

MEMOIRS
OF
HYDROGRAPHY

INCLUDING

*Brief Biographies of the Principal Officers who
have Served in*

H.M. NAVAL SURVEYING SERVICE

BETWEEN THE YEARS 1750 and 1885

COMPILED BY

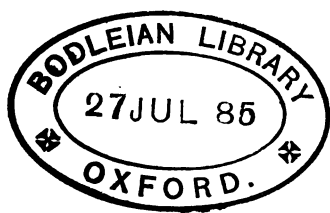
COMMANDER L. S. DAWSON, R.N.

IN TWO PARTS.

PART II.—1830 to 1885.

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PREFACE.

IN the compilation of Part II. of the Memoirs of Hydrography, the endeavour has been to give the services of the many excellent surveying officers of the late Indian Navy, equal prominence with those of the Royal Navy.

Except in the geographical abridgment, under the heading of "*Progress of Marine Surveys*" attached to the Memoirs of the various Hydrographers, the personal services of officers still on the Active List, and employed in the surveying service of the Royal Navy, have not been alluded to; thereby the lines of official etiquette will not have been over-stepped.

L. S. D.

January, 1885.

CONTENTS OF PART II.

CHAPTER I.

	PAGE
Beaufort, Progress 1829 to 1854, Fitzroy, Belcher, Graves, Raper, Blackwood, Barral, Arlett, Frazer, Owen Stanley, J. L. Stokes, Sullivan, Berard, Collinson, Lloyd, Otter, Kellett, La Place, Schubert, Haines, Nolloth, Brock, Spratt, C. G. Robinson, Sheringham, Williams, Becher, Bate, Church, Powell, E. J. Bedford, Elwon, Ethersey, Carless, G. A. Bedford, James Wood, Wolfe, Balleny, Wilkes, W. Allen, Maury, Miles, Mooney, R. B. Beechey, P. Shortland, Yule, Lord, Burdwood, Dayman, Drury, Barrow, Christopher, John Wood, Harding, Kortright, Johnson, Du Petit Thouars, Lawrance, Klint, W. Smyth, Dunsterville, Cox, F. W. L. Thomas, Biddlecombe, Gordon, Bird Allen, Curtis, Edye, F. Robinson, Bouchier, Orlebar, Mercer, Veitch, Alldridge, Glover, Felix Jones, Whitelock, Montriou	1

CHAPTER II.

Washington, Progress 1854 to 1863, Smith, Sanders, Selby, Grieve, E. K. Calver, Pullen, Aird, Hoskyn, Jeffery, Richards, Sidney, Skead, Usborne, Scott Taylor, Burstal, Cudlip, A. D. Taylor, Constable, Creyke, Ward, Heathcote, Stanton, Bewsher, Sweny, Fell	93
---	----

CHAPTER III.

Richards, Progress 1863 to 1874, Mansell, Davis, Whish, Parsons, Ward, Bullock, Brooker, Chimmo, Inskip, McDougal, Hall, Mayne, Reed, Pender, Wilkinson, Nares, Wilds, Hutchison, Hull, May, St. John, Collingwood, Howard, Bedwell, Gray	134
---	-----

CHAPTER IV.

Evans, Progress 1874 to 1884, Appendix, Marine Surveys of India, United States Coast Survey, Chronological Table of Discovery, Early History of Chronometers and their Introduction as Aids to Navigation in the Royal Navy .	179
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REAR-ADMIRAL SIR FRANCIS BEAUFORT, K.C.B., D.C.L., F.R.S.,

Hydrographer, 1820 to 1855.

CHAPTER I.

