, but without success, the sea being very rough at the time. "Awful sight!" wrote in his diary Mr. Rees, the then principal keeper at the Smalls. And, in the following

September, the thread of a bolt "stripped," and let the iron jib of the landing crane down upon a Cornish miner named Thomas Oats, injuring the poor fellow's spine to such an extent that he died, after terrible suffering, at the end of about five weeks. "A more steady, persevering and trustworthy man," wrote Mr. Douglass in reporting this latter occurrence, "I never had in my employ." Oats was, indeed, a favourite with every one, and his sad fate cast quite a gloom over the work.

CHAPTER V.

THE following is an outline of the process pursued in the erection of the new Smalls lighthouse. During the spring and summer months, when alone the rock operations could, as a rule, be safely carried on, the executive engineer and his working party, composed of forty or fifty artificers, seamen, and labourers, resided on board their sailing barrack, which was moored at a short distance from the rock; and from her they rowed to the latter in boats as early every morning as the state of the sea, or of the tide, permitted of their landing,—often at daybreak,—returning to the vessel when the rock no longer afforded the men a safe footing, or when approaching night rendered further work until the morrow impracticable. In the meantime, a steam tug of sixty nominal horse power, which was specially built for this purpose, plied between the workyard and the Smalls, a distance of twenty-two miles, towing one or two forty ton barges containing the materials of the

tower, and returning for other cargoes as often as the previous ones had been discharged. When the weather became tempestuous, and the executive engineer saw little chance of resuming the building operations for several days, the vessels, with all hands on board, returned to Solva, where the men proceeded with the preparation of further work for the rock, until an improvement in the weather rendered possible the resumption of their labours at sea. That those labours were exhausting, will appear from the fact that the men worked on the Smalls, during one week, an average net time of sixteen and a half hours per day, and frequently worked seventeen and eighteen hours on single days. And that they were dangerous, will be evident when it is stated that each man was compelled to wear a life-belt at his post; that eye-bolts, with ropes attached, had to be fixed in the rock as holdfasts for the executive party, in the not improbable event of the sea suddenly rushing upon them; and that the surf often rose so rapidly around the rock that the landing boats could not approach sufficiently near to take

off the men, who then had to jump into the seething water, with a rope fastened to their waist, and be hauled to the far-distant boats by the seamen who formed the crews. In all these scenes of hardship and of peril the resident engineer, as need scarcely be said, was the tried and trusted leader. When, in the erection of the third Eddystone lighthouse, there was a duty to perform of an exceptionally hazardous nature, Smeaton always placed himself in the most dangerous position, which he called "the post of honour;" and all successful rock lighthouse builders since his day (the Douglasses of the English, the Stevensons of the Scotch, Lighthouse Service) have worthily imitated their great predecessor in this respect. And to the fact that these brave men have, in the execution of their dangerous duties, counted not their lives dear unto them, the lives of multitudes of their fellow-men, both now and in far distant ages, owe, or will yet owe, their preservation.

And here, perhaps, may be fittingly inserted some interesting reminiscences, which have been specially written for this memoir, by Mr. Frederick Spurr, late a

principal light keeper in the Trinity House service, but who, in 1859, during the building of the new tower on the Smalls rocks, became assistant keeper in the old lighthouse thereat, where he remained for several years. Mr. Spurr, — a man of education and veracity, highly intelligent and observing, who had exceptional opportunities of witnessing the conduct, and studying the character, of the resident engineer during the progress of the new structure, — is peculiarly qualified to convey an accurate idea of the subject of this biography at that time. And the following is the graphic account which he has prepared.

“I was in May 1859 glad to accept the situation of light keeper at the old “Smalls,” and have a perfect memory of my first introduction to Sir J. N. Douglass. I soon recognised him to be the right man in the right place, a leader of men, not one to say “you do this” or “that” and not able to do the thing himself. Venturesome almost to rashness, yet never foolhardy; a man who then, and ever after, gave proof of his belief in the doctrine, often preached but seldom practised, ‘the dignity and ennobling

power of work.' No task that could advance the work he had in hand did he deem beneath his notice or lowering to his personal dignity. By boldly taking this path, he struck a death-blow at the preposterous idea of many of his workmen, who thought their caste in danger if they did any but the one task they were pleased to call their own peculiar trade. Sir James, *by example*, soon convinced his men that the fact of a man being a good stonemason did not render him unfit to lend a helping hand to a smith or carpenter ; there was a task to be done, and he and they were the men who had to do it ; so his mechanics, good as they were in their own selected branches of work, soon, under his leading, learned to be a help to the sailors of the tug and tender employed on the work, and as boatmen they were one and all hard to match and harder to beat. In all these things he, the master-spirit, was better than the best man there. I very soon noticed one striking trait in his character, his power of mentally absorbing and applying ideas that did not originate in his own mind, but were brought under his notice, sometimes by design, at others in conversation.

"I hardly know which of his most marked qualities of character, his tenacity of purpose, or his personal courage, I most admired. I have often seen him achieve seeming impossibilities by dint of what, in others, I should have called mere obstinacy. His personal courage was indisputable. I have frequently seen him deliberately act as none but a coolly brave man does. I remember a fearful storm, one of the worst I ever encountered, springing up so suddenly that it was impossible for all the workmen to return from the house rock to the "Buoy Yacht," a floating barrack moored about half a mile from the old "Smalls." The men had to put up with such poor quarters as the lighthouse could afford them. During the night the "Buoy Yacht" had to let go her moorings, and, the weather being so tempestuous, the nearest harbour that could be safely made was in the Bristol Channel, from whence she was sailed to her station at Solva as soon as the weather would permit. At the earliest possible opportunity Sir J. N. Douglass and a volunteer crew came off to the rescue of the imprisoned workmen. The sea, at low

water, was making a clean sweep over the greater part of the rocks, so that it was impossible to land at any of the recognised landing places, or even to approach the house rock, the one on which the imprisoned men were, but, by dint of watching for the least unfavourable chance, a boat manned by Sir J. N. Douglass and a volunteer crew, mostly masons, made a bold dash, and after being nearly swamped or upset many times, at last got so near to one of the outlying rocks that Sir James and one other brave man, at the risk of their lives, managed to make a landing, the seas dashing over them, now hiding them in clouds of spray, anon all but sweeping them off their feet. *It was* a fight for life, not only their own, but for those whom they came to relieve. At last a rope was passed from the outlying to the house rock, and these two heroes forced their dangerous way, now swimming, now clinging to the weed-covered rocks, till they joined hands with those who anxiously waited their assistance in gaining the boat and steam tug, thereby escaping the confined space and short allowance of food, which they had to bear as

best they could, while they were most unwilling guests of most unwilling hosts on the old Smalls lighthouse. Since then it has been my fate to see many bold deeds done, but never one to eclipse for courage and endurance that which I now record, after the lapse of more than forty years. Nearly all of those who, with myself, witnessed or assisted in this adventure have passed away, as he has who so nobly led it. I do not think this brave deed of our lion-hearted friend was ever made public. I am sure he himself would have been the last to claim any merit for the action. He would have said he was only doing his duty by the men he led, and who so entirely trusted his leadership. Can we wonder at such a man being so trusted?"

As Mr. Douglass shared to the full the excessive labours of his staff when at sea, so, when on shore, he worked precisely the same hours as they, and often several beyond. By six o'clock in the mornings of summer, and seven in those of winter, he was always in the yard, which meant getting up at least half an hour before those times; and, though the labours of the others closed at six in the

evening, he was generally engaged in his office on drawings, calculations, accounts, or correspondence until eight or nine at night, and sometimes later. He could certainly have said, from his inmost heart, with Mrs. Browning, either then, or at any other period before his health broke down :

"Get leave to work
In this world,—'tis the best you get at all ;
For God, in cursing, gives us better gifts
Than men in benediction."

Even when he had settled in London, he was a very early riser, having usually got through a couple of hours' writing at home before commencing his duties at the Trinity House, where, nevertheless, he was invariably one of the first to arrive. He had, however, the happy gift of being able to sleep with the same thoroughness that he worked. His slumber was no mere listless half-hearted apology for the genuine thing, but good, sound, honest sleep, that really *did* knit up "the ravelled sleeve of care," and from even a short spell of which he would awake like a giant refreshed.

CHAPTER VI.

THE Smalls lighthouse is solid for forty-five and a half feet above the base, with the exception of the space for the entrance, and its total height to the top of the gallery course is one hundred and fourteen feet. The building has six rooms, the walls being five feet in thickness at the bottom, tapering to two feet at the top. It contains seventy-three courses in all.

Mention has been made of "dioptric" and "catoptric" lights; and, for the benefit of the unprofessional reader, a brief account of the development of coast illumination may here be not inappropriate.

The idea of a lighthouse is, of course, old. The Colossus of Rhodes, erected about three hundred years B.C., is supposed to have been used as a beacon for guiding the mariner; and in Josephus there is a reference to the fires that were shown in the famous Pharos of Alexandria, completed two hundred and eighty-five years B.C. The first lighthouse in this country appears to

have been the one,—built before A.D. 53,—which may still be seen, adjoining the ancient church at Dover Castle. It is only, however, within the last century that the illumination of lighthouses has assumed anything like scientific proportions. The lights previously shown from them were usually wood, pitch or coal fires; and it was but in 1822 that the last coal beacon fire, viz.: that at St. Bees lighthouse on the coast of Cumberland, was extinguished. Even Smeaton's noble tower on the Eddystone,—which may be looked upon as the model of all subsequent rock lighthouses,—was, when completed in 1759, merely illuminated by twenty-four wax candles, which required snuffing, and were devoid of any optical appliance for concentrating their rays upon the sea, and thus preventing waste of light. The earliest known reflector used in lighthouses was invented, in 1763, by one William Hutchinson, a master mariner of Liverpool. The surface of this reflector was nearly parabolic in form, and was covered with small facets of glass. The reflector was furnished with a rude oil lamp, having a flat wick about one and an eighth

inch wide, and is estimated to have augmented the initial intensity of the flame about thirty-six times. But, seventeen years later, a more important step in lighthouse illumination was the invention of the cylindrical wick lamp of Argand, after whom it was named; and this lamp, in combination with silvered parabolic reflectors, was soon afterwards adopted in several of our lighthouses. The system thus established is still in force, under the name of the catoptric or reflecting system. It consists in a number of Argand lamps, fitted within twenty-one inch diameter silvered parabolic reflectors, arranged close to each other around a column in the centre of the lantern. The twenty - four large wax candles employed, as before mentioned, in Smeaton's tower gave a light equivalent to about sixty-seven standard sperm candles, or units, of the present day. The value of the catoptric system will appear from the fact that when, in 1810, it was applied to the Eddystone lighthouse, the intensity of the light was increased to eleven hundred and twenty-five of these candles or units. But the grandest step of all in

lighthouse illumination was the invention, in 1819, of the dioptric or refracting system of Fresnel, also, like Argand, a Frenchman. This system consists of a lamp, having from one to six or more concentric wicks, placed in the centre of an elaborate and beautiful series of glass lenses, so formed as to refract the rays issuing from the lamp, and concentrate them, with vastly augmented intensity, upon the sea. The importance of Fresnel's invention will be apparent when it is stated that, on its application, in 1845, to the Eddystone lighthouse, the light thereat was increased from eleven hundred and twenty-five to three thousand two hundred and sixteen standard candles, which power was augmented in 1872, by the introduction of a larger lamp, to about seven thousand three hundred and twenty-five candles.

Owing to the limited dimensions of Smeaton's building, it was never practicable to instal in its lantern the most efficient specimen of a dioptric apparatus. The tower by which that famous lighthouse was, in 1882, superseded, in consequence of the rock upon which it was founded being

undermined by the sea, has, however, been fitted with one of the most powerful optical apparatus ever constructed. It is, in fact, a *double* apparatus, consisting of two tiers of lenticular panels,—twelve in each tier,—in the centre of each of which is placed a six-wick Douglass lamp of eight hundred candles intensity. The two lamps,—fixed one above the other,—are intended to be used *together* only when the atmosphere is thick, one lamp being sufficient for the purposes of the mariner in ordinary weather. The maximum intensity available, with both lamps alight, is sixteen hundred candles for the unaided flames, and the enormous power of seventy-nine thousand two hundred and fifty candles when magnified and transmitted to the sea by this two-fold optical appliance, being one thousand one hundred and eighty-three times the intensity of Smeaton's original candles.

The manufacture of dioptric apparatus for lighthouses, it should here be stated, is a highly difficult and delicate process; and, while there are several French firms, there is only one English firm, capable of

such work, viz.: that of Messrs. Chance Brothers and Co., of Spon Lane, near Birmingham. It was about the year 1850 that Mr., now Sir, James T. Chance, who, besides being a graduate of Cambridge, was seventh wrangler, induced the great glass-making firm of which he was a member to embark in this scientific branch of industry. For many years the work, owing to its novelty and other causes, was unremunerative, and was engaged in by Mr. James Chance very much as a labour of love; but it has long proved in every way a thoroughly successful enterprise, a result largely due to the high business capacity and varied talents of Mr. James Kenward, F.S.A., who was for so lengthy a term responsible for the management of the lighthouse department of his firm, and now represents the latter in London. The recent scientific adviser to Messrs. Chance was Dr. John Hopkinson F.R.S.,—senior wrangler in 1871 and first Smith's prizeman,—the distinguished electrical expert, whose tragic and widely regretted death, in August 1898, while Alpine-climbing, would have deeply distressed the subject of this memoir, had the latter then been alive. For the

elder engineer, a close personal friend, had watched, with the utmost pride and pleasure, the development of the younger one's remarkable gifts,—gifts which made him, in the words of Sir John Wolfe Barry, when presiding, soon after Dr. Hopkinson's death, over the mechanical section of the British Association, at Bristol, an "ornament to the world of science, whether it be European or American," and "one of the brightest ornaments of the century." During his long connection with Messrs. Chance, Dr. Hopkinson introduced many improvements in optical apparatus for lighthouses, and was the originator of the group-flash system, which has proved so efficient a means of differentiating the various lights.

Mr. Douglass was very popular with those who served under him at the Smalls, as a man of his dash and daring would be likely to be. One of them, Sam Dimond by name, a stone-mason and rhymester, had truthfully written, in a ballad which he composed, descriptive of the life and adventures of the rock party :

"Our master cheers our spirits up ; he is a gallant man ;
The first wherever danger is, he always leads the van."

But the "master" was kind as well as brave; and, though a strict disciplinarian, as one in his position had to be, took a lively interest in the welfare of his workpeople. Thus, he established at Solva, for their use, an excellent reading room, which not only proved highly attractive, but self-supporting; encouraged thrift among them by starting a savings bank, of which he was treasurer,—paying interest on deposits at the rate of five per cent.; and, in the absence of a local English place of worship, assembled the working staff and their families twice on Sundays, in the reading room above mentioned, and read the church service for the day, as well as a short homily from Burder's "Village Sermons."

Mention has been made of the principal keeper at the old Smalls lighthouse, where, by the way, he remained during the long term of twenty years. He was a Mr. Henry Rees, a most respectable, worthy man, the following story of whom may interest the student of the occult. It is given in the words of Miss Alice Douglass, who has rendered valuable assistance in the preparation of this biography of her father. "One

of those curious warnings or visions, which there is so much speculation about, came under Mr. Douglass' notice whilst at Solva; and, as he was naturally incredulous of such things, but was obliged to acknowledge *this*, it is worth mentioning. One day, on visiting the rock, he noticed that Rees, the head keeper, was in a most unusual state of depression; and asked the cause. The man told him he could not shake off a dream he had the previous night. He saw, with great vividness, a ship go down in a storm, and, in spite of his efforts, he could only save three men. Mr. Douglass laughed at the man's fears and thought no more of the conversation. He left the rock that night as usual, but, before morning, such a gale was blowing and continued that it was a week before the steamer could again visit the rock. On landing, to Mr. Douglass' great surprise, it was found that Rees' dream had been fulfilled in every detail. A Norwegian sailing ship had foundered on the spot where he had seen it, and he had saved three men, who were then in the lighthouse, and the additional mouths had caused provisions to run short."