Fitzroy, Belcher, Graves, Raper, Blackwood, Barral, Arlett, Frazer, Owen Stanley, J. L. Stokes, Sullivan, Berard, Collinson, Lloyd, Otter, Kellett, La Place, Schubert, Haines, Nolloth, Brock, Spratt, C. G. Robinson, Sheringham, Williams, Becher, Bate, Church, Powell, E. J. Bedford, Elwon, Ethersey, Carless, G. A. Bedford, Frazer, James Wood, Wolfe, Balleny, Wilkes, W. Allen, Maury, Miles, Mooney, R. B. Beechey, P. Shortland, Yule, Lord, Burdwood, Dayman, Drury, Kerhallet, Montravel, John Wood, Harding, Kortright, Johnson, Du Petit Thouars, Lawrence, Klint, W. Smyth, Dunsterville, Cox, F. W. L. Thomas, R. B. Beechey, Biddlecombe, Gordon, Bird Allen, Curtis, Edye, F. Robinson, Bouchier, Orlebar, Mercer, Veitch, Alldridge, Dayman, Glover, Felix Jones, Whitelock, Montrieu.

Francis Beaufort, born in 1774, was second son of the late Rev. Daniel A. Beaufort, D.D., Rector of Navan, county Meath, and Vicar of Collon, county Louth, a divine of great learning and piety, descended from an ancient and noble French family, and author of one of the best maps of Ireland, and of a valuable memoir on the topographical and civil and ecclesiastical state of that country. His sister was the fourth wife of the late Richard L. Edgeworth, the celebrated writer on education and inventions, father by a former marriage of Miss Maria Edgeworth, the distinguished novelist.

He entered the Navy 21st June, 1787, his name being borne as a volunteer on the books of the *Colossus*, but his first voyage was made in the *Vansittart*, East Indiaman, as a "guinea pig"—that is in virtue of the payment of a hundred guineas, and here he afforded valuable assistance to his commander, Captain Lestock Wilson, in surveying the Strait of Gaspar. This survey was just completed when the *Vansittart* struck upon a rock off the island of Banca, near the spot where the *Transit* went down in 1857. A hole was stove, and all effort had to be made to keep the ship afloat, till the flat shore of Sumatra could be reached. She was run aground on an island, seven miles from Banca, the crew escaping in the boats, with the loss of six lives. This occurred in August, 1789.

On Beaufort's return to England from the East he became midshipman of the *Latona* 38, and afterwards the *Aquilon* 32, one of Lord Howe's repeaters in the action off Brest of the 1st of June, 1794. Upon the return of Lord Howe to Portsmouth with six French ships of the line, the King and Royal Family, who came to inspect the captures, went on board the *Aquilon* to sail round the fleet. It was probably about this period that he so nearly perished from drowning—he described himself “as a youngster at Portsmouth in one of the king's ships”—no record of the year is given, but in a letter to Dr. Wollaston describing the sensations experienced on the occasion, published in the Autobiography of Sir John Barrow, he states that the principal events of his past life passed before him as in a panorama, each act being accompanied by a consciousness of right or wrong. He was saved, however, and after undergoing the process of emptying the water he had swallowed by letting his head hang downwards, being bled, chafed, and having gin administered he recovered. The feelings as consciousness returned, being described by him, as the reverse in every point to those which he had just experienced. Interesting in itself, the story is valuable as coming from one, as singularly truthful in recording experience, as skilled in detailing it. For some years Beaufort was the sole surviving officer of Lord Howe's action previously alluded to. Following his captain, the Honble. Robert Stopford, to the *Phaeton* he was serving in that ship when Cornwallis made his celebrated retreat from the French fleet, 17th June, 1795. In this ship he performed a deed of great gallantry, boarding with the barge and two cutters under his orders, and capturing after an obstinate resistance the Spanish polacre-rigged ship, *San Joseph*, of 24 guns, 34 seamen, and 22 soldiers, moored under the protection of 5 guns of the fortress *Frangerola*, near Malaga, and flanked by a French privateer. For this affair Lieutenant Beaufort, who had received a wound in the head and several slugs through his left arm and body, was rewarded with a Commander's commission, and a pension of £45. 12s. 6d.; this was increased in 1815 to £125 per annum.

From November, 1803, to June, 1804, he gratuitously devoted his time to the formation of a line of telegraphs between Dublin and Galway, an object of great importance as long as Ireland was liable to invasion from continental enemies. For this, declining any other acknowledgment, he received the thanks of Government.

In June, 1805, he obtained command of the *Woolwich* 44, *armée en flute* in which he convoyed from India, sixteen Indiamen, in 1806. In 1807, he was engaged in surveying the River Plate, proceeding thence to the Cape and Mauritius.

In 1809, in command of the *Blossom* sloop-of-war, he was employed on the coast of Spain, at Quebec and in convoying merchant vessels. Obtaining post rank in May, 1810, he was appointed to command the frigate *Fredericksteen*, but he did not join until December, in the meantime being occupied in protecting the outward-bound trade to Portugal, Cadiz, and Gibraltar in accompanying two Spanish line-of-battle ships to Minorca; and in acting for some months as Captain of the *Ville de Paris*, a first-rate, in the fleet off Toulon, under Sir Edward Pellew.

In 1811, Beaufort was selected to survey the coast of Karamania, the result of which was, not only a capital survey, but a review of the country as illustrated by the remains of antiquity. Beaufort's “Karamania” was the great book of travels of its day—sound, substantial, and learned, and full of interest, both to the man of science and the scholar. It was this book that induced Fellowes, Spratt, Forbes, and Charles Newton, to Asia Minor, to relate of the works of art extant there, and to bring over the Kalicarnassian marbles to the British Museum.

After much hazardous service against the pirates in Greek waters, Captain Beaufort commenced the survey of the coast of Syria, in the course of which he nearly lost his life.

In June, 1812, his party were surrounded by armed Turks, led by a crazy Dervish, and he was wounded in the hip-joint so seriously, that the wonder was that he ever walked again. It was a severe struggle, between life and death, and in the following October, when the ship paid off, he was still undergoing much pain from the exfoliation of the bone.

He employed his enforced leisure by preparing for the Admiralty, a set of charts of the coasts of Asia Minor, the Archipelago, Black Sea, and Northern Africa, finished and arranged so as to be fit for engraving without further aid.

In 1829, Sir John Barrow recommended Captain Beaufort to Lord Melville for the post of Hydrographer, declaring that he had no equal in that line and very few in most other branches of science. There were many applicants previous to this, but in 1829, when Parry resigned and left for Australia, the selection was confined to a choice of two—either Captain Peter Heywood (formerly midshipman of the *Bounty*) or Captain Beaufort. It has been said that Captain Heywood had the vacant office offered him, but declined. Whether this was so or not, Lord Melville, acting under the advice of Sir John Barrow, appointed Captain Beaufort to the Hydrographership, and very early he made his office the model on which Copenhagen and St. Petersburg constructed theirs. Everywhere Hydrography took a new form and existence through the life and energy which he put into his work.

When he entered the Admiralty he found his department a mere map-office—small, cheerless, out of the way, altogether unfit and inadequate. Maritime surveying on an extended scale was only beginning. We were not yet in full possession of the labours of Flinders, Smyth, King and Owen, and the Hydrographer had been considered the supporter rather than the guide or originator of nautical surveys. The state of the surveying service was by no means satisfactory; scarcely a foreign or colonial survey was in existence; the coasts of England were but partially sounded, while in Scotland and Ireland nothing really definite had been undertaken. He began a great series of works, in which he intended to comprise all the maritime surveys of the world—our own coasts still shamefully obscure, being destined for a thorough exploration in the first place. Whatever depended on his own energy was done thoroughly throughout his whole term of office; but he had to endure the affliction, which breaks the heart of every highly qualified servant of Government—the baffling of his aims and plans by failure of sympathy in those who hold the power and the purse—manifested either in opposition to useful projects, or parsimony in providing for them. After Beaufort had so shown what his office might be as to stimulate nearly every Government in Europe, he was compelled to see them all gradually outstripping his own. It is no small mortification to compare our Hydrographical Department with that at Paris, or with those at St. Petersburg, Copenhagen and Washington. “The natural tendency of men is to undervalue what they cannot understand,” with bitter truth these words were uttered from the chair of the Royal Society. But this is digressive.