Another reminiscence of the keepers at the old Smalls lighthouse may not be unacceptable to the reader. The senior assistant to Mr. Rees, during the building of the new tower, was "Tom" Bowen, as he was familiarly called,—a man not without his weaknesses, but a great favourite with Mr. Douglass, as indeed with all the workmen, for, beneath a surly manner, he hid the kindest of hearts, and was everybody's friend. Among many curious things that Tom knew was every nook and cranny in the rocks where the crabs were to be found, and would put his arm into the holes, often right up to the shoulder, and haul out, with wonderful dexterity,—generally to make a present to somebody else,—one fine specimen after another of those shell-fish. He seldom met with a mishap while engaged in this dangerous sport, but *once*, at any rate, he did, as the following extract from a rough diary which was kept by the principal keeper,—a strict Sabbatarian,—quaintly records. "Sunday, 26th August. T. B. after crabs; one bit him by the hand to pay him for Sunday."

Before the completion of the work at the

Smalls, viz: in February 1861, Mr. Douglass had the honour of being elected a member of the Institution of Civil Engineers. Nor were his employers, the Corporation of Trinity House, slow to recognise his merits; for, about the same time, they secured his services in advance for the execution of an undertaking of even greater difficulty than the one he was then finishing, viz: the erection of a lighthouse on the Wolf rock, off the Land's End; and, when the "Smalls" was actually completed, testified to the "expedition and economy" with which that work had been carried out, and to the "zealous perseverance and upright conduct" of its resident engineer, whom they presented with a cheque for a large sum of money, as a tangible token of their approval.

After the erection of the beautiful new granite tower, Mr. Douglass received orders from the Trinity House to paint it externally in red and white horizontal bands, a course which seemed to those who knew little about the matter to be a species of vandalism. But, in lighthouse engineering, above all professions, beauty has to yield to utility. A lighthouse is not only "a pillar of fire by

night," but of "cloud by day", and it is the dark or variegated cloud that, at the latter time, soonest attracts notice. The Royal Commissioners on lights, buoys, and beacons, whose report was issued in 1861, made, under the direction of their scientific member Dr. J. H. Gladstone F.R.S., who still survives in hale and honoured old age, a series of careful observations, with the view of determining the best colour for lighthouses, and condemned the grey of granite as a most unsuitable tint. They state: "It is within the knowledge of persons who have shot wild fowl on the water by day and night, that dark-coloured birds are most easily seen, and that young swans, which are of a grey colour, are the most difficult to distinguish of all wild fowl. It is also well known that smugglers, and coastguard men, and duck shooters, who wish to conceal themselves on the water, paint their boats, and often dress themselves, in white or grey."

In October 1861, Mr. Douglass, accompanied by his working staff, together with the vessels and plant, left Solva for Penzance, to assume his new duties, his departure being the occasion of many

manifestations of regret by the inhabitants of the former place. The presence, for so long a period, of the busy hive of lighthouse builders in that old-world Welsh-speaking village,—a pretty spot, with its long winding creek or natural harbour,—had been an excellent thing for the little port, reviving, in a wonderful manner, its almost stagnant trade. Its dwellers, however, thoroughly deserved such grist as thus came to their mill, for they were a quiet, kind and courteous people. Nor was their regret at the loss of their English friends due to interested motives merely. There had sprung up many attachments between the settlers and the villagers; while towards Mr. Douglass, in particular, there was but one feeling entertained by the residents, viz.: that of deep respect for his sterling character, and intense admiration for his marvellous courage and resource. And the stranger who, even at this remote distance of time, should chance to visit that neglected place,—a veritable “deserted village,”—and engage its oldest inhabitants in a conversation about the lighthouse builders who, nearly half a

century ago, sojourned for too brief a period in their midst, would promptly receive abundant confirmation of the truth of the foregoing statements.

The Wolf,—or, as it was formerly called, the “Gulf,”—rock, situated between the Land’s End and the Scilly Isles, in deep water and exposed to the full force of the Atlantic, had long been a terror to mariners. There had stood on the rock, since 1840, a beacon which was erected under the supervision of Mr. John Thorburn, acting for Mr. Walker; and, as an indication of the difficulty of executing work at the site, it may be mentioned that this structure, which was a mere day mark, took five years to build,—only three hundred and two and a half hours, altogether, being worked on the rock during that time,—and cost over £11,000. The Corporation of Trinity House had, however, long felt that such a dangerous spot required lighting, and, in the autumn of 1861, as already mentioned, set about that important undertaking, the design for the proposed tower being, of course, furnished by Mr. Walker.

The workyard,—situated as aforesaid at

Penzance,—was seventeen miles from the Wolf, a distance not so great as Solva from the Smalls; but then the rock itself, in the former case, is exposed to far heavier seas, and is submerged during half the tide in all weathers. The steam tug and barges that had been employed at the Smalls were used at this work, but a more suitable tender than the "Buoy Yacht," viz.: a schooner of one hundred tons register, was specially built and fitted up as a barrack for the executive staff when afloat. On the 17th of March 1862, Mr. Douglass and his working party got upon the rock, and commenced the necessary excavations for the foundations of the building, and on the 29th of September the last landing for the season was effected. Between those dates, only twenty-two landings altogether, representing eighty-three hours of work, were possible, which fact sufficiently shows the onerous nature of the project which Mr. Douglass had commenced, but was destined not to finish; for, soon after the close of the first season's operations, an event occurred which completely altered the course of his life, viz.: the unexpected death, in October 1862, of

Mr. Walker. The firm of which this eminent man was the head, whose offices were in Great George Street, Westminster, had long been carried on under the style of Walker, Burges & Cooper. The decease of Mr. James Cooper, the junior partner, whose great abilities had, for some time, been specially directed to the lighthouse branch of the business, had, however, preceded by a few months that of Mr. Walker, under circumstances of even a more sudden and touching nature. Mr. Cooper, who was unmarried, had attended church as usual, with his sister, one Sunday morning in March, and, having dined early, was sitting with his father in the drawing room, where they both fell into a doze. When a servant came in to say that tea was ready, the father woke, but the son could not be roused,—for he had died in his sleep. Mr. Burges was now, therefore, the only surviving representative of the firm, was in advanced years, wealthy, and disposed rather to rid himself of responsibilities than assume fresh ones. Mr. Douglass was, consequently, selected by the Corporation of Trinity House to be their chief engineer,—his

brother William, who had just completed the erection of a lighthouse on the Hanois rock, off Guernsey, succeeding him at the Wolf.

It was remarkable, and altogether unlooked for,—this conjunction of circumstances to which Mr. Douglass owed his promotion. But why was he enabled to profit by it? Because he had prepared himself, by previous study and every other available means, for any such contingency that might arise. And his case is, after all, quite a typical one. The difference, as a rule, between a “successful” and an “unsuccessful” man is this, that, when there arrives in their “affairs” that lucky “tide” which comes to most persons, the former has, by dint of foresight and effort, already got his boat well and carefully built, ready to embark at the right moment upon the “flood” which leads to “fortune”; whereas the other, who has been dreaming while his rival has been working, has still only a magnificent scheme of the thing in his head, if indeed he has got as far as that. “Chance,” says a French author, “generally favours the prudent.”

CHAPTER VII.

PASSING through Trinity Square, City, after a visit, perhaps, to the Tower or the Mint, the stranger in London observes, situated on the northern eminence of the square, and forming almost one entire side of it, a long, low handsome Classical building in Portland stone. It has a railed-in courtyard in front, is approached through carriage-gates on either side; and altogether wears an aspect of importance which is likely to excite the stranger's curiosity. On making enquiry of a passer-by, he probably learns that the edifice is known as the Trinity House; and, if this name conveys to his mind no definite idea as to the purposes for which the establishment exists, a peep into the spacious hall of the building would, at once, afford him a general notion, at least, on the subject. For, disposed on either hand, he would see models, in glass cases, of lighthouses, light-vessels, buoys and beacons, and would gather that it is with these important matters

that the Trinity House has to do. If, when he has returned to his hotel, he should refer to the official pages of the London Directory, he would find, under the head of "Trinity House," that the Duke of York is the Master of this organisation; that Captain George Rawlinson Vyvyan is the Deputy Master; that the Prince of Wales, the Marquess of Salisbury, Lord Rosebery, Mr. Goschen, and several other eminent men, are enrolled among its "Elder Brethren," and that its official staff is a numerous one. Should the stranger feel still further curiosity on the subject, and desire to be enlightened as to the origin, constitution, history and labours of the Trinity House, he would have to consult a great many authorities, and should especially study the multifarious evidence, published in 1861, by the Royal Commission on lights, buoys, and beacons; but, if he be not terribly in earnest in the matter, he may, perhaps, be satisfied with such information as the following pages contain.

The Honourable Corporation of Trinity House, or, to use the words of its original charter, "The Guild, Fraternity, or Brotherhood of the most glorious and

undivided Trinity," dates its existence back to the reign of Henry VII., though its functions then related only to the pilotage of ships. Subsequently,—in the reign of Henry VIII.,—the association was incorporated by royal charter, which was confirmed and modified by Edward VI., Mary, Elizabeth, and James I. The charter of James I. settled the Corporation as it is now. This charter was, however, dissolved in 1647, but was renewed in the reign of Charles II. It is to this renewal that Samuel Pepys, who was then a Younger Brother, and afterwards Master, of the Trinity House, thus alludes, in his famous diary, under date January 2nd, 1660-61: "This day I left Sir W. Batten and Captain Rider my chine of beef for to serve to-morrow at Trinity House, the Duke of Albemarle being to be there, and all the Brethren, it being a great day for the reading of their new charter, which the King has recently given them."

Pepys, by the way, seems to have enjoyed immensely his connection with the Trinity House, and one frequently meets, in his diary, with most laudatory accounts of the

good fellowship, and the good cheer, to which that connection introduced him. The charter of Charles II. was surrendered to, and renewed by, his successor in 1685.

The Corporation of Trinity House has now the superintendence and management of all lighthouses, light-vessels, buoys, and beacons in England, Wales, the Channel Islands, and Gibraltar, except such as are under local authorities, over whom, however, the Corporation possesses jurisdiction. It also exercises control over the two other great British Lighthouse Boards, viz., the Commissioners of Northern Lights (Scotch) and the Commissioners of Irish Lights. It is further entrusted with the licensing and supervision of pilots; and is required, by the terms of its charter, to assist the judge of the High Court of Admiralty in cases where nautical experience is needed; two of the Elder Brethren attending the Court for each such case. The revenue for maintaining the coast-marking system of the British Isles is derived from the taxation of shipping entering and leaving our ports, the receipts of the Trinity House from this source averaging nearly half a million pounds

sterling per annum. The dues are carried to a fund called the "General Lighthouse Fund," under the management and control of the Board of Trade, to which department the three Lighthouse Authorities are responsible for their expenditure. The charges for light dues are fixed at the minimum rates, consistent with obtaining a sufficient income for the maintenance of the coast-marking system, and are paid by each vessel to the collector of customs at the port of arrival or departure.

In addition to the public functions which the Corporation of Trinity House discharges, it occupies an important position as one of the most ancient and dignified of the old City guilds,—in this respect, of course, owning no allegiance to the Board of Trade. Its private revenue is derived from bequests of individual Elder Brethren, and from other sources of income which the Government would be powerless to control, even were the Corporation to cease to exist as the chief custodians of our lighthouses; and this revenue it largely employs for charitable purposes connected with the mercantile marine.

Its working Board consists of the Deputy Master and twelve other Elder Brethren, composed of retired commanders in the royal navy and merchant service,—the distinguished names previously enumerated being, with the exception of the Deputy Master, those of its non-active members merely,—and the position of a working Elder Brother is one which is much coveted by such commanders, being a post of dignity, honour, and usefulness. One of the best known of the active Elder Brethren at the present date is, perhaps, Admiral Sir Leopold M'Clintock, K.C.B., F.R.S., who, about the time that Mr. Douglass was occupied in setting the lower courses of the Smalls lighthouse, was, as commander of the "Fox" arctic expedition, engaged in those gallant achievements which resulted in the discovery of the fate of Sir John Franklin. The Board meets at least weekly, but committees of it sit almost daily, for the transaction of the special duties with which they are entrusted; and periodical inspections, in the Trinity House steam vessels, are made by the Elder Brethren of all the lights &c. under their control.

Recurring, however, to the subject of the edifice itself, it should be stated that, if the imagined visitor to the Trinity House be fortunate enough to have with him, on the occasion which has been assumed, a letter of introduction to its courteous secretary, Mr. Charles A. Kent, and be allowed to walk through the court room, the library, and other parts of the building, he would find much else to interest him. He would see more models, not only of lighthouses and other structures, but of ships of war, together with ancient books and manuscripts; and oil paintings, by well-known artists, of those who have served as Master of the Corporation, among the most recent of whom (prior to the Duke of York) have been King William IV., the Duke of Wellington, the Prince Consort, Lord Palmerston and the Duke of Edinburgh; as well as portraits, by Sir Godfrey Kneller, Sir Joshua Reynolds, Sir Martin Shee, Sir W. Beechey, G. F. Watts and Frank Holl, — together with marble busts, — of other celebrated people who have, at different times, been connected with this ancient institution.

CHAPTER VIII.

To the building described in the last chapter it was, then, that Mr. Douglass came from Penzance to pass the remainder of his official life; and here, in the early part of 1863, he entered upon his new duties with his characteristic zeal and energy. There was abundant scope for the exercise of those qualities. First, his department had to be organized, for there had never before been an engineer attached to the official staff at the Trinity House; then there was the Wolf lighthouse, of which he had now assumed the supreme control, to occupy his thought and attention; while many other works of minor, but still considerable, importance were designed and, during the next few years, successfully carried out by him, such undertakings as the construction of new lighthouses at Winterton, Portland, Usk, Lowestoftness and St. Bees, besides extensive alterations and improvements to the lighthouses at Europa Point (Gibraltar) Orford, Flatholm, St. Ann's (Milford) and

other stations. A heavy task, moreover, was the establishment of engineering workshops at the Trinity Wharf, Blackwall. Previously most of the repairs to the plant, apparatus and machinery of the English lighthouse service had been executed by private firms; but, in 1869, the Corporation, acting under their engineer's advice, determined, in the interest of efficiency and economy, to put an end to this system, and thenceforth arrange to do such work with their own staff and appliances,—a project which was promptly and successfully initiated. These workshops, which were fortunate in having as their superintendent, for twenty years, a highly ingenious and capable mechanical engineer in the person of Mr. G. H. Slight, are now a very important branch of the Trinity House service. In them the repairs to the machinery and apparatus of lighthouses, light vessels, fog signals, buoys, &c., are effected; and trained mechanics are kept,—about one hundred and fifty men altogether are employed,—for despatching, literally at an hour's notice, to out-stations, in the frequent event of such experts being required for

remedying defects in lamps, burners, fog signal machinery, &c. Oil gas is, also, made at the workshops for maintaining the system of illuminated buoys and automatic lighthouses; and, with the staff and appliances of this establishment, are conducted, from time to time, elaborate and exhaustive experiments, to which, in the past, many important improvements in the various branches of the service have been due.

By the end of 1869 the Wolf lighthouse was rapidly approaching completion. To show the difficult nature of this enterprise, so successfully carried out by Mr. William Douglass, it may be stated,—at such rare intervals, and for so few hours at any one time, could operations be conducted on the rock,—that it was not until the end of three years, from the commencement of the work, that the foundation pit could be got ready and the first stone laid,—the granite, by the way, was Cornish, and dressed in the workyard,—after which the construction of the building occupied another five years. “The insecurity of the foothold,” his brother James once explained, “and the constant

breaking of surf over it, rendered great precaution necessary for the safety of the workmen. Heavy iron stanchions were sunk into the rock around the site for the foundation, and each man worked with a safety-rope lying near him, one end of which was attached to the nearest stanchion. An experienced man was always stationed on the summit, as 'crow,' to look out for the sea, who would give warning of such waves as were likely to sweep the rock, when the men would hold on, head to the sea, while it washed over them; picks, hammers and jumpers, some exceeding 20 lbs. in weight, were frequently found to have been washed away, when the waves had passed and were followed by a lull."

The Wolf light had been arranged to be revolving dioptric of the first order, showing alternate flashes of red and white every half minute; and, as the question of the loss in the red beams by passing through a coloured medium had not previously been determined with sufficient accuracy, Professor Tyndall, who was then scientific adviser to the Trinity House, investigated the subject with all the care and thoroughness which were

by being dragged through the surf with a rope around the waist, had to be resorted to; the men, Mr. Beazeley, and lastly Mr. Douglass, having all to undergo this ordeal, which, with the subsequent exposure in an open boat before the tug could be boarded, at such a season of the year, was certainly not a little trying. However, the affair was laughed off by those concerned in it, especially when they were comfortably settled in the warm engine room of the "Solva" steamer, which latter, amid the cheers of the party on the rock, then started for Penzance. So ends this too brief account of the building of the Wolf rock lighthouse, except that it should be stated that the cost of the entire undertaking was about £63,000, and that the authorities of the Trinity House made their engineer a handsome presentation "as a memorial of his skill and energy in connection with this great work, and as a token of the high regard and esteem" which the Elder Brethren entertained towards him.

CHAPTER IX.

FOR many years before any practical measures were taken in the matter, the necessity for a lighthouse on the Great Basses reef, situated about eighty miles eastward of Point de Galle, was generally recognised by those who were conversant with the dangers of that locality; and, in 1856, operations, initiated by the Board of Trade, who have jurisdiction over the lighthouses of Ceylon, were commenced, with a view to the erection, on the reef, of an iron tower supported by a granite base, the structure being the design of a now deceased engineer of considerable eminence, and,—though not connected permanently with the lighthouse service,—of special experience in the carrying out of such projects. The granite base, iron tower, lantern, and illuminating apparatus were prepared in England, and delivered and stored at Galle, where the shore dépôt in connection with the works was situated; but, after three years, only a few landings had been effected on the rock, and a

beacon-mast, — a mere day mark, — constructed thereon. Up to this time about £40,000 had been expended on the enterprise, and it was estimated that £20,000 per annum for five years would still be required to complete the structure. The works were thereupon suspended by the authorities, who were not unreasonably alarmed at the magnitude of the scheme, and the matter remained in abeyance for some years. But, in 1867, the Board of Trade revived the proposal, and referred the whole question for the consideration and advice of the Corporation of Trinity House, who placed the matter in the efficient hands of their own engineer, after which all difficulties in regard to it disappeared,—so far, at least, as the authorities were concerned. The design prepared by Mr. Douglass was for a granite structure, in which the base of the lighthouse previously proposed was utilized, his scheme further providing for a light-vessel being moored off the rock, for exhibiting a red revolving light every night during the progress of the new work, and also serving as a barrack for the executive engineer and staff. The

idea of the barrack light-vessel was a particularly happy one, as it not only admitted of the workmen being accommodated on board while the tower was under construction, but guarded the dangers of the reef, besides enabling the Government to collect a toll for the light, during the whole period that the structure on the rock was being proceeded with. But, indeed, the entire scheme,—not this feature of it merely,—was conceived in a masterly manner. The Board of Trade having, in due time, approved these proposals, and requested the Trinity House to undertake the work, which the latter body agreed to do, Mr. William Douglass was selected to proceed to Ceylon, as executive engineer, so soon as the necessary preliminary measures in connection with the scheme were completed in this country, by which time, also, it was expected that his work at the Wolf would be practically finished. Two iron twin-screw steam vessels and the light vessel, all specially designed, were put in hand, also the granite blocks for the tower,—which stones were both quarried and dressed at Dalbeattie, Scotland,—and the internal fittings, lantern

and optical apparatus. The two steam vessels, each capable of carrying one hundred and twenty tons of cargo, at a speed of ten knots per hour, were fitted with the requisite appliances for hoisting and stowing the stones on board, hoisting them again to the deck, and from thence to the rock. Mr. William Douglass states that "the arrangement was very successful, and tended considerably to expedite the completion of the work. Although it was necessary, owing to the shallow water, to moor the steamers, when laden, at a distance of thirty fathoms from the rock, stones weighing on an average two and a half tons were hoisted out of the hold, landed, and deposited twenty-eight feet above the rock, at the rate of ten per hour."

Mr. William Douglass arrived at Galle in December 1869, and on the 27th of that month made an attempt to reach the Basses in a small sailing vessel, but accomplished only one third of the distance in eight days, owing to head winds and an adverse current. He, therefore, returned to Galle to await the arrival from England of one of the two steamers, and on the 5th of March left with

her for the Great Basses, where he landed on the 7th. The first stone of the tower was laid on the 28th of December 1870, and, by the end of the working season, viz.: the north-east monsoon from April to November, of 1872 the masonry was completed, the light,—dioptric of the first order, emitting red flashes at intervals of forty-five seconds,—being exhibited in March 1873. This important work, so efficiently carried out in a tropical climate, seven thousand miles from their country, by a small number of Europeans, assisted by natives, was executed for the very moderate sum of £62,000, an amount which, in a very short time after the completion of the undertaking, was saved in coal alone by passing steamers, in consequence of their voyages having been shortened by the lighting of what was formerly so dangerous a spot.

The successful construction of this tower caused the Board of Trade to decide on proceeding with the erection of a similar one upon the Little Basses reef, which also stood in urgent need of lighting, whereupon they requested the Trinity House to

undertake the carrying out of this project likewise, in which course the Elder Brethren readily acquiesced. A design was then furnished by Mr. Douglass for this second structure, which was erected by his brother with the same staff, vessels and plant that had been employed at the Great Basses, and generally in a similar manner. This work was of even greater difficulty than the previous one, the Little Basses reef being twenty miles farther from Galle than the Great Basses, and awash only at low water ; but precisely the same satisfactory results attended its execution. The lighthouse was completed in the early part of 1878, and illuminated, in March of that year, by a first order dioptric apparatus, showing two white flashes in quick succession every minute, the entire cost of the undertaking being about £88,500.

Thus, both these fine granite towers were erected and lighted at an aggregate expenditure very little in excess of the estimate for the iron building for the Great Basses alone, an estimate which, judging from the practically negative result of the three years' operations at the latter site, in connection with that

structure, would probably have been exceeded before the edifice,—an unsuitable one, by the way, for such a position,—was ever completed; a fact which demonstrates, more forcibly than any words could do, the pre-eminent fitness of the brothers Douglass for enterprises of this nature.

On the termination of his duties in Ceylon, Mr. William Douglass was appointed engineer-in-chief to the Commissioners of Irish Lights, in which position he has abundantly fulfilled the high expectations that had been formed of him, and is now closing his long and distinguished career by erecting a granite tower upon the dangerous Fastnet rock, off the coast of Cork, to supersede the present unsatisfactory building, of cast iron and brickwork. With a special view to this project, his services have been retained much beyond the usual age limit for the retirement of public officials.

It is now necessary, however, to go back a few years. Mr. Beazeley who, as the reader has been informed, succeeded Mr. William Douglass as resident engineer at the Wolf rock lighthouse, not only

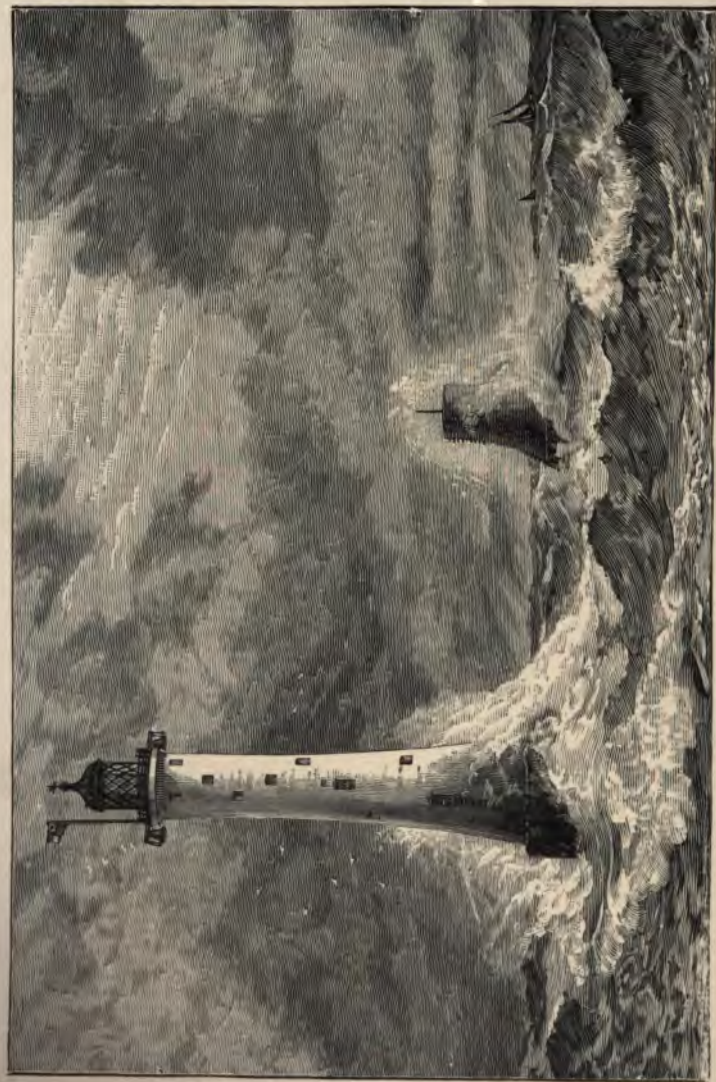
completed the interior arrangements of that structure, and whatever else remained unfinished at the time of the exhibition of its light, but was entrusted with the erection of a new granite tower upon the Longships rock, situated about a mile westward of the Land's End, as visitors to the latter interesting and picturesque spot know full well. There was already standing on the Longships a lighthouse, which was built in 1795; but its lantern, at an elevation of only seventy-nine feet above high water of spring tides, was frequently enveloped in heavy seas, at which times the character of the light could not be accurately determined, and it was not deemed prudent to raise the old tower a sufficient height to counteract this disadvantage. Mr. Douglass was, therefore, instructed by his Board to prepare a design and estimate, which were duly approved, for a new and more massive lighthouse to supersede the then existing one; and the erection of this superior structure,—the granite of which was supplied partly from local quarries, and partly from Dinan, France, — proceeded vigorously between the years 1870 and 1873, the same

vessels, plant, &c., that had been employed in the Wolf work being generally utilized here. The tower was completed, and the new light shown, in December 1873, the illuminating apparatus being dioptric of the first order, showing a fixed light, and marking by red sectors the adjacent dangers of the Runnelstone and Brissons rocks. The cost of the undertaking was £43,870.

During the time that the Wolf, the Basses and the Longships towers were being proceeded with, the following shore, or island, works were also carried out, from the designs, and under the direction, of Mr. Douglass, viz.: new lighthouses at Great Castle Head, Souter Point (for electricity), Hurst, Lowestoft, Hartland Point, St. Tudwal, and Bull Point; new fog signal stations at St. Catherine's, South Stack, Skerries, St. Ann's (Milford), Longstone, Start, and Bardsey; and extensive alterations and additions at South Foreland and Lizard (both for electricity), Haisboro', Caldy, Holyhead Breakwater, Flamboro', Longstone, Bardsey, Heligoland, Dungeness, and Caskets; as well as new district storehouses at Yarmouth and Holyhead.

CHAPTER X.

IN August 1877, Mr. Douglass startled the members of the mechanical section of the British Association, then assembled at Plymouth, by the statement that Smeaton's famous lighthouse was doomed, in consequence of the portion of the rock on which it was founded having been seriously undermined by the sea, and that a new structure would soon have to be erected to replace it. The members were *startled*, but they were also saddened; and Mr. Edward Woods, the president of the section, only expressed what was felt by all who were present, when he eloquently said that it was not without the deepest regret and concern that they had heard the announcement which had been made. The Eddystone lighthouse was the glory of Smeaton, and the glory of their profession itself, and, he might add, the glory of Plymouth. They had hoped, and believed, that the splendid structure would endure throughout all time; but alas! it was, unfortunately, to become an emblem of the perishing nature of earthly things. So arrangements were commenced,



THE DOUGLASS EDDYSTONE LIGHTHOUSE, WITH THE BASE OF SMEATON'S TOWER.

as early as practicable, for the erection, upon another and firmer part of the rocks, viz.: about one hundred and twenty feet from Smeaton's building, of the fourth and present Eddystone lighthouse. As a preliminary, however, to a description,—which, considering the importance, historically and otherwise, of the subject, must be rather detailed,—of this, the latest and most effective example of a rock tower, a short account of the three former structures that stood upon the famous reef, and of their respective builders, familiar as the story may be to the reader, is essential to the completeness of this narrative.

The first lighthouse erected on the Eddystone rocks was designed by Henry Winstanley, who is described as a “gent,” of Littlebury, in Essex. He had “distinguished himself,” says Smeaton, “in a certain branch of mechanics, the tendency of which is to raise wonder and surprise,” which statement is amply borne out by the following account of the “set of contrivances” which this ingenious practical joker had in his house at Littlebury. In one room there lay an old slipper, apparently left heedlessly

in the middle of the floor. If, as was natural, the visitor gave it a kick, up would start a ghost. There was a chair, so arranged that, when any one sat down in it, a couple of arms would pinion the person, and hold him in "durance vile" until the attendant came to his rescue. But the cruellest joke of all was the following. If the visitor seated himself in a certain arbour by the side of the canal, he was forthwith sent out afloat into the middle of the water, whence he had to be restored to his former place by the manager of this sensational performance. At Hyde Park Corner were situated what were called "Winstanley's Waterworks," an account of which exhibition will be found in the "Tatler" of September 1709. Winstanley's lighthouse was commenced in 1696, and completed in 1699. It was never well adapted for so exposed a position as the Eddystone rocks. It has been humorously described as resembling "a Chinese pagoda or belvedere in some suburban tea-gardens," its numerous angles and projections furnishing a gratuitous and dangerous obstruction to the winds and waves. Consequently, the structure was

swept away by the historic storm of the 26th of November 1703. Winstanley was in the lighthouse at the time, with a company of workmen, executing repairs. He had often said,—such was his confidence in the stability of his building,—that nothing would please him better than to be in it during “the greatest storm that ever blew under the face of the heavens.” And, unfortunately, his wish was gratified, though with different results from what he had anticipated ; for the brave man, his assistants, and the light keepers, all perished in the hurricane. It was noticed as a remarkable coincidence that, at the time the house was demolished, the model of it, in Winstanley’s residence at Littlebury, two hundred miles away, fell down and was broken in pieces ; upon which event Smeaton makes the following shrewd common-sense observation : “ This, however, may not appear extraordinary if we consider that the same *general* wind that blew down the lighthouse, near Plymouth, might blow down the model at Littlebury.”

The second Eddystone lighthouse was designed by John Rudyard, a silk mercer of Ludgate Hill. There is no other record of

any mechanical achievement of his; yet, as Smeaton pronounces, the building was admirably conceived. "He seems," Smeaton adds, "to have adopted ideas the very reverse of his predecessor; for all the unwieldy ornaments at top, the open gallery, the projecting cranes, and other contrivances, more for ornament and pleasure than use, Mr. Rudyerd laid totally aside; he saw that, how beautiful soever ornaments might be in themselves, yet when they are improperly applied and out of *place*, by affecting to show a taste, they betray ignorance of its first principle, *judgment*; for whatever deviates from propriety is erroneous, and at best insipid." The lighthouse was commenced in 1706, completed in 1709, and stood until 1755, when it was destroyed by fire, much of the material of the structure having been of an inflammable nature. It was in connection with this sad event that the extraordinary incident occurred of a man, Henry Hall, aged ninety-four, surviving twelve days after swallowing, from the burning building, a quantity of molten lead which, when taken out of his stomach, was found to weigh seven ounces five drachms. "As

the man," says Smeaton, in relating this story, "was looking upward with the utmost attention, to see the direction and success of the water thrown, on which occasion, as physiognomists tell us, the mouth is naturally a little open, a quantity of lead, dissolved by the heat of the flames, suddenly rushed like a torrent from the roof," and fell upon his face and head. He was attended by Dr. Spry, of Plymouth, who could not believe, though the sufferer so asserted, "in a very hoarse voice," that the lead had really been swallowed; but, after the man's death, that fact was proved. Many people, however, continued to doubt the possibility of such a thing; whereupon Dr. Spry, deeming his reputation at stake, made experiments by pouring from six drachms to six ounces of melted lead down the throats of dogs and fowls, and found that "those animals survived the operation till they were killed to extract the lead." Then, says the narrator, Dr. Spry fell under a censure of a different kind, "that of cruelty towards the animals, in trying the experiments mentioned."