Captain Beaufort had a remarkable power of discerning and appropriating ability to its right object whenever it came in his way; and at every turn of his life he was using this power on behalf of others, yet he could not avail himself of it on his own. He was so restricted in his office that he had no subordinate who could be a comrade in his labours, and what he had at heart had to be done by his own hand. His industry sustained by principle appeared something miraculous. Day by day, for a quarter of a century, he might be seen entering the Admiralty as the clock struck nine, and for eight hours he worked in a way which few men even understand. A man who carried his own letter-paper and pens to the Admiralty for his private correspondence, was not one to occupy his official hours with other than official business. For many years he rose at five, and worked for three hours before his official day began. This, too, at the age of between sixty and seventy years.

As if he had not enough to do in his own department, in order to get the maps of the “Diffusion of Useful Knowledge” sold for sixpence each, instead of a shilling, he offered to superintend their preparation. There was no pedantry in his industry any more than in his knowledge. He never seemed in a hurry, giving intrepid advice when it was asked, and honest rebuke when it was deserved, and might be effectual.

On one occasion to a senior captain and eminent surveyor at that time in charge of a colonial survey, but whose weightier supplementary occupations in his own opinion rendered it desirable that he should depute a portion of his duties to another, he thus expressed himself.

"Nor indeed do I think any divided command of that sort would succeed were the abilities and experience of the officer you mention of the highest order. I have no idea that a survey can be well achieved unless the planner and director is actually the principal executive labourer also, and with a mind intent on the one great object, to the exclusion of all other pursuits. If, therefore, your private affairs or your legislative duties, or your health, or any other cause leads you to wish for rest, say so to me at once, and I will endeavour to provide some officer, to whom you can impart all your views, and who will be able to guide the extensive machinery you have organised."

Not as a mere servant of the Board, but as a man with mind and energy to think and act for himself, did Captain Beaufort undertake the onerous duties that lay before him. He knew that there was scarcely what could be termed a correct chart of any portion of the globe, in existence when he accepted office. Seconded by an able staff of surveyors, proud to serve under one so competent to appreciate their labours, he soon gave them occupation. Fitzroy was despatched to complete the survey of South America; Belcher, Kellett and Wood were sent to the south coast of America and of Mexico; Vidal, Denham, Skyring and Arlett were charged to complete the west coast of Africa; Blackwood and Owen Stanley to survey the northern coast of Australia and New Guinea; Sullivan went to the Falkland Islands and River Plate; Stokes and Drury to New Zealand; Bate to Palawan; Collinson to China; Owen and Barnett to the West Indies; Bayfield and Shortland to the St. Lawrence and Nova Scotia; Graves and Spratt (pupils of Smyth) to the Greek Archipelago; Hewett to the North Sea; Beechey to the Irish Sea, while others spread their labours over different portions of the United Kingdom. The master mind of Beaufort, which directed these efforts for a quarter of a century, did more for the advancement of maritime geography than was effected by all the surveyors of European countries united. All men of science, as well as travellers and geographical explorers, always obtained from Beaufort the clearest information, communicated in the heartiest manner. Not trusting to others what he could do with his own pair of compasses and pen, there was no public servant who more uprightly served his Sovereign and country.

His first wife (the daughter of his first commander, Captain Lestock Wilson) died of a lingering and most painful disease. His second marriage with a sister of Maria Edgeworth (the novelist) secured a friend to himself and daughters for many of the latter years of his life. He became Rear-Admiral on the retired list rather than surrender his office; but he never liked his "yellow flag," and his retirement was but slightly solaced by the K.C.B. conferred in 1848.

Among his public honors were those of the successive offices of Commissioner of Pilotage (1835), Tidal Harbour Commission (1845). He was corresponding member of the Institute of France; D.C.L. of Oxford; and an honorary member of various foreign societies. He was long a distinguished Fellow of the Royal Astronomical and Geological Societies, and one of the founders of the Royal Geographical Society.