The third, and most famous, Eddystone

lighthouse was that of Smeaton. This truly great man was by profession a philosophical-instrument maker. He had distinguished himself, however, by the ingenuity of many of his mechanical inventions and improvements communicated to the Royal Society, of which body he had been elected a member in 1753. Upon the President of that Society, the Earl of Macclesfield, being applied to, by the proprietors of the Eddystone, to recommend a suitable architect to rebuild the lighthouse, Smeaton was nominated for the work. And, surely, the choice was nothing less than an inspired one. Smeaton's structure was commenced in 1756, completed in 1759, and removed in 1882, having stood one hundred and twenty-three years. A literally truthful motto for this tower, had the "Lady of the Lake" been written, to suggest it, in Smeaton's time, would have been the familiar passage which Scott, in that beautiful poem, puts into the mouth of Fitz-James (the reader must imagine the lighthouse uttering words of defiance to the angry billows)

"Come one, come all! this rock shall fly
From its firm base as soon as I."

It has been explained that the rock *did* actually give way before the tower. But, though that inscription would not have been inapt, a far more appropriate one commended itself to Smeaton's simple, pious nature; and, inside the upper store-room of his building, was cut with a chisel the following text: "Except the Lord build the house, they labour in vain that build it," which same inscription, it may be mentioned, has been graven on the internal face of the *new* tower.

Coming now to the Douglass "Eddystone," it should be stated that the decision of the Trinity House to replace the magnificent work of that father of the modern race of civil engineers, John Smeaton, was, as might have been expected, not arrived at until every practical expedient had been vainly tried for rendering the building secure. The whole of the upper part of the tower, from the lantern floor down to the solid portion of the masonry, had been strengthened by internal iron ties; the outer joints of the stones had been re-pointed with Portland cement; many of the courses had been re-bolted; and the projection of the cornice, upon which the upward stroke of the waves

was found to act, had been reduced five inches; but all these measures were ineffectual to ensure the stability of the building, which, during heavy storms from the west and west-south-west, continued to oscillate to an alarming extent.

At this juncture came a proposal, emanating from a private source, but received with favour by a section of the public, that, instead of a new tower being erected upon the Eddystone rocks, the rocks themselves should be blown away. The proposal was thus tersely stated by its author: "*The raison d'être* of the light is, no doubt, the reef; why not remove the reef?" And this alternative plan actually came before the consideration of Parliament. Putting aside, however, the immense expense attending such an operation as that contemplated,—an expense estimated as seven times greater than that of building a new lighthouse, for two million tons of rock would have had to be removed,—the authorities of the Trinity House contended that the suggestion was gravely unpractical, the value to shipping of a guiding and warning light in such a position being, they held, incalculably great,

beyond that of merely marking a particular danger.

The Eddystone rocks are chiefly composed of three nearly parallel gneiss reefs of from three hundred to six hundred feet long, situated from one hundred to one hundred and fifty feet apart. They lie, almost north and south, fourteen miles to the south-south-west of Plymouth, and about nine miles from Rame Head, which is the nearest point of land. The rocks are exposed to the heavy seas of the Bay of Biscay and the Atlantic Ocean; and, until the erection of Winstanley's lighthouse in 1699, were a source of great danger to the mariner, "many a good ship," to use the words of Daniel Defoe, "having been lost there in former times." The reef upon which Smeaton's lighthouse stood was the westernmost one. That upon which the present tower was erected is the middle one. The site of the Douglass lighthouse lies considerably lower than that of Smeaton's building, the foundation of the latter structure having been laid near the level of high water, whereas the foundation of the present one was laid below the level of low water.

CHAPTER XI.

THE Corporation of Trinity House had not, for some years past, made any addition, in this country, to that "small number of man's extreme outposts in the ocean," as Robert Louis Stevenson characteristically describes our rock towers,—Stevenson who, himself, as is well known, had been trained to follow his eminent father in the erection of lighthouses, before, as a writer of books, he began to construct more lasting memorials of his genius. Hence, there was not available for acting as resident engineer at the Eddystone an officer having precisely the requisite experience for the purpose. The difficulty was, therefore, met in the following manner. Mr. Thomas Edmond (by trade a builder) who had, for a considerable time, been employed under Mr. Douglass in the construction of shore and island lighthouse works, several of which had been very efficiently carried out without a contractor, and who was a daring and energetic man, was appointed superintendent in charge;

Mr. William Tregarthen Douglass, the eldest surviving son, and then recent pupil, of the engineer-in-chief, was deputed to act on the work as the special representative of his father; while Mr. Douglass himself undertook to give every detail of the rock operations his close personal attention, and in fact, by very frequent visits to Plymouth and the Eddystone, *himself* to fill, to a large extent, the office of resident engineer, until his son,—who had already shown great promise,—should prove sufficiently experienced to occupy that position, which he fully did by the time the external masonry of the tower was completed, when Mr. Edmond's services were utilized elsewhere. These arrangements look somewhat complicated on paper; but no better seemed possible at the time; and, that they worked extremely well in practice, will appear later on, when it is seen how expeditiously, economically, and in every way satisfactorily, the entire undertaking was carried out.

The shore depôt was established at Oreston, on the river Laira, Plymouth; and one of the two twin-screw steam vessels, already described in connection with the

works at the Great Basses lighthouse, was employed for conveying to the rock the executive staff and the material for the new tower. What would not Smeaton have given for such a rapid means of transport! That versatile engineer himself assisted, though in this respect he was eclipsed by Watt, in perfecting the "Newcomen" engine; but the great lighthouse-builder had been dead fifteen years before (in 1807) Robert Fulton's boat, the "Clermont," steamed successfully up the Hudson. Small sailing vessels,—herring boats, or busses as they were called,—were, therefore, the best craft obtainable for conveying the material of Smeaton's tower from Millbay to the rock, which vessels were completely at the mercy of wind and weather, and used to beat about for days, and sometimes weeks, before reaching the Eddystone.

The first landing was effected on the rock by Mr. Douglass and the executive party on the 17th of July 1878, and a commencement made with the preliminary stages of the work, which consisted in the cutting and levelling of the rock into benches for receiving the bottom courses. The founda-

tion of the building being, as already stated, below the level of low water, it was necessary, in the first place, to construct a brick and cement cofferdam, inside which the men could proceed safely with their boring and cutting operations, and eventually with the setting of the lower courses, for the brief three or four hours that constituted a usual tide's work. In these operations no blasting was allowed, for fear of shaking the adjoining rock; the whole of the cutting and levelling being accomplished by tools known as "jumpers," assisted by a rock-boring drill, which was worked by compressed air from the steam vessel. This was the first occasion of such an appliance as the latter being employed in the erection of a rock lighthouse; and it proved a very useful auxiliary in this branch of marine engineering, the work which it is capable of executing being equivalent to that which can be done by ten "jumpers," plied by the most brawny Cornish miners.

The preparation of the site for receiving the foundation courses, inclusive of the construction of the cofferdam, occupied the workmen about a year, and on the 19th

of August 1879 the foundation stone of the structure,—a block weighing three and a quarter tons,—was laid by the Duke of Edinburgh (Master of the Trinity House) assisted by the Prince of Wales. Until December of that year, throughout 1880, and during the early months of the following year, the work of building the tower proceeded apace, so that, by the 1st of June 1881, all was in readiness for the setting of the last stone, which on that day was laid by the Duke of Edinburgh, who landed on the rock for the purpose when passing up Channel in H.M.S. "Lively." Thus the whole of the masonry was completed within the short space of two years.

With reference to the contour of the building, this does not essentially differ, except in one respect, from that of its predecessor. Modern lighthouse engineers get their form of rock tower from Smeaton, because Smeaton got his from Nature, to which infallible teacher true architects are ever indebted for the most perfect types of beauty and strength. The trunk of a large spreading oak-tree presented itself to the mind of Smeaton as the natural model of a

column possessing the greatest stability; and this form has, ever since, proved the most suitable for resisting the force of the terrific waves to which rock lighthouses are exposed. The new tower, however, unlike Smeaton's building, has a vertical base, which rises to a height above low water mark of eighteen feet nine inches,—at which point the curved shaft commences,—and has a set off, or projection, of four feet, the lighthouse proper thus standing on a cylindrical pedestal. Mr. Douglass, previous to designing his most famous work, had, as he afterwards explained, given great attention to “the question of arresting the force of a large ocean wave on a structure of that kind,” and came to the conclusion that, in this instance, a vertical base was the proper form to be adopted; though, as might have been expected, such a deviation from what had hitherto been generally accepted as the perfection of a rock tower did not escape criticism; and Mr. R. H. Brunton, an authority on lighthouse matters, speaking at the Institution of Civil Engineers, after the completion of the Douglass structure, thus expressed himself on the subject: “It has

been said that the green seas rushed up Smeaton's tower to the cornice and considerably above, and that, in the case of the present tower, the circular base breaks the waves, which rush round to the opposite side. If that be so, it would appear that the energy expended in projecting the volume of water, say fifty or a hundred tons, so many feet into the air, is now expended directly against the circular base." In his reply Sir James Douglass, as he had then become, admitted that the blow delivered at that point is heavier ; but, he added, *that* is precisely where the structure is best able to receive it, besides being the "point of least leverage, and thus of least destructive effect on the rock-foundation below." And Mr. E. C. Allam, in supporting these views, put the case very effectively, when he said : "To divert the wave from the solid base where it is best able to withstand the shock,—to cause the base, as it were, to shirk the duty which it is so well able to perform,—and to send the wave aloft to strike against the less solid portion of the tower, seems to me like the action of a commanding general

who allows the enemy to break through the front ranks of his army, where his veterans are stationed, and fall, almost unchecked, on the recruits in the rear." At any rate, experience, so far, has entirely justified this bold innovation; and the vertical base forms, moreover, an admirable landing place, greatly facilitating the relieving of keepers, and the placing of stores and provisions in the lighthouse.

But, although the form of the Douglass tower, with the exception of the vertical base, approximates closely to that of Smeaton's building, its dimensions greatly exceed those of the latter structure. The base of Smeaton's tower was thirty-two feet in diameter, and its light seventy-two feet above high water, with a range of visibility of fourteen nautical miles. Its rooms were four in number, besides the lantern; each room being twelve and a quarter feet in diameter; and it contained about thirteen thousand three hundred and forty-three cubic feet, or nine hundred and eighty-eight tons, of stone. The base of the Douglass tower is forty-four feet in diameter, and its light one hundred and thirty-three feet above high water,

with a range of visibility of seventeen and a half nautical miles. Its rooms are nine in number, besides the lantern; the seven uppermost being fourteen feet in diameter; and it contains about sixty-two thousand one hundred cubic feet, or four thousand six hundred and sixty-eight tons, of stone.

In a building of this enlarged capacity, it was possible to instal, instead of the comparatively feeble light which was the utmost that Smeaton's tower could accommodate, the powerful biform illuminating apparatus described on page 54 of this narrative. Thus the calamity which overtook Smeaton's noble structure proved, in the end, a blessing to the maritime community; and, were its architect now alive, he would, probably, feel more than compensated, for any natural disappointment he might at first have experienced at seeing his great work become a thing of the past, by the knowledge that, in its place, has been reared, though by another's skill, a building better adapted than his own to subserve the interests of that humanity which he so much loved.

Well wrote Mr. Kenward,—bard no less than lighthouse expert,—in the poem

“Eddystone” which he printed on the eve of the completion of the Douglass tower :

“We build on firmer base, with loftier hope ;
The granite shell sits broader on the rock ;
The light will search the sea with larger scope
And tenfold beam. All mists that veil and mock,
All winds and tides that baffle, shoals that shock,
Must yield them to the giant lenses’ might,
Which, drawn from stores the passing hours unlock,
Instinct with central flame serenely bright,
Will flash their splendours soon across the waste of
Night.”

The Douglass lighthouse, like its predecessor, is composed of granite, many of the blocks of which weigh over three tons each. The tower is solid, with the exception of a water tank, for twenty-five and a half feet above high water of spring tides. At this point the rooms, arranged one above the other, begin ; the walls of the lowest being eight and a half feet thick, and those of the highest two and a quarter feet thick. The entrance-door, situated at the top of the solid portion of the tower, is approached by gunmetal steps, let into the surfaces of the vertical base and the lighthouse ; and internal iron ladders are provided for the ascent from floor to

floor. The external door and window frames of all the rooms are of solid gunmetal, with panels of thick plate-glass, and some idea of the substantial character of these fittings will be conveyed when it is mentioned that the entrance door alone weighs over a ton.

CHAPTER XII.

THE masonry of the new Eddystone tower was dressed at Wadebridge, Cornwall, and Dalbeattie, Scotland; and all the stones composing it were temporarily fitted, or dry-set, in sections, on a specially prepared platform in the workyard. When found to be accurately shaped, the blocks were taken apart, properly lettered and numbered in red and black paint on the joints, and packed ready for transporting to the rock.

A further comparison between the two structures, in the mode of dovetailing the stones together, may here be not unprofitable. In Smeaton's tower there were six hundred and thirty-six stone joggles, one thousand eight hundred oak trenails, four thousand five hundred and seventy pairs of oak wedges, eight circular floor chains, and two hundred and twenty six iron cramps. In modern rock towers scarcely any such appliances are now used, though composition metal bolts, slit and wedged at both ends, are employed in fastening down the

foundation courses. The present system of dovetailing the stones one into the other is, indeed, so complete, and the modern quick-setting cements possess such an advantage, for hydraulic work, over the mixture of blue lias and *terro-puzzuolana* limes used for the blocks of Smeaton's lighthouse, that, except where the courses come in contact with the rock, no necessity exists for separate joggling and trenailing. Smeaton's method of bonding was, like every other mechanical arrangement which his skilful mind devised or adapted, characterised by extreme ingenuity, and was the first successful application to masonry of a process which had previously been almost exclusively confined to carpentry. In his writings, to which Robert Stephenson always referred young engineers when they asked him what they should read, Smeaton relates minutely, as is his wont, the development of his mode of dovetailing, from the first hints he received, by observing the manner in which the kerbs along the London foot paths were fixed, to the elaborate system which he eventually "matured," as he calls it, and applied to

the Eddystone lighthouse. The method adopted, in the case of the present tower, as well as in that of every rock lighthouse erected by the Trinity House since the "Hanois" (completed in 1862) is the invention of Mr. Nicholas Douglass. It consists in having a raised dovetailed band, three inches in height, on the top bed and one end joint of each stone. A corresponding dovetailed recess is cut in the bottom bed and end joint of the adjoining stones, with just sufficient clearance for the raised band to enter it freely in setting. The work, when thus put together and set in Portland cement, is nearly as homogeneous as solid granite. The engineer of the present "Eddystone" has said of this description of joggling: "It does not add materially to the cost of the structure, but it adds immensely to the reliability of the work, step by step as it is carried on, and thus facilitates its construction. I do not know any other system by which it is possible to set masonry with such readiness, where exposed to heavy seas. By the method adopted each stone is supported, not only by the stone

below, but by the stones that are beside and behind it, so that it can be left, immediately after setting, with perfect certainty."

On the completion of the external masonry Mr. W. T. Douglass was, as already mentioned, placed in full charge of the work, which consisted, not only in completing the internal arrangements of the tower, and generally preparing for its illumination, but dismantling the portions of Smeaton's structure down to the solid part. These, viz.: the lantern and four rooms, to receive which a new granite base had to be prepared, were afterwards re-erected on the Hoe at Plymouth, through the commendable public spirit of the inhabitants of that place, as a permanent memorial to Smeaton; and a very attractive object it is, on that beautiful parade. The taking of the blocks of the building asunder, in so careful a manner as not to injure them for putting together again, was no easy task, but it was very successfully accomplished by the young resident engineer, who, however, nearly lost his life during that process, in April 1882, as the following letter, written by his

father to the latter's old friend Mr. R. Price-Williams, clearly and succinctly describes.

"You have probably ere this heard of the accident to my dear boy Willie at the Eddystone last Monday, and his miraculous escape from a terrible death. He had taken down Smeaton's tower to the level of the lantern gallery, and had a pair of shears rigged on it for landing the central crane for taking down and shipping the masonry. On landing the crane, however, there was some ground swell, which caused a heavy surge on the tackle, and the chain back guy of the shears parted, when Willie was struck by one of the legs and flung several feet into the air, and thence fell about seventy feet, as it was thought at the moment on to the rocks below, but, most providentially, a wave rose over the rocks at the very moment, and he fell on to it, when fortunately he recovered sufficient consciousness and strength to strike out and swim ashore. I am thankful to state that not a bone has been broken, and so far no internal injury appears to have been sustained. He has most marvellously escaped with a few cuts and bruises, which we hope will be all right again in a few days.