On his retirement from the post of Hydrographer a subscription was entered into for the purpose of presenting him with a tribute of respect in consideration of his long and eminent services. This took the form of a half-length portrait, painted by Stephen Pearce, which now graces the walls of the painted hall at Greenwich, the interest of that part of the fund remaining over being devoted to the founding of the "Beaufort Testimonial," the blue riband of the junior executive officers of the Navy even to the present day, the winner, in a minor sense, representing the Senior Naval Wrangler of the year.

The sudden expansion of railway projects so increased his work that his health began to fail in 1855—he was then entering his eighty-first year. Early in that year he was obliged to give up and go home to a sick bed, where he lingered until the 17th December, 1857. It has been related of him, that when lying thus, in his eighty-third year patiently waiting for the end, his face beamed with joyous hope when the memorial to H.M. Government praying for a last search after Franklin, was brought for his signature.

He was short in stature, but his countenance, in which astute intelligence, honesty, and genial kindness revealed the man so truly, could nowhere pass without notice. The Navy and society in general, past and present, should be thankful together that such a man was spared to them so long.

It has been said that upon entering upon the duties of office as Hydrographer in 1829, Sir Francis Beaufort at once recognised the gravity and responsibility of the position.

He had his immediate staff to organise, for at this time they consisted of what might truly be termed journeymen, paid their wages like other labourers on a Saturday night; indeed, it was not until the year 1831, that the Hydrographic Office was formed into a separate department under the Admiralty; framing its own estimates, and providing, under the sanction of the Board, a programme of duties to be undertaken each succeeding year. With these difficulties before him, but persuaded that he would be afforded every help in overcoming them, Captain Beaufort accepted the post of Hydrographer; and fortunately, not alone for our service, the long lease of a quarter of a century of official life was accorded to him; during all these years he steadily and systematically pursued the attainment of the objects he had laid down, and lived to see them in great part accomplished. Although the survey of the coasts of the United Kingdom had been determined on, and partially commenced before he succeeded to office, they were, under his direction and auspices, far advanced towards completion. Surveys of the Mediterranean, the African coast, the Pacific ocean, South America, Australia, New Zealand and China were set on foot; and the various Arctic Expeditions which sailed from England for exploration, and in the search for Franklin's ships, between the years 1845 and 1854, received their instructions prepared by his hand. Many of the accomplished surveying officers—trained in the Beaufort school—have passed away, King, Wickham, Belcher, Smyth, Fitzroy, Foster, Owen Stanley, Skyring, Vidal, Beechy, Otter, Frazer, Williams, being among them. Many still remain whose names will be long remembered in connection with their works, and unworthy and feeble as may be the power, of the pen of he who now endeavours, to rescue such names, and such works from oblivion, still feeling assured that the longer such a chronicle is withheld, the more difficult becomes the task of the chronicler; added to the fact that in the advanced state, and rapid development of other sciences in modern days, Hydrography is lagging more and more behind, encourage the temerity of the compiler of this small tribute to a branch of naval science, which, if much longer neglected must surely fail to be appreciated.

It was one of the maxims of Sir Francis Beaufort when Hydrographer, that no chart or other document was ever permitted to be made public until it had undergone his personal revision and critical examination. The consequence was that he left a vast mass of material behind him, the publication of which had not kept pace with its collection. It must be remembered however, that in the early days of his official life, and for some time after them, his personal supervision was positively necessary, and it is very difficult to depart from habits of this nature when once acquired.

In 1855, Sir Francis Beaufort retired from the Hydrographership, being at that time upwards of eighty years of age, with a share of worldly honors which, though conferred somewhat late in life, he never despised.

Captain John Washington, who had been since the commencement of the Russian war assisting him at the Admiralty, was selected to take his place, and succeeded to the office, at a time of unusual activity, when the energies of every individual in every department of the Admiralty were taxed to the uttermost, more especially, perhaps, the Hydrographic Department, which was called upon to furnish information of every conceivable kind from its rich store of undigested documents.

In October, 1828, the *Blossom* returned from her voyage round the world, under Captain Beechey.

In 1829, Lieutenant H. B. Beecher, who had served with Captain Basil Hall in the *Conway*, and Lieutenant Sheringham were appointed to assist the Hydrographer at the Admiralty, the latter left in the succeeding year.

In December, of this year, La Place sailed in *le Favorite* on his celebrated voyage around the world.

In 1830, Captain Vidal, with the brigs *Onyx* and *Leveret*, Lieutenants Dawson and Worth under his orders, was ordered to search for the Aitkin's Rock, a *vigia* oft-times reported to exist in the North Atlantic several miles westward of the west coast of Ireland. In this year the *Adventure* and *Beagle*, under Captain P. P. King and Commander Robert Fitzroy, returned to England.

In May, of this year, the names of Lieutenant Denham and C. Gepp Robinson appear on the books of the flagship at Plymouth for surveying service, the latter on the north coast of Wales.

In April, 1830, Lieutenant Sheringham was appointed to the *Prince Regent*, at Chatham, for the survey of the north coast of Wales. In May, the *Etna*, under Commander E. Belcher, who had been promoted at the termination of the *Blossom's* voyage, was commissioned for the West African survey. In July, Lieutenant G. A. Fraser was appointed assistant to Mudge in Dublin Bay, and in August, Lieutenant John Washington (afterwards hydrographer), was placed on the books of the *Royal George* at Sheerness for surveying service. In this year Lieutenant Barral, in *l'Emulation*, completed the operations of Roussin on the coast of Brazil, and surveyed part of the River Plate.

In 1831, the *Beagle* was commissioned to continue the survey of South America and the Falkland Islands, under Commander Fitzroy, Lieutenant John Wickham serving as First and B. J. Sullivan as Second Lieutenant.

The *Eden*, under Captain W. F. Owen, which had during the last part of her commission been sent from the west coast of Africa to the South American Station, was paid off at the latter end of this year, Lieutenant (afterward Vice-Admiral Sir) H. Kellet at that time being the First Lieutenant.

In November, the *Raven* cutter, Lieutenant Arlett, was despatched to the west coast of Africa as tender to the *Etna*.

In 1831-32, M. A. Berard surveyed the coast of Algiers, measuring his meridian distances between Algiers and Toulon.

In 1831, the name of Secretary of the Admiralty, the Right Honorable John Wilson Croker, LL.D., F.R.S., disappears from the Navy List, and he was succeeded by a naval officer, Captain the Hon. George Elliott, with Mr. John (afterwards Sir John) Barrow, still as second Secretary. This year saw the formation of the R.G.S., caused by blending the African and Palestine Associations, the first President being Viscount Goderich and the first Secretary, a naval officer, Captain Maconochie, R.N.

The British Association also sprung into life this year. The French Geographical Society had been already in existence for ten years.

In May, 1832, the *Beacon*, under Commander Copeland, with A. C. Dawson as First and T. S. Brock as Second Lieutenant, and the *Mastiff*, under Lieutenant Graves, were commissioned for surveying duties in the Grecian Archipelago.

In March, 1832, Lieutenant H. C. Otter was appointed to the books of the *Ocean* at Sheerness, as assistant to Lieutenant Michael Slater, on the north-east coast of England. In April, 1832, Lieutenant John Harding was appointed to assist Commander Mudge on the coast of Ireland.

In 1832, the Bombay Geographical Society was formed, having in view the elucidation of the geography of Western India and the surrounding countries, and mainly supported by the Marine Surveyors of the Indian Navy.

February, 1833, the *Jackdaw* schooner was commissioned by Lieutenant Barnett as tender to the *Thunder*. This vessel was lost March 10th, 1835, on the reef extending northward of Old Providence Island; charts, books, &c., were saved.

The first published set of Admiralty Tide Tables were issued in 1832.

In March, 1833, the *Thunder* was commissioned by Commander Richard Owen, in succession to the *Blossom*, which was paid off the previous year, Bird Allen being again the First Lieutenant, and Edward Dunsterville the Master. Commander Belcher having paid the *Etna* off, was appointed to survey St. George's Channel. In December, the *Etna* was again fitted for the west coast of Africa, under Lieutenant Arlett, with the *Raven* as tender, under Lieutenant H. Kellett.