The doctors recommend him perfect quiet for a week to recover the shock, therefore I have taken his place temporarily, which I am only too thankful to do under the circumstances."

In connection with Smeaton's lighthouse on the Hoe, there lately occurred the following amusing incident, which illustrates once more the difficulty of writing history, unless Sir Robert Walpole's dictum that "history must be false" is to be accepted as correct. An old resident of Plymouth, a generally intelligent man, just the kind of person on whom a chronicler would be likely to rely for information relative to local matters, was showing a friend, who was a stranger to the neighbourhood, the many attractions of the beautiful town. Coming to the Hoe, "Ah!" said the visitor, on seeing Smeaton's structure; "what a handsome lighthouse you have!" "Yes!" replied the Plymouthian,—and he thought he was speaking the truth,—"that is Smeaton's famous tower which formerly stood on the Eddystone. It, unfortunately, got blown down in a storm, but was recovered from the sea, and erected here as a curiosity."

The Douglass lighthouse being practically completed by May 1882, the building was formally opened on the 18th of that month by the Duke of Edinburgh, who thus made his third visit to the Eddystone in connection with this undertaking. His Royal Highness, indeed, took at all times the utmost interest in the affairs of the ancient Corporation of which, for the long period of twenty-eight years, he was the Master, but it may surprise the reader to be told that the Duchess of Edinburgh did also ; yet such was the case. On the occasion of Her Imperial Highness' first visit to the Trinity House, Mr. Douglass had the honour of being commanded to explain to the Duchess the various models. But he found that there was very little of importance that Her Imperial Highness did not already know respecting our lighthouses. The Duchess, he afterwards said, showed a more intimate acquaintance with the subject than any other lady to whom he had ever spoken. But, —to return to the opening ceremony,—wind and weather favoured that interesting function, by which, as one of the newspapers put it, "Plymouth was profoundly stirred" ;

and at sunset the new double-flashing half minute light, with a lower fixed one to mark a dangerous shoal called the Hand Deep, blazed from the Douglass tower. The estimate for this lighthouse was £78,000. "We are disposed to think," wrote one of the high-class engineering journals, in July 1873, "that Mr. Douglass' estimate will be greatly exceeded. . . . If he succeeds in keeping the actual cost of the work down to anything like £80,000, he will have done very well indeed." The actual cost was £59,250. The same journal stated: "It appears to us that, bearing all the conditions in view, he has assigned far too short a time, —five years,—for the completion of the work." The work was completed in four years.

At the end of June 1882, Her Majesty the Queen conferred upon its architect the honour of a knighthood, "on the occasion," —Mr. Gladstone had written, in communicating the Royal intention,— "of the completion of the new Eddystone lighthouse, with which your name is so honourably connected." And surely, if a man can ever be said to merit such a reward, the recipient

had done so, even regardless of the particular achievement for which it was bestowed ; for the new "Eddystone," though the best known, was by no means the most difficult of the many important engineering works which its designer had, throughout his long and laborious life, been instrumental in carrying out, for the benefit of those "that do business in great waters."

Before this chapter closes, it should be stated that, for many years after the completion of the Douglass tower, two bells were rung from the gallery course during thick or foggy weather ; but that, in 1891, an explosive signal, giving a report every five minutes, was substituted for these.

CHAPTER XIII.

IN 1881 the Corporation of Trinity House undertook, at the request of the Board of Trade, the erection of a lighthouse on the island of Minicoy, in the Indian Ocean; and, on the 4th of November of that year, Mr. T. Matthews, then the tried and trusted chief constructive assistant to Mr. Douglass, whom he afterwards succeeded as engineer-in-chief at the Trinity House, was selected to visit the site, for the purpose of making the necessary survey and local enquiries. Mr. Matthews reached Colombo on the 24th of November, whence he proceeded to Minicoy in H.M.S. "Ready," arriving at the island on the morning of the 1st of December, and completed his work there with great promptitude, viz.: by the 8th. Mr. Douglass' design and estimate for the structure having been approved, and the requisite preliminary arrangements made, Mr. T. Edmond was appointed to supervise its erection, and left England in September 1882, with a foreman and three leading

hands, to commence the building operations. The project, which was not a difficult one, need not be described in detail ; but it may be stated that masons, and other mechanics, were got from Galle to assist the English workmen,—the islanders making up the rest of the executive staff ; that the walls of the tower, for which the site had previously to be cleared of all jungle and cocoa-nut trees, were built of coral (taken from the foreshore) faced with blue vitrified Staffordshire bricks ; and that the lighthouse was completed by the end of 1884, nothing having occurred to mar the success of the undertaking, except the death, from malarial fever, of the English foreman, Mr. John Woodcock, a trustworthy and excellent man. But, though little need be said about the building, the following particulars, mainly supplied by Mr. Oliver Bartholomeusz, L.C.M.C. (the clever young Ceylonese medical officer who was attached to the works) respecting Minicoy and its people, may prove interesting.

Minicoy, or “Malika,” belongs to the group of coral islands called the Lakadives, which, with the Maldives, stretch over a

space of about twelve hundred miles from north to south, the Maldives alone consisting of about twelve thousand islets. The islands are grouped together by twos and threes, within girdle-like reefs, each cluster being called by the natives an "atoll"; and a sort of telephonic communication is carried on between their respective inhabitants, by means of a cord attached to the centre of a membrane stretched over the end of a hollow cylinder.

Minicoy lies between latitude $8^{\circ} 14'$ and $8^{\circ} 19' N.$; long. $72^{\circ} 59'$ and $73^{\circ} 5' E.$ Its position is directly in the track of steamers trading to India, Ceylon, China, Japan, and Australia; and, in 1863, the Peninsular and Oriental steam vessel "Colombo" was wrecked in the immediate locality. The island is a narrow crescent-shaped strip of low coral land, well planted throughout with cocoanut trees, is seven miles long, from a quarter to a half a mile wide, and lies north-east and south-west. An irregular coral reef projects from its north-west face about three miles, and is joined to the extremes of the island, forming a large lagoon where boats and small vessels,

drawing seven or eight feet of water, are well sheltered.

The natives of Minicoy, numbering between two and three thousand, are descended from a colony of ancient Singhalese. The men are well built, strong and muscular, averaging in height between five feet two inches and five feet six inches. They are of a dark copper colour, have angular features, with dark eyes and well shaped noses. The women are small, shapely in figure, and of a lighter colour than the men.

The islanders are all Mohammedans; the new religion, according to tradition, having been introduced here, between four and five hundred years ago, by Boduthakuruman, a religious reformer from the Maldives. Mr. Bartholomeusz says: "the natives recognise many of the Old Testament worthies, and are able to narrate the events connected with their lives, but with many variations and modifications. They believe in Christ as a prophet, "Esa Nabbi," and recount some of the miracles wrought by Him, which, in the main, correspond with the description given of them by the Gospel writers."

The children are all taught to read and write, free education having been adopted on the island even before such a system was established in England, and are expected to commit to memory the prayers and certain portions of the Koran. Toy boats, some of which are elaborately carved and painted, are the chief playthings of the boys and girls, who learn to swim by the time they can run, and "it is interesting," says Mr. Bartholomeusz, "to watch the little ones swimming after their boats, as they float away with their diminutive sails filled with the wind." The boys fish with the rod and line, fly kites, make and use pop-guns, but don't play with marbles or tops; nor, strange to say, do the girls know what dolls are.

The women wear round the waist a cloth kept in position by a silver girdle, and over this a long loose tunic, reaching from the neck to the ankles, with sleeves down to the wrists, the collar being beautifully embroidered with different coloured threads. Thus attired, says Mr. Bartholomeusz, "the women and girls look very decent and modest." They are fond of

jewels, especially bangles and ear-rings, the united weight of the former on each arm being about three pounds; and the friction of these, where the pressure is greatest, often causes warts on the wrists. Nose rings are never worn, and finger rings seldom. They paint their eyebrows and the borders of their eyelids with a thick tarry substance of a jet-black colour, which, says Mr. Bartholomeusz, "does certainly lend a peculiar charm to the countenance, especially if it be that of a 'cudabebe' or young woman."

The lowest class are the Raveries, or toddy drawers. "They are not allowed," says Mr. Bartholomeusz, "to aspire to anything higher than the trade of their fathers," although, as he dryly adds, "rising high is an essential feature in it." The toddy is extracted from the flower of the cocoanut palm, and converted into jaggery by boiling it over a slow fire. None of it is allowed to ferment, the natives being strict teetotallers, to which fact Mr. Bartholomeusz attributes the peaceable nature of the people. The middle class men (the Thakuruwanus) generally follow

a seafaring life, and the aristocratic caste (the Manikuwanus) are owners of vessels, captains or traders.

The village of Minicoy is situated in the centre of the island, which position is also the most elevated part. On the beach the native gentlemen lounge in large swinging cradles, and enjoy the breeze. Every house has a verandah and a porch, in which latter is suspended a similar cradle, where the master has his mid-day siesta. "On one side of the porch," says Mr. Bartholomeusz, "is a large raised platform or divan, built of coral and mortar, and covered with pretty Maldive mats. Here visitors are entertained, and on it they sit, tailor fashion, and chew the aromatic, but mouth discolouring, compound of betel leaf, areka nut, lime, tobacco, and cloves, which is as sure to be offered to them as are liquid, but intoxicating compounds among nations boasting of a Western civilisation. Here, too, they eat sweets, and sip tea or coffee, or else lounge comfortably and smoke the hookah."

There are lepers at Minicoy, and these

are segregated in a group of huts about three miles from the village.

So ends all that can here be inserted relative to this little-known island and its interesting people. It is only indirectly connected with the story which these pages are intended to unfold; but the reader may, perhaps, find the account somewhat of a relief, after the more technical topics which have, necessarily, preceded it.

The works at Minicoy being, as aforesaid, completed, Sir James Douglass proceeded there to inspect them, and witness the first exhibition of the new light, arriving at the island from Colombo, in the "Ceylon" steam tender, accompanied by Lieutenant Wilding, R.N. (the Board of Trade local agent) on the 2nd of February 1885. The visitors were received by the Amin, or governor, arrayed in gilt turban and robe of purple silk, attended by his chiefs and retainers, also gorgeously attired; and, all along the palm-fringed pathway leading from the beach to the lighthouse, flags and other decorations abounded,—the islanders forming a procession, partly composed of native musicians

playing on their brass drums, and dancing and singing. After the official inspection of the new establishment, with its apparatus, and the temporary lighting, by the Amin, of the large concentric lamp, a return was made to the beach, where was found an imposing gathering of gaily-dressed native ladies and women, who sprinkled the strangers with rose water, presented each with a clove-studded betel leaf, and with sweet-smelling otto for anointing their beards. Then the village, three miles distant from the lighthouse, was visited, the Amin and his guests proceeding thither in a gig, towed by a pair of the native pleasure barges, each manned by twenty-two young men rowers, in smart attire, and singing all the way; and at sunset, the guests having meanwhile been regally entertained by the Amin and his brother-in-law, Don Manakin, the lamp of the optical apparatus was re-kindled, and the light,—dioptric of the first order giving a white flash every half minute,—permanently exhibited from the new building.

Before leaving for England, Sir James took the opportunity of accompanying Lieutenant Wilding, in the "Ceylon," to

the Great and Little Basses lighthouses, and of seeing, for the first time, those splendid towers of his own design. There was too much sea at both rocks for a boat to approach either with safety, and landings had to be effected by the visitors being hauled through the surf. The structures were found to be in perfect order.

CHAPTER XIV.

THE condition of the tower on the Bishop rock, with the erection of which structure the early pages of this memoir so fully dealt, had, for many years prior to 1882, caused no little anxiety to the authorities of the Trinity House. There never was a work of the kind better constructed; but the seas to which the building is exposed are, as has been said, terrific. Thus, during a violent storm, a five hundredweight fog bell, fixed on the gallery course a hundred feet above high water, was torn from its attachments, and hurled on to the rock; large pieces,—some of them weighing half a hundredweight each,—were split from the lower external blocks of granite, owing to the excessive strain on the structure in rough weather; and the prisms of the optical apparatus were, from the same cause, fractured. In 1874 the tower was strengthened by massive iron ties, bolted to the internal surface of the walls, and connected through the floors; but even this

precaution was not found sufficient to ensure the stability of the lighthouse. The Corporation of Trinity House,—acting under the advice of their engineer,—thereupon decided practically to rebuild it, by enveloping the structure in an outer casing of masonry, dovetailed horizontally and vertically, from the foundation courses up to the level of the service room floor, removing the portions above that point, and adding four new rooms, which alteration rendered it necessary that the outline of the tower should be adapted to the increased height of the building. It was further decided to construct a vertical base to the structure, as in the case of the new Eddystone lighthouse.

On the completion, in 1882, of the works at the latter station, the steam vessel, plant and tools were transferred therefrom to the Bishop, and Mr. W. T. Douglass was appointed resident engineer of the new enterprise. Thus the grandfather, the father, and the son were all engaged, at some time or other, in the construction of the tower on the Bishop rock. The dressing back of the surface of the old

structure, to receive the outer stones, was a very tedious operation; and, at the lower levels of the work, the men engaged in this process, and afterwards in fitting the new blocks into the old ones, were often in danger of being washed off the staging by the heavy seas that would, unexpectedly, break upon the tower and submerge them. The entire project, however, was most courageously and efficiently carried out, without serious accident of any kind, and was completed in five years, the weight of the original structure having thus been increased by the addition of three thousand two hundred and twenty tons of granite. This important strengthening and improvement of the tower admitted of its more effectual lighting, the desirability of which, indeed, had long been felt. Accordingly, a new lantern and dioptric apparatus, —the latter on the biform principle adopted at the Eddystone, but having a greater focal distance,—were erected at the Bishop. The new light, which was first shown on the night of the 25th of October 1887, gives two white flashes every minute, has a maximum intensity of one hundred and

seventy thousand five hundred candles, and a nautical range of eighteen and a quarter miles. An explosive signal was also provided, and is fired every five minutes during thick or foggy weather. The cost of the whole undertaking was nearly £65,000, making the total sum expended altogether in lighthouse construction on this rock about £112,000.

While the works at the Bishop were in progress, Mr. W. T. Douglass also built the lighthouse mentioned in the early part of this memoir as having been erected on Round Island. After completing these two projects, he left the service of the Corporation of Trinity House, there being no immediate prospect of that body proceeding with another work of sufficient magnitude to induce him to remain under his father. He then commenced practice for himself in Westminster, and soon, by dint of that superabundant energy, and many of the other high qualities, which one naturally associates with his name, won for himself an excellent position, which he still retains, as a *general*,—and especially a *lighthouse*,—consulting engineer, in which latter capacity he is now the chief

authority in this country, outside official circles.

As this record, mainly of rock lighthouse building, began with the Bishop, so with the Bishop it must end, for there was no other undertaking of the kind that Sir James lived to carry out. The following shore and island works were, however, executed from his designs, and under his supervision, subsequently to those last-mentioned, viz.: new lighthouses at Anvil Point, Round Island, Southwold, Broadness, Stoneness and Tilburyness; a new fog signal station at Souter Point; and extensive alterations and additions at Start, St. Catherine's (for electricity) Orford and Gibraltar, also at the following district storehouses, viz.: Blackwall, Harwich, Cowes and Penzance.

It should further be stated in this place that, either through his official superiors or with their concurrence, he rendered, during the entire period of his service at the Trinity House, valuable assistance in lighthouse construction and development to many of our public departments at home and abroad, to most of our Colonies, to the Chinese Imperial

Maritime Customs, and to foreign Governments. Sometimes, in this connection, his advice only was sought; but frequently he designed lighthouses, lanterns, optical and fog signal apparatus &c., in which case such portions,—often the greater part,—of the work as were prepared in this country were constructed here under his supervision.

Sir James was an ingenious, as well as a bold and energetic, man. While engaged in the erection of the Smalls rock lighthouse, in the early stages of his career, he invented a many-bladed axe, which considerably facilitated the dressing of granite, and had not been long at the Trinity House before he was able to effect an important improvement in bell buoys, causing them not only to ride better than formerly, but, what is of greater importance, to ring out their warning notes more loudly and reliably in all states of the weather. Then he turned his attention to the subject of lighthouse lanterns. Smeaton's lantern was of the octagon type, having massive horizontal and vertical sash bars, which obstructed, in certain directions, nearly fifty per cent. of the light from the luminary. The lantern

thus described had not long become obsolete in this country, and, until comparatively recent years, was the only one used in the lighthouse service of the United States. It was, however, a source of frequent mischief; for, often, one of its vertical sashes interposing between the light and the point of observation, proved so complete a barrier, that mariners have reported a light extinguished altogether, when it was merely thus practically extinguished for them. To Mr. Alan Stevenson is due the introduction of helical joints in dioptric apparatus; and it was he, also, who first substituted diagonal for vertical framing in the lantern, by which improvements, to quote from Professor Tyndall, "the flame is never obscured from top to bottom of the apparatus at the same time." In 1864, however, Mr. Douglass invented his cylindrical helically framed lantern,—now solely used for new English lighthouses,—which, besides being optically perfect in form, and possessing a maximum of strength, offers a minimum of obstruction to the light sent from the illuminating apparatus. In fact, such shadow as the framing of this lantern casts was reported

by Faraday, who was scientific adviser to the Trinity House, to be entirely lost at a distance of less than one hundred feet; and Tyndall, who succeeded Faraday in that capacity, stated that Mr. Douglass had formed and carried out his design "in a manner which excites my admiration." A lantern of this type, it should be added, was shown at the Paris Exhibition of 1867, and elicited the highest praise from foreign engineers.

But the most important improvement due to Mr. Douglass' inventiveness was in connection with the burners of lighthouses and light vessels. This improvement consists of an arrangement of compound deflectors surrounding the burner and lower part of the flames, in connection with which deflectors is a glass chimney, both deflectors and chimney being so arranged as to force the outer flame or flames on to the inner flame or flames, thus condensing them to the smallest possible dimensions, and deflecting on to the internal and external surfaces of each of the rings of flame the whole of the ascending currents of air, in such a manner as to obtain a maximum intensity of light. The power

can be increased or decreased, as may be required for coast illumination, to meet changes in the state of the atmosphere, and the increase or decrease can be promptly effected without altering the external form or dimensions of the light. A cylindrical chimney having no shoulder is employed, this shape being more suitable for an optical apparatus than a cylinder having a shoulder, and its cost being less. The flame of the improved burner is nearly cylindrical in form, and is thus better adapted for service in an optical apparatus than the tapered flames of the lamps previously used for coast illumination. Flames vastly greater in intensity than formerly are produced, with a corresponding diameter and height; consequently the efficiency of optical apparatus of any dimensions, with one of the old burners at the focus, can be very much augmented by installing one of the improved burners, or, where reduction of first cost and of maintenance is the chief desideratum, optical apparatus and lanterns of the second order dimensions for dioptric stations can be adopted, with the same degree of efficiency as before with the first order size, and thus

a considerable saving in cost be effected. The number of concentric wicks, moreover, in the Fresnel lighthouse-burner was increased from four to six, then to eight, and ultimately to ten; and the one-wick Argand lamp enlarged, and made to burn two wicks. The net result of these improvements is that there is now available, for lighthouse illumination, a burner having a maximum intensity of eighteen hundred candles, instead of only two hundred and thirty candles as formerly, and that the intensity of the Argand lamp,—chiefly employed in the illumination of light vessels,—has been increased from nineteen candles to sixty candles, which gains in initial power are, of course, greatly augmented by the optical apparatus before the light reaches the eye of the mariner.

Another invention of Sir James' was the fluted craterless carbon for electric arc lighting. He had found that, with the most reliable and efficient machine that had yet been tried for lighthouse purposes, viz.: the large size alternate current magneto machine of De Meritens, the intensity of the arc in the horizontal plane, per square millimetre

of sectional area of carbon, was about thirty-five per cent. less than it was with the old small square carbons used with the "Holmes" direct current magneto machines. This result appeared to be due, first, to the loss, with the powerful currents now available, of a large portion of the most intense part of the arc which is confined within the crater of each carbon, and, secondly, to the fluctuations in the intensity of the arc, caused by the current passing between various parts of the end of each carbon. In connection with the electric installation at St. Catherine's lighthouse, completed in 1888, it was intended to use one "De Meritens" machine during clear weather, and two of such machines in thick weather. Here, then, would have arisen a defect common to all electric flashing lights where two intensities are adopted, viz.: that the duration of the flashes of minimum and maximum intensity would vary in the ratio of the difference in the diameters of the two sizes of carbons employed, thus impairing the distinctive character of the light. "It occurred to me, however," wrote Sir James, in a communication which he

made on the subject to the Royal Society, "that, if carbons of a fluted section were employed for the arc of minimum intensity, whose extreme diameter corresponded exactly with the diameter of the cylindrical carbons used for the arc of maximum intensity, and of exactly half the sectional area of the latter, the defect referred to would be entirely obviated, and the flashes of maximum and minimum intensity would have exactly the same duration. Other advantages to be obtained with fluted carbons are, (1) a larger vertical angle of radiant light from the arc, and with a higher co-efficient of intensity, in consequence of the unobstructed radiance through the fluting at the points of each carbon; and (2) a steadier light is obtained, owing to the localising of the current at the central portion of each carbon. The results of many experimental trials, with fluted carbons 50 mm. diameter, have entirely confirmed my expectations. No crater is formed, and the point of each carbon is all that can be desired for utilising fully the maximum light of the arc. My experiments have not been sufficient to determine accurately the

additional intensity of light obtained from the arc of a pair of the fluted carbons, as compared with that from the arc of a pair of cylindrical carbons, but I am of opinion that the gain with fluted carbons is not less than ten per cent." These carbons are now used, with excellent results, at all the electric lighthouses under the jurisdiction of the Trinity House.

The above-mentioned are the chief, but not the whole, of Sir James' inventions. Most of them were patented at his own expense, and, as he allowed all public authorities to adopt the improvements without any payment, either direct or indirect, and, as there was practically no other demand for them, it follows that his inventions were a heavy tax on his purse.

CHAPTER XV.

IN addition to the construction of light-houses and other buildings, the engineer-in-chief to the Trinity House is entrusted with the control of its workshops at Blackwall, which have already been described, with the construction and installation of Siren and other fog signals, both ashore and afloat, with the supervision of the manufacture of chain cables for light vessels, the construction of steel buoys, and iron buoy sinkers, also of the engines and boilers of the Trinity House steam vessels. A very important part, moreover, of his duties consists, sometimes in proposing, but generally in organizing, and taking a leading share in carrying out, from time to time, those practical experiments by which the Elder Brethren are enabled to maintain, in the highest state of efficiency, the service which they are responsible for administering. Some of the most important of such investigations in which Sir James took part,—being efficiently aided throughout all of

them by Mr. Arthur Ayres, who was for many years his assistant engineer,—were (1) with a view to the adoption of mineral oil as an illuminant for lighthouses and light vessels,—which resulted in his successfully adapting their burners for consuming that illuminant, instead of the more expensive colza as previously, whereby a large annual economy was effected; (2) for determining, at different times, the most efficient electric machines for lighthouse purposes; (3) for testing the merits of the “Siren” and other fog signals; (4) for ascertaining the precise relative advantages of electricity, gas and oil for lighthouse illumination; (5) for establishing electrical communication with light vessels; (6) for fixing, by actual measurements, the exact powers of all types of optical apparatus used in the three lighthouse services of the British Isles. The experiments with fog signals, and the important results which ensued from them, demand here some fulness of treatment; and, should the reader desire any information on the subject beyond what will now be set forth, he cannot do better than consult the admirable descriptive account contributed

to "Lighthouses of the World" (Laurie) by Mr. E. Price Edwards, one of the principal officials of the Trinity House.

The Londoner knows the danger to locomotion of the fogs that not unfrequently envelope the metropolis in a thick veil, which the fingers of Science have hitherto been powerless to raise; but a fog at sea is, it is needless to observe, an infinitely more serious matter, often utterly baffling, as it does, the skill of the most efficient navigator. It is true that the greatly augmented penetrative intensity which the modern lights of our lighthouses possess, over those of even a few years ago, diminishes, at night, to some extent, the evils of a fog at sea; although, in reference to even the most powerful of these luminaries,—the electric light,—its increased penetrative capacity during fog is not, in comparison with oil or gas lights, in the ratio of its higher illuminating power; while fogs by day are, of course, independently of sound warnings, as perilous to the mariner now as they ever were.

Until within the last quarter of a century, the only fog signals provided by the

lighthouse authorities of the United Kingdom were gongs, bells, and guns. The gongs, which were chiefly employed on board light vessels, were usually of Chinese make, were suspended by a line, and struck by hand with a gong-stick. The sound thus produced is said to have been distinctive, and evenly distributed all round, its minimum range being about a quarter of a mile. The bells, which were chiefly employed at lighthouses, varied from three to forty-five hundredweight. They were suspended by brackets from the pedestal of the lantern, or the gallery, and were struck by a hammer, set in motion by clockwork driven by a weight. Another form, however in which bells were, and still are, used as fog-signals is when fixed on the top of a large buoy, with four hanging clappers around the outside of the bell, which is struck by them as the buoy is moved by the action of the waves. The reader probably remembers Southey's ballad about the bell on the Inchcape rock:—

“On a buoy in the storm it floated and swung,
And over the waves its warning rung.
When the rock was hid by the surge's swell,
The mariners heard the warning bell;
And then they knew the perilous rock.
And 'twas the Abbot of Aberbrothok.”

The sound of the best of these instruments, under the most favourable atmospheric conditions, may be wafted by the breeze to a distance of several miles; but their minimum range is, probably, not in excess of that of gongs. The guns, which were chiefly employed at lighthouses on prominent headlands, were ordinarily the old long eighteen-pounder, with a three-pound charge of powder, their minimum range being extremely limited. Professor Tyndall mentions various objections against the use of guns as fog signals, chief among which is that "the duration of sound is so short that, unless the observer is prepared beforehand, the sound, through lack of attention rather than through its own powerlessness, is liable to be unheard." He, however, observes: "Still, notwithstanding these drawbacks, I think the gun is entitled to rank as a first-class signal."

The above-named instruments answered fairly well the purpose for which they were intended; but, for many years before their partial abolition, it was felt by the lighthouse authorities of this country that the time had come when, in the interests of our

rapidly increasing maritime commerce, these signals should yield to more efficient ones. Accordingly, in 1873-4, a prolonged investigation into the subject of fog, and competitive trials of the various sound-producing instruments, were conducted, at the South Foreland lighthouses, by Professor Tyndall, in his capacity of scientific adviser to the Trinity House, with the co-operation of Mr. Douglass. That investigation, which, it is unnecessary to observe, was carried out with immense care and ability, established important results, which are stated at length in Professor Tyndall's work on "Sound," but which Mr. Price Edwards has thus summarised: "That neither rain, hail, snow, or fog has any sensible power to obstruct sound. That the real obstructors of sound are, first, the wind; and, secondly, what Dr. Tyndall named acoustic clouds. These clouds have nothing to do with ordinary clouds, fogs, or haze, and may arise from air currents differently heated, or from air currents differently saturated with vapour, and they often exist on days when the atmosphere is visually in a very transparent condition. The obstruction is caused by the sound, intercepted by the

acoustic clouds, being wasted by repeated reflections. In short, it is now established that a bright clear day is not necessarily the best for hearing distant sounds, and that, on a day of dense fog, it is more than probable that no obstruction is offered to the passage of sounds."

The competitive trials disclosed, beyond doubt, the fact that, of all sound-producing instruments, the "Siren" was the most powerful. The Siren, as a fog signal, is of American origin, having been patented by Messrs. A. & F. Brown, of New York. A committee from the Trinity House visited the United States in 1872, and witnessed, while there, a performance of this instrument, with the working of which they were so well pleased that, for the competitive experiments at the South Foreland in the two following years, one of the Sirens was sent over from America, and tried, with the successful result which has been mentioned. The Siren can be sounded with either steam or compressed air, made to pass through a fixed flat disc, fitted into the throat of a long trumpet connected with the steam or air pipe. It is thus further described by Mr. Price

Edwards : " This disc has twelve radial slits, and behind it is a rotating disc, with twelve similar slits, the rotation being effected by separate mechanism. Imagine, then, the pressure of steam or air to be impinging on the fixed disc, and the other disc rotating; it will be understood that the slits in each frequently coincide,—in fact, the twelve slits in one revolution coincide twelve times, and at each coincidence a puff of steam or air at great pressure escapes through into the trumpet. It is the rapid succession of these puffs which forms the sound of the Siren. The disc is rotated so as to make two thousand four hundred rotations in a minute, and, as there are twelve coincidences in a revolution, it follows that the number of puffs passing through in a minute would be twenty-eight thousand eight hundred. It can readily be understood that a sound of surpassing power is thus generated, and, as the vibrations produced are not taken up by the cast-iron trumpet, the sound issues from the mouth in a condensed beam of great intensity."

The Siren above described is the original or "driven" one; but the improved modern type, which has superseded it, is cylindrical

in form and rotated automatically by the air in passing through it, the Siren being fitted with a centrifugal governor, which is readily adjustable for any required speed of the instrument. The cylindrical form of Siren, as also this governor, are due to the ingenuity of Mr. G. H. Slight, who, as already stated, was for so long a period the superintendent of the Trinity House engineering workshops.

Nearly forty of these powerful instruments, worked by caloric engines, were installed by Mr. Douglass,—acting under the instructions of his Board,—at a cost of about £50,000, around the coast of England and Wales, and answer admirably the purpose they are intended to serve. He calculated their minimum sound range to be a mile, under the most adverse conditions of the atmosphere and against a strong wind; but that, with favourable wind and weather, they might be heard at a distance of ten miles. The apparatus is always maintained in a forward state for immediate use, by a small fire being kept constantly burning in the furnace of one of the caloric engines, so that, on the first indication of fog, the signal may be sounded. And a horrible noise it makes.

"When the Siren hoots and roars," says Kipling, which is a graphic description of the hideous, but useful, notes it emits.

A matter of the greatest importance, in connection with coast fog-signals, is the most effective mode of individualising their sound, so that one signal shall not be mistaken for another. At present it is attempted to obtain this result by merely varying, in a given period, the number of blasts and silent intervals and the pitch of the notes. These distinctions appear to be sufficiently characteristic to satisfy the nautical mind, but it would seem that they do not altogether satisfy the scientific mind, for Sir W. H. Preece, F.R.S., late engineer-in-chief to the Post Office, has thus expressed himself on the subject: "On entering the English Channel there are three prominent points, the Lizard, the Start, and the Caskets; and it is perfectly clear that, if each of those lighthouses were supplied with a Siren which should shout 'I am the Lizard'; 'I am the Start'; 'I am the Caskets,' no one could possibly make a mistake, if he understood English, though a Russian or a Danish sailor might still be puzzled." To make this system more

comprehensive, Lord Kelvin, F.R.S., when Sir William Thomson, proposed that every light-house should indicate its position in telegraphic language, which is this : " Instead of using common words, the names are spelled out in high and low tones, or by long and short sounds, or by dots and dashes, but generally by long and short sounds, which are to the telegraphist as clear and distinct as language.

. . . By this code a lighthouse might be flashing out its name all night long in this telegraphic language. And not only could it do so by means of light, but it could do so by means of sound. They only need arrange the fog-horns, Sirens, or whistles, to repeat these signals after each other in a certain preconcerted way, so that, whether by day or night, in clear weather or fog, a mariner who has once learned this language, when he came within range of a lighthouse could not fail to know where he was."

Now, all this reads delightfully simple ; but, unfortunately, no less an authority than Professor Tyndall has said that " it is not really so easy as one might be led to suppose ;" although he admits that the ideal state of things thus set forth is " one to

aim at, on the principle that, as Chesterfield says, 'the man who aims at the sky would probably reach much higher than the man who only threatens a tree.'" The lighthouse authorities of this country, moreover, assert that the difficulty of "educating every grade of maritime intelligence up to the comprehension of such a system" would be insuperable; and that broad optical or acoustic effects, rather than "needlessly subtle ones," are desired. They further state that, among seamen, the parties chiefly concerned in the matter, a strong preponderance of opinion is on the side of the existing system.

CHAPTER XVI.