In 1833, Lieutenant C. G. Robinson, one of Owen's midshipmen, was appointed to the books of one of the home harbour ships for the survey of the north coast of Wales.

Lieutenant-General Schubert, Director of the Chart Depôt, &c., of St. Petersburg, proceeded three times round the Baltic in 1833 in a steam vessel with 56 chronometers. M. Touchard, too, in *la Bonite*, observed meridian distances between Pondicherry, the Hooghly, Malacca, Singapore, Manila, Macao, Sandwich Islands, Callao, Payta and Valparaiso.

In 1834, in the East Indies, Captain Haines having surveyed the island of Socotra the previous year, continued to the coast of Arabia.

Officially Guaranteed Notices to Mariners were issued from the Admiralty for the first time in the year 1834.

In 1835, the *Sulphur* was fitted out under Captain F. W. Beechey for a continuation of the survey of the west coast of America, with the cutter *Starling* as tender, under Lieutenant Kellett; Beechey invalided at Valparaiso in the autumn of 1836, and Commander Belcher was taken from the Lancashire coast survey and appointed to the command.

In November, the schooner *Lark* left England as tender to the *Thunder* in the West Indies.

In 1837, the surveys of the Thames and Medway having met at the Nore Light, Captain Frederick Bullock was employed on the sands and channels between the Nore and Margate.

The Scottish shore had been examined by Captain Slater as far as the gulf of Cromarty. The Orkney Islands were in the skilful hands of Mr. George Thomas. When finished they presented the same singular and interesting features as the beautiful chart of the Shetland's issued from the Hydrographic Office in 1837.

Many of the old banks in the North Sea were found to have been erroneously placed by Captain Hewett, and others were discovered, the existence of which was not known before; one for instance, "The Falls," found to be ten miles longer than was supposed, while its ridge-like form—the character of all the North Sea banks—was found to be so narrow that a vessel might well have a deep water cast before and after crossing it, and remain ignorant of its existence.

Lieutenant Sheringham completed the examination of the coast of North Wales, and was continuing between Milford Haven and Cardigan Bay in South Wales.

Lieutenant Robinson was making progress to the northward in the survey of Solway Firth. The steam vessel *African*, commanded by Captain Beechey, R.N., was appointed to the survey of the Irish Channel too late in the year to have produced any great result.

The coast from Dublin round by north to Sligo Bay had been finished. Lieutenant Wolfe and his assistant were now employed on the navigable lakes of Ree and Derg, traversed by the Shannon.

The survey of the coast of Anatolia, under Lieutenant Graves, R.N., assisted by Lieutenant Brock, became united to that of Karamania by Captain Beaufort.

In West Africa Captain Vidal, R.N., who steadily devoted himself, during a period of ill-health, to complete this unpopular work, reached the parallel of the Bight of Benin during 1837, having already completed a survey of the Canary Islands.

In America, following the course of Captain Back in H.M.S. *Terror*, 120 miles of the north-east shores of Southampton Island, from Cape Comfort to Seahorse Point, were laid down for the first time on our charts by Lieutenant Owen Stanley.

In Canada, the charts resulting from the survey of the River St. Lawrence, from Quebec to its mouth by Captain Bayfield, R.N., were published; and the surveyors engaged completing the gulf of St. Lawrence, as well as the upper river from Quebec to Montreal.

At Port Phillip, in Australia, a town named Melbourne had been founded at the north-eastern angle of the bay, and from the latest accounts then received was rapidly increasing in population, and in flocks and herds, as the country was found admirably adapted for pasturage.

The nautical part of the expedition, under command of Lieutenant Wickham, R.N., to explore the N.W. coast of Australia, visited Swan River, and then proceeded to examine Dampier's Archipelago.

Lieutenants Grey and Lushington sailed from the Cape of Good Hope on the 5th of October, 1837, their intention being to convey the most useful animals, plants and seeds from Brazil, the Cape and Timor, to the interior of Australia, by way of the north-west coast.