THE experiments, — which also need describing,—with electricity, gas and oil were undertaken in 1884-5 for the purpose of settling for a long term of years, at any rate, the relative merits of those illuminants for lighthouse purposes. The investigating committee consisted of the then Deputy Master and six other Elder Brethren of the Trinity House, with Mr. E. Price Edwards as secretary, and with the following scientific advisers, viz.: Mr. A. Vernon Harcourt, M.A., F.R.S. (representing the Board of Trade), Professor W. Grylls Adams, M.A., F.R.S. (for electricity), Mr. Harold Dixon, M.A., of Trinity College, Oxford (for photometry), Sir James Douglass (acting for the Trinity House), Mr. Thomas Stevenson (acting for the Scotch Light Commissioners), and Dr., now Sir Robert, Ball, F.R.S. (acting for the Irish Light Commissioners). Mr. John R. Wigham, the inventor of the gas system, personally supervised the installation and working of

his apparatus, and the experiments were witnessed at various times by representatives of the Governments of France, Germany, Denmark, Norway and Sweden, Russia, Italy, Spain, Brazil, the United States and Canada; as also by many members of scientific and engineering bodies at home and abroad.

On the site of the experiments,—South Foreland,—three strong wooden towers were erected, in which were installed respectively the electric light, the gas light, and the oil light. The electric light was produced by three of De Meritens magneto machines, each containing sixty permanent magnets of horseshoe form, eight laminated pieces to every magnet, the whole disposed in five rings of twelve magnets each, and associated with five discs revolving within them, each having twenty-four coils on its outer ring, the revolving portion being run at a speed of six hundred revolutions per minute. The gas light was, as has been said, on the Wigham system; the burners, four in number, being each composed of one hundred and eight jets, compactly fitted within a circle of eleven and a quarter inches

in diameter. The lowest of the burners, which were superposed, was made in rings, removable, according to the intensity of the light required to be invoked, by twenties in a ring, until the number of jets was reduced to twenty-eight, the others being constantly maintained at their normal power. The oil light was produced by three six-wick concentric lamps,—also superposed,—of the Trinity House “Douglass” old pattern, consuming paraffin, having a flashing point of 154 deg. Fah. Each light was surrounded by an optical apparatus, arranged for producing both fixed and revolving effects, which were witnessed at sea as well as on shore, while actual measurements of the lights were obtained in a photometric gallery, three hundred and eighty feet long by eight feet wide, erected near the permanent lighthouse premises.

Omitting any detailed description of the various observations and results of these prolonged experiments, the general conclusions at which the committee arrived may be summarised as follows. The electric light, the report states, was demonstrated to be the most powerful of the three

luminaries, not only in clear weather, but also in haze, mist, rain or snow ; and has, to a limited extent, even greater penetration in actual fog. Its first cost was found to be below that of gas, but its annual maintenance slightly in excess of gas, and considerably above that of oil, owing chiefly to the necessity for placing an engineer, with a special staff of trained assistants, in charge of an electric light establishment. The committee, however, admitted that, in clear weather, the electric light is not popular with sailors, chiefly on account of its dazzling effect at short ranges ; and did not recommend its general adoption around the coast, but only its limited use for bold headlands. The gas light, under the multiform system of Mr. Wigham, was declared to be an unquestionably fine one, but not practically superior in intensity to the oil light. The flexibility of the gas light is, the committee pointed out, an advantage in enabling its power to be varied at pleasure, and the system is, they added, well suited for the superposed arrangement. The great heat, however, which it generates under the multiform

system was, in their opinion, a serious drawback to its use, such heat being destructive of the optical apparatus (an experience actually realized at South Foreland) detrimental to the health of the attendant keeper, and involving a serious risk of fire to the structure. Besides all this, its cost is considerably greater than that of a first-class oil light. The satisfactory performance of the oil light has been already referred to. Its chief merit, in comparison with gas,—with which, as has been shown, it successfully copes in power,—is, the report states, its immensely greater economy. The further advantages claimed, by the committee, for oil were that no complicated process of manufacture at the lighthouse renders the system unsuitable, like gas, for rock stations; that the management of the lamps is extremely simple, and that the heat generated by oil is considerably less than that inseparable from the gas system.

The report of the committee concluded by stating their opinion, as the result of the enquiry, that oil is the most suitable and economical illuminant for the ordinary necessities of lighthouse illumination, and

that electricity offers the greatest advantages for important headlands, or landfalls, where a very powerful light is needed.

It may have been noticed by the reader that the name of Professor Tyndall, who had, for many years, rendered such conspicuous service in his capacity as scientific adviser to the lighthouse authorities of this country, does not appear in the list of the eminent men who technically assisted in this investigation. Unfortunately, the Professor resigned all connection with lighthouse matters in the initial stages of the arrangements for conducting this very enquiry. He had for a considerable time espoused, with all the enthusiasm of his Celtic nature, the cause of the inventor of the gas system, Mr. John R. Wigham, whom he looked upon as a clever and meritorious inventor who was not having fair play; and, as regards this particular investigation, objected to Sir James Douglass, who had himself invented oil burners, being allowed practically to sit in judgment on a rival's scheme. Sir James declined to admit, by word or act, that, though his previous experience of the Wigham system was

unfavourable, he was, therefore, incapable of modifying his views on the subject, should fresh facts warrant his so doing; and, his Board supporting him in this attitude, the loss of their distinguished scientific adviser was the unhappy consequence. No one, who was acquainted with the circumstances, questioned the Professor's chivalrous conduct in this affair. He was not a rich man, yet he relinquished an income of several hundreds a year, rather than be a party to what he deemed an unjust arrangement. But, though his motives were thus disinterested, it does not follow that his views were correct; as to which latter point, however, the time has passed, even if this were the place, which it is not, for the expression of any opinion.

With reference to the experiments,—the last in which Sir James Douglass took part,—for ascertaining the actual powers of lights, the authorities of the Trinity House had, a considerable time prior to 1889, adopted some practical measures with that object; but an impetus was, undoubtedly, given to the question by a resolution of the Washington International Maritime Conference of that

year, to the effect "that a uniform classification of lights, based on luminous intensity, be adopted." Up to that date the mariner, it is true, was told, in the published official information for his guidance,—the British Admiralty List, for instance,—that a light was of a certain "order"; but this, for various reasons, afforded little indication of its intensity. Accordingly, during the years 1891-2, the engineers to the English, Scotch, and Irish Lighthouse Boards,—Sir James Douglass, Mr. D. A. Stevenson and Mr. William Douglass,—assisted by Mr. T. Matthews, the present engineer-in-chief to the Trinity House, subjected to photometric measurement, at the South Foreland, each description of burner and optical apparatus used in the lighthouse services of the United Kingdom; and now the Admiralty List gives the actual intensity of every light, in addition to the information which it before contained, such intensity being represented by a "pyre," or standard of one thousand candles. For example, the very first light mentioned in this publication is the Bishop Rock, which is described as white, group-flashing, one minute, D (which means dioptric) 57 to 170½,

i.e., fifty-seven thousand candles minimum intensity, and one hundred and seventy thousand five hundred candles maximum intensity. The mariner, now, therefore, not only knows, from its individuality, what light he is looking at, but also what power it possesses, and is thus greatly assisted in calculating his distances.

In the preparations for the several experiments which have been described, as in the performance of whatever share he was called upon to take in directing them, Sir James displayed the same irrepressible zeal that characterised him in all things. Mr. J. Sparling, who was the engineer-in-charge at South Foreland electric lighthouses previous to, and during, the protracted investigation of the subject of lighthouse illuminants, states: "There was such a consuming desire, on the part of Sir James, to cram all he could, in the way of work, into the twenty-four hours that he never seemed to trouble himself about food or rest"; and again: "When Mr. Harold Dixon, Mr. Vernon Harcourt and others were taking measurements in the photometric shed, Sir James would be engaged the whole

day with them, being satisfied with a few sandwiches for luncheon; he would stay there until 6.0 p.m., go to dinner, and afterwards occupy himself in taking observations at the huts until midnight, or accompanying gentlemen over the experimental towers, sometimes walking back just before we would put out the lights" (day-break). Nor was he only thus full of energy, but also, as the same witness says, "full of resource." "In fact," adds Mr. Sparling: "to be with him was to be inspired,"—a remark as truthful as it is telling.

And, in illustration of another phase of Sir James' personality, Mr. Robert Smith, a foreman at the Trinity House Blackwall workshops, who has taken an active part in most of the important experiments that have been carried out by the English light-house authorities during the past twenty-five years, thus writes: "A notable feature in the character of Sir James was the power he had of evoking loyal and even enthusiastic service. This was due to his habit of putting himself in the place of those who worked for or with him, so that they knew *that* to be true which he has been heard to say:

‘I never ask a man to do that which I would not do myself if necessary.’ Those who have been closely associated with him have many times seen him put ‘his shoulder to the wheel’ in a way that a smaller man would have thought undignified, but they felt only increased respect and even affection for him. A perfect memory, for not only the faces, but the personalities of those who served him, no matter what their grade, and his evident sincerity of belief that they were doing their best, put them on honour, to try and be worthy of the trust reposed in them. Just as Dr. Arnold’s boys felt that they must do their best because the Doctor believed in them, so those who worked under Sir James Douglass felt.”

Very much in the nature of experiments, and, therefore, finding suitable mention in this place, were the duties which periodically took Sir James to the works, near Birmingham, of Messrs. Chance Brothers & Co., who, as already stated, are the sole makers in this country of dioptric apparatus for lighthouses. During the whole of the time that he was at the Trinity House he paid frequent visits thither,—often in the company

of Professor Tyndall,—for the purpose of inspecting and testing some beautiful combination of lenses and prisms that had been completed for installation ; in allusion to which visits Mr. James Kenward, who, throughout the greater part of the period in question, was the manager of Messrs. Chance's lighthouse department, thus writes: "The cardinal element in the professional character of Sir James Douglass was perhaps *thoroughness*. Others can speak as to how this was illustrated in his labours for the Trinity House generally. I can speak with full knowledge of that part of them which came under my notice during a connexion with him of many years. . . . Then his energy and unweariedness were not less worthy of note. I had many opportunities of observing this in his visits to the Lighthouse Works of Messrs. Chance, both in company with Professor Tyndall, and alone, for the purpose of examining the finished apparatus constructed by that firm. Not only was he careful to note every item stipulated by the specifications, but he was prompt to suggest any possible improvement, whether optical or mechanical, throughout

the apparatus. Dr. Tyndall has often spoken to myself and others of the great aptness, skill and discrimination he found in his colleague." And a foreman lamp-maker, Mr. W. Rathbone, who served under Mr. Kenward, as he still does under Mr. H. J. Stobart, the present manager of Messrs. Chance's lighthouse department, thus describes, in phrases luminous like his burners, how Sir James appeared to him and his fellow-mechanics: "His soul was in his work, and in his work he literally spent himself. . . . Sir James made a lasting impression upon me by his strength of character. He was manly; he was firm, strict, but reasonable. He had confidence in his own power and ability, consequently it was not necessary for him to *appear* to have these qualities. When he had once settled a matter one felt that it would be all right. . . . I can confirm what I have written by conversations I have had many times with our men; all had similar impressions. If the work were ready it was always a pleasure to meet Sir James; if not ready then we had to look out for it; and if matters went wrong we knew about

it. . . . Because Sir James was chief engineer he was not opinionated. Like all men of his calibre he was ever ready to listen to suggestions; being practical he realized that it is easier to expect than to get. He always knew that what was once said by a great man was true, and is true: 'The mental and physical power of man cannot always overcome the inertia of the material.'" While another leading assistant employed on a different branch of work in the lighthouse department of Messrs. Chance, viz.: Mr. Alfred Pendrous, says: "I fancy I can see him now, coming here to examine a 'Douglass Lantern'; how he would take off his coat and hat, roll up his shirt sleeves, and thoroughly go into every detail of the job"!

CHAPTER XVII.

SIR JAMES DOUGLASS, in addition to being, from 1887, a Fellow of the Royal Society, was a Member of the Council, a Vice-President, and, had his health been preserved, would in a few years have been President, of the Institution of Civil Engineers and of the Institution of Mechanical Engineers. He was also a Member of the Council of the Institution of Electrical Engineers, and a Member of the Smeatonian Society of Engineers. To his duties in connection with these offices he brought to bear all that capacity and energy of which mention has been so often made in the foregoing pages. This fact is sufficiently illustrated by the following testimonies, borne by Mr. James Forrest and Mr. Alfred Bache, who, until lately, had been for so long the able and indefatigable secretaries of the two first-named Institutions, which indeed owe no small portion of their prosperity to the wisdom and zeal of those officials. "Sir James Douglass," says Mr. Forrest, "was,

British Association, because its members travelled through Canada before, instead of after, the meeting. Captain Bedford Pim was a most popular leader, not only because of his gracious presence and genial manners,—"a magnificent specimen of an Englishman" one of the Canadian papers said of him,—and because he had been a brave and gallant sailor and arctic explorer, but because it was he who originally proposed, and by his persistence brought about, the Montreal meeting. The idea when first mooted was, to use his own words, "laughed to scorn. My old friends thought I had taken leave of my senses, and I got terribly chaffed about it." Even when, in the following year, his renewed proposal, which was seconded by Sir Richard Temple, was carried many felt dubious about the result. "You won't get fifty members to go," said Sir John Lubbock (now Lord Avebury), to his gallant friend, who replied that he was sure at least five hundred would; and, as a matter of fact, about a thousand in all went out, and the meeting was a prodigious success. Among the Bedford Pim party, besides Sir James, Lady, and Miss Alice

Douglass, was their old and revered friend Mr. James Glaisher F.R.S., the distinguished aeronaut and meteorologist,—a desirable and delightful companion, whether in a balloon, or on *terra-firma*. Even then he was affectionately known among his *confrères* as “the patriarch”; and, though now in his ninety-second year, “age cannot wither” him, “nor custom stale” his “infinite variety.” The party went from the Mersey in the “Lake Huron” (Beaver Line), direct to Montreal, where they arrived on the 27th of July. After staying there, sight-seeing, for a few days, they proceeded, as guests of the Canadian Pacific Railway Company, to the Rocky Mountains, which was the furthest point the wonderful line to Vancouver had then reached, visiting on the way Ontario, Toronto and Niagara. “My father,” says Miss Douglass, “enjoyed the Falls more than anything up to this time, and studied them from every available point of view on both sides.” Resuming their journey, via Lakes Huron and Superior, they again took the Canadian Pacific Railway at Port Arthur, and arrived at Kicking Horse Pass

on the 11th of August, having inspected some Indian encampments *en route*. "We saw several hundred of the red skins," said Captain Bedford Pim; "but even the ladies were disappointed in the evident degeneracy of the 'Noble Savage' from 'Le Cerf Agile' and 'The last of the Mohicans'; their chief tendency now being to beg for tobacco, tea, or in fact anything which the travellers would give them." "My father," says Miss Douglass, "was greatly interested in the engineering difficulties of the line in the mountains, and laid some of the sleepers at the end of the track." No train had previously crossed the summit of the Rockies, and Lady Douglass was the first of the party to do so, consequently, said Captain Bedford Pim, "she became the heroine of the hour." On the return journey, Winnipeg was visited, to enable the travellers to inspect some of the Railway Company's model farms, and an eighteen mile drive took them to Fort Qu'Appelle, where Captain Bedford Pim met a young friend,—the grandson of an English peer,—who had just bought a farm for six thousand dollars, and "informed

me" (the Captain) "that he was quite a 'dab' at making butter." His partner, also an aristocrat, was equally proud of his talent for making *bread*; and a neighbour, an Oxford man of high intellectual attainments, was getting thirty dollars a month as gardener at the Fort,—“just the kind you want to settle in the Northwest,” said the Captain, “not too big for his boots.” How all this would have delighted the heart of Mr. Ruskin! At Fort Qu’Appelle the Hudson’s Bay stores were visited, and another drive of twenty-five miles across the prairies brought the party to Indian Head. Winnipeg and Port Arthur were again reached, and finally, on the 25th, Montreal. Interviewed by a newspaper reporter, after this extensive trip, Sir James said that he never beheld more magnificent scenery in his life. They had traversed about one thousand miles of prairie as flat as the page of a book, and then the glorious scenery of the Rockies burst upon them. The most marvellous thing about the Rockies was that they were wooded up to the very summit. There was not a single crevice, which had room for a tree, that was

not covered with pines. In this respect they differed from any other mountains he had ever beheld. Then, from the summit, could be seen the illimitable primeval forest, stretching away below them as far as the eye could reach, until it was lost against the horizon. He was deeply impressed, as well as greatly charmed, with this magnificent spectacle. The timber, of which he was a judge, seemed of the best class, the fibre as soft as flax, and infinitely superior to any in the Province of Quebec. The prospect of future development, suggested by all he had seen, was simply boundless. That the vast region through which they had passed would yet be populous settlements he had not the least doubt. It only required to be known to be properly appreciated. The journey there and back was not accomplished without considerable hardship. The ladies of the party, especially, felt the loss of the conveniences and comforts to which they had been accustomed. Had they taken an ample supply of food all would have been well. As it was, but for the little they did take, they must often have wanted. The rough young fellows on

the cars would eat up all the food at the refreshment stations (which were mostly rude tents), and consequently those who wished to preserve the courtesies of civilized life had to want. But, considering the enormous length of the journey, and the fact that it was through an unpeopled region for the most part, they fared tolerably. Not a single member of the party regretted the trip; on the contrary they would not have missed for a great deal the wonderful experience which had been theirs.

The proceedings of the British Association commenced on the 27th of August, Lord Rayleigh, F.R.S., now scientific adviser to the Trinity House, being the President, and Sir Frederick Bramwell, F.R.S., presiding over the mechanical section, before which Sir James read a paper on "Improvements in Coast Signals." "At Montreal a very interesting acquaintance, that was afterwards renewed in England," says Miss Douglass, "was made with the explorers Lieutenants Greeley and Ray, who had just arrived there after their terrible experiences in the Arctic regions." On the 2nd of September the party left for the

meeting, at Philadelphia, of the American Association for the Advancement of Science, Sir James going by way of Lake George and the Hudson river to New York. Washington was afterwards visited, then New York again, whence they sailed for England by the White Star Line on the 15th of September.

This was the first long holiday that Sir James ever had, and he gave himself up to the enjoyment of it with all the enthusiasm of his ardent nature. He carried with him, however, an observing eye, and a receptive mind, for whatever wonderful things there were to see in Canada and the United States, and notably displayed, on several occasions, his characteristic nerve and practicalness. Thus, when the party were once on board a lake steamer, a paraffin lamp was upset in their cabin, and the place set on fire; but, before there was time for panic, Sir James had put out the flames with his overcoat. Another steamer, by which they were passengers, stranded on the banks of a river where she had gone for firewood. No efforts to get her off succeeded until he took the matter in hand, when she was safely floated. And, lastly, at a hotel where the party stayed for

several days, he was impressed with the inadequate means of escape provided in case of fire, interviewed the manager, and made suggestions which, if carried out, would probably have prevented the sad loss of life that occurred when the house was afterwards entirely burned down.

Sir James was also a governor of Dulwich College, and, on the grounds of "distinction in science," of University College, London. His duties in the former capacity were important, and most zealously and efficiently discharged. The Rev. Canon Carver D.D., who held the office of head master of the College for twenty-five years, during which period, under his fostering care, it flourished greatly,—the number of boys increasing in that time from twelve to six hundred,—thus writes of Sir James: "It was certainly a remarkable testimony to the high esteem in which he was held in Dulwich (the place of his residence) that he was chosen by the head and assistant masters of the College as their representative upon the Board of Governors of this great foundation, which took office in 1883 for ten years, under a new scheme of the Charity

Commissioners. He brought, it need scarcely be said, to the duties of this new position the good sense and intelligence, with the scrupulous care and attention, which characterised his whole work in life. It is an evidence of no little versatility of talent that he was able so readily to adapt himself to the discharge of duties for which the labours and experience of his earlier years can have done little to prepare him. His special efforts were directed, at Dulwich, to the development of the engineering side of the school; and it was under his advice and constant supervision that the laboratory and class rooms of the engineering department were constructed, and fitted up with the necessary machinery and apparatus for teaching. It is well known how successful this branch of the instruction given at Dulwich College has proved."

It is unnecessary, in this place, to multiply instances to prove, what has been so fully shown throughout the course of this narrative, viz: that Sir James Douglass did nothing in a perfunctory manner, but, whatever task he undertook, so performed it as if *that* had been the one work which he was sent into the world to accomplish.

CHAPTER XVIII.

SIR JAMES continued to discharge the duties of his position at the Trinity House beyond the usual age-limit for retirement, viz. : sixty-five years, a special arrangement having, in the interest of the service, been made with that object. But an attack of paralysis, in March 1892, incapacitated him for further work, and his formal resignation of the office he had so long, and so worthily, filled took place in the ensuing autumn. The Elder Brethren wrote, through their secretary, Mr. Charles A. Kent, expressing their "great regret" that the condition of his health had led to "the cessation of his active and brilliant career" at so much earlier a date than had been anticipated, and placed upon record "their high appreciation of the ability, energy and perseverance" which had been displayed by him in carrying out, as their engineer-in-chief, the important works with which he had been entrusted, and their

“heartly acknowledgment of the many benefits that had been conferred upon navigation at large” as the result of his “achievements.”

Sir James partially, however, recovered his health, the last years of his life having been spent at Bonchurch, Isle of Wight. Yet he was never, at any time after his first illness, much more than the wreck of his former self,—a wreck painful to contemplate. It is sad enough to see the once strong and vigorous frame wasted by the ravages of disease and suffering. But, when this is so, the *memory* of the beholder has to be vividly exercised,—often no easy task,—before the full force of the painful contrast can be felt. In Sir James’ case, the strength and the weakness were visible together. There was the stalwart body, the ruddy, weather-beaten countenance, as suggestive of health as formerly, with the faltering gait, and all the other unmistakable signs of helplessness, to show how terrible was the change which he had undergone. But the sufferer bore his affliction nobly. As he had been a brave man in health, so, as might have been expected, he was a patient man in sickness ; for are not bravery and

patience but different manifestations of one and the same virtue, viz. : courage ? He felt that he had accomplished his life's work, and submitted himself to the will of Providence with a quiet, cheerful resignation that was touching to witness. "We must not give other people our sorrows to bear," he once said to a member of his family who had gently reproached him for hiding the pain he was suffering. Fortunately for him he had, throughout his life, amid much to distract him from such a pursuit, sedulously cultivated the domestic virtues. Thus, though possessed of an iron constitution and an unconquerable will,—though

"endued as with a sense
And faculty for storm and turbulence,"—

he was really, in all his family relationships, the gentlest and homeliest of men. His mother used to say that when, before his marriage, he lived under his parents' roof, she had no need of a daughter, for he was just like one to her. She was often an invalid, and James was the most thoughtful of nurses. Nor was there ever a more devoted husband. Miss Alice Douglass writes : "My mother, who was very delicate for a long time, was always his

first thought, and he was never really happy away from her. She accompanied him sometimes in his visits to the lighthouses, and, when he was absent alone, the morning letter never failed, nor did he ever return without some little trifle." The same highly competent pen thus depicts his parental character: "I never recollect my father out of temper, or even moody and self-occupied. Little time as he had to devote himself to his children, he managed to be completely one with them. No hours of our day were quite so full of fun and happiness as those he spent with us. When we came down in the morning, till he left for town, he was not allowed a moment alone. Breakfast was a ceaseless merry chatter, chiefly about our doings. He entered thoroughly into all our fun, able to sympathise as fully with the children in the nursery as with the elder ones, and, although never checking our talk, yet making us, unconsciously, be at our best, for we knew that quarrels, or unkind judgments, would hurt him. Little time as he had before leaving for London, he always read prayers and sang a hymn with us. In order to allow for this, breakfast was at seven in

summer and half past in winter. Sunday was our especial holiday, for then we had him to ourselves, except for one hour in the afternoon, when our mother would insist on his taking a short rest. When fine we spent as much time as possible in the garden ; but, wherever we were, he would always keep us merry or interested. During the day he liked us all to repeat to him the collect for that Sunday and a hymn ; this was done even by the big sons home from college, because father liked it. Prizes played a great part in his educational system, but they were not promised, so the work was not *done* for them, but were only given at *any* time, that no one should feel jealousy. Improvement in some branch or other was generally discovered in each of us, so that all would feel equally cheered. I remember my mother often looking up from her book, herself laughing, to say, " James ! you are really worse than the children," and, certainly, none of us entered into games with more zest. Perhaps the secret of it was that, whatever he was doing, *that*, for the moment, completely absorbed him. This, probably, accounted for the love he won from all. He would listen to his

companion for the time being, with great interest, and, if there was any way in which he could render assistance, it would be done, even at the sacrifice of his valuable time." This is a charming picture, the beauty of which would be marred by any addition from the hand of a stranger, who has, indeed, no right to intermeddle with such things.

It was merciful that the paralysis from which Sir James suffered had not affected his intellect, except that any prolonged mental effort wearied him. He was thus able to enjoy, almost up to the last, the society of his family and friends, and many of those simple domestic pleasures which, in health, had been so precious to him, also the delights of desultory reading,—of which his busy career had previously largely deprived him,—his flowers, and his livestock, which latter is thus described in a letter he wrote during the early stages of his illness: "I presume that you have heard of my last pet,—a baby grey parrot from the Congo, carefully selected by a friend for talking qualities, only two months old. So far it is a very sweet-tempered

creature, and promises to talk soon. I have now plenty of company, Rollo (that was the dog) twenty-seven fowls, three canaries, two parrots, and a very prettily-marked and sweet-tempered cat. I fancy you cannot boast of such a family." Then, when he had left Dulwich and settled at Bonchurch, there was the sight, which he loved so well, of the glorious sea whose waves rippled, or thundered, just below the beautiful grounds of his house, and of the stately ships which, owing in no small measure to his own most useful labours, were being guided in safety across the trackless deep. Often, too, Lady Douglass would take him for pleasant drives about the lovely island, a favourite resort at such times being St. Catherine's lighthouse, where, amid the electrical machinery and appliances which he had himself installed, and in the company of the engineer-in-charge, Mr. H. C. Millett, for whom he had a warm regard, he spent many a happy hour. The sorrow and suffering which marked the closing scenes of his life were, therefore, not without substantial alleviations, for which he was ever grateful, dwelling little on the

blessings he had lost, but much on those that were yet his.

He died, rather suddenly, after another attack of paralysis, on the 19th of June 1898, in his seventy-second year, and is buried in the little cemetery at Bonchurch.

With regard to his qualities as a *man*, it may be said that, highly gifted as he was in intellect, remarkable for shrewd common sense, and possessed of business capacities of a high order, he was, in private intercourse, singularly simple and unworldly, a special favourite, therefore, with children, who were always attracted to him. In bearing and manners, he was exceedingly modest, nor had he only the charity that "is not puffed up," but that which "thinketh no evil." "Those have not been my temptations, so there is no merit in not having yielded to them," he would say, in deprecation of any comparison of himself with one whose conduct had been the subject of unfavourable comment. Moreover, though disinclined to take lax, sentimental views of things, especially where the principles of right and wrong were concerned, nor accustomed to wear his heart upon his sleeve, he always

knew how to season justice with mercy. Mr. Alfred Bache, who has already been quoted, thus writes on this point: "To myself it seemed that his spirit and action on various occasions brought to light, and illustrated, a fresh interpretation of the familiar adage 'be just before you are generous':—namely that, while it is a matter of duty that justice should precede generosity, it is no less, but equally, a matter of duty that generosity should follow justice." Further, while simple in his tastes and abstemious in his habits,—for he hated every form of luxuriousness,—he gave and lent with prodigality. Lastly, he was personally a man of the highest character. "His undoubted influence with others," says Mr. James Forrest,—so capable an authority,—“may be ascribed to the rectitude of his conduct in all the relations of life, to unswerving honesty of purpose which made his word his bond, to the fearless expression of his opinions when once carefully formed,—all qualities which won for him unbounded respect as a God-fearing man;” relative to which latter phrase it may be observed that Sir James’ piety was

sincere, if (or rather *because*) unobtrusive ; for, though he spoke little on the subject of religion, he had none the less on that account,—nay, rather, had all the more, seeing he was not accustomed to dissipate it in words. Of course, he was not without his failings ; but these were small, while his virtues were great.

Coming now to his *official* merits, which, after all, are the proper subject, as they are the main justification, of this biography, it should be stated that the qualities, in addition to the dash and daring, the inventive-ness and resource, of which mention has already been fully made, that chiefly distinguished Sir James Douglass were,

First: A high and chivalrous sense of duty. As he had often risked his life in the discharge of the arduous labours of his calling, so he was always prepared to do so ; and, early and late, devoted himself to his work with an enthusiasm that was quite infectious. Not less faithfully than forcibly does Mr. Kenward, who has been quoted in former chapters, thus write of his old friend: " He never spared himself. He would rush from south to north, east to west, with scant time for food or

repose. He would face dangers on sea and land, climb ladders, scale rocks and lantern tops, watch in light-rooms the burning of his admirable lamps, and the movements of the complex clockwork, and in short inspect and control the abounding details of a great lighthouse as a matter of duty and loyalty to the Elder Brethren and to the public service." And Professor Tyndall, with whom Sir James was so long and so closely associated in official matters, often expressed his astonishment at the wondrous activity of his colleague. "Your indefatigable engineer," and similar phrases, repeatedly occur in that eminent man's reports to the Trinity House during the period that he and Sir James worked together. While Canon Carver, who also knew the latter intimately, has said: "He was one, as it appeared to me, who never asked whether the work before him was specially agreeable or congenial, or such as might promote his personal advancement; it was enough for him that it was a *duty*, and he threw himself into its performance with all the force of his strong will and resolute energy, and his unsparing self-negation." The sudden collapse of Sir James' health, at

a time when it appeared to be in its usual virile condition, was only the natural result of the ceaseless mental and physical strain to which he subjected himself. In other matters, too, a conscientious zeal for the interests of his employers ever actuated him. He had, in the execution of the important works with which he was entrusted, the practical disbursing of very large sums of public money, and never spared himself, or allowed his subordinates to spare themselves, any personal trouble to ensure the utmost possible economy, combined with efficiency. It is true that his life's efforts were crowned with success. The Corporation whom he so well served appreciated and liberally rewarded him ; an easy competence, if not riches, came to him ; many learned and distinguished societies enrolled his name among their members ; his Queen honoured him ; but he would have been the same zealous and faithful servant had Fortune frowned, instead of thus smiling, on him ; for he loved and followed Duty for herself, not merely for the outward and visible prizes with which she sometimes rewards men.

Secondly : Indomitable energy and force of character. His concentration of purpose was, indeed, remarkable. Whatsoever his hand found to do, he truly did with his might. Obstacles, that would have daunted an ordinary man, only stimulated him to greater exertion, for he held, with Emerson, that such things "exist to be surmounted"; and to undertake a task was, in his case, to accomplish it. To him, indeed, the words with which Dr. Johnson concludes his life of Milton are singularly appropriate : "Difficulties vanished at his touch; he was born for whatever is arduous."

As a chief, he exacted hard work from those who served under him, but then he worked harder himself, and, if intolerant of carelessness and stupidity, he treasured no resentment, but, having censured the offender, never afterwards mentioned the incident.

Of course, he did not escape criticism. There were those who, while acknowledging his many great qualities, thought him, sometimes, to be wanting in breadth of perception; to be biased in favour of his own views; prone to see things only in one light. And, to a certain extent, such persons judged correctly.

But his lack of an "open mind" on questions of procedure was *after*, not *before*, his decision was taken. In *arriving at* an opinion as to the best course to adopt, in given circumstances, he was careful and patient in the extreme, collecting with unwearied diligence all necessary data to enable him to judge aright; but, having *completed* that process, he was far too wise a man to fritter away his energy, and destroy his usefulness, by considering, when the time had come for action, whether, after all, there might not be some better way of attaining his purpose. He did not want to find, and would not discuss, a better way, now that it was too late to walk in it. So some people said he was "narrow." In this restricted sense, he *was* narrow; but therein lay one of the chief secrets of his strength.

In conclusion: lighthouses are being, and will be, constructed though Sir James Douglass is no longer alive to build them; that important branch of the public service to which his life was devoted performs, and will perform, its beneficent labours without him; but the works which he carried out, the improvements which he wrought, for the

protection of life and property at sea, will long survive as monuments of his genius, and the example of his pluck and daring, his zeal and energy, prove an inspiration to lighthouse builders yet unborn.

THE END.