In the beginning of 1838, two vessels, commanded by Sir Gordon Brewer and Lieutenant Owen Stanley, left England to establish a settlement at Port Essington on the north coast of Australia. The Bombay Geographical Society contributed to the *R. G. S. Journal* an account of the bore in the Gulf of Cambay, by Lieutenant Ethersey.

Lieutenant Carless continued upon the survey of the mouths of the Indus, commenced in 1836.

Surveys of the coast of Katiawar and Gulf of Cambay were completed by Lieutenants Whitelock and Ethersey.

Captain Moresby having completed the Maldive Islands, was similarly engaged in the Chagos Archipelago, after which he proceeded to make an examination of Saya de Malha bank, as well as the great and little Basses on the coast of Ceylon.

In 1838 the following were the surveys in progress:—

H.M.S. <i>Boxer</i>	River Thames.
Hired Boats	Coast of Wales.
H.M.S. <i>Fairy</i> and Tender	North Sea.
Hired Boats	Solway Firth.
H.M.S. <i>Mastiff</i> and Tender.	Orkney Islands.
Hired Boats	N.E. Coast of Scotland.
Hired Boats	Coast of Ireland.
Hired Boats	Lough Dey.
H.M.S. <i>African</i>	Irish Channel.
H.M.S. <i>Beacon</i>	Mediterranean.
H.M.S. <i>Magpie</i> }	
H.M.S. <i>Etna</i> }	West Coast of Africa.
H.M.S. <i>Raven</i> }	
H.M.S. <i>Thunder</i> }	West Indies.
H.M.S. <i>Lark</i> }	
Hired Schooner	Gulf and River St. Lawrence.
H.M.S. <i>Sulphur</i> }	West Coast of South America.
H.M.S. <i>Starling</i> }	
H.M.S. <i>Beagle</i>	N.W. Coast of Australia and Bass' Strait.

The largest sizes of charts engraved, viz., antiquarian or double elephant, were then generally sold for 3s., the next size 2s., and so on down to 6d.

For sale of charts the Admiralty employed a general agent, Bate, of 31, Poultry, sub-agents being appointed by that house.

In 1839, the surveys were the same as in 1838, except that of the west coast of Africa, which was discontinued in consequence of the sickness which prevailed in the vessels; and that in England, the party employed on the survey of the coast of Wales, proceeded to the coast of Cornwall.

In 1840, the same surveys continued; the Lough Derg party being transferred to the navigable parts of the River Shannon; and that of the Solway Frith was extended along the west coast of Scotland.

In 1841, the same arrangement, except that circumstances requiring the immediate survey of Portsmouth and Spithead, the Cornwall party were removed to that duty, in the *Sylvia* cutter; and that abroad, H.M.S. *Sulphur* and *Starling* quitted South America, and were employed in surveying the waters of China, and in co-operating with our squadron there.

In 1842—To the above surveys, the important investigation of the Barrier reefs of Australia and Torres Strait was this year added in the *Fly* and *Bramble*; the *Philomel* was sent to examine the harbours of the Falkland Islands, and a survey of the Azores was commenced in the *Styx* steamer; the *Sulphur* and *Starling* quitted the survey of the coast of China, but leaving the *Plover* and *Royalist* to continue that work. At home the *Shearwater* steam vessel, was appointed to the North Sea survey in place of the *Fairy* (unhappily lost at the close of 1840 with all hands), and the *Rocket* steam vessel was substituted for the *Sylvia* at Portsmouth and Spithead.

In 1843, the *Rocket* was replaced by the *Fearless* steamer; the *Shearwater* was sent to the west coast of Scotland survey, and the *Blazer* steamer to the North Sea, instead of the *Shearwater*. The survey of the coast of Lancashire and Cumberland was commenced in hired boats. Abroad, the survey of the Bay of Fundy was commenced by the *Columbia* steamer, and the *Beagle* returned from her survey of Bass Strait and the coast of Australia.

In 1844, at home, the south and western coasts of Ireland were so little known that an additional survey was commenced in Galway Bay, by means of hired boats, and the party in the River Shannon having finished that work, were directed to make a complete survey of Cork Harbour in the *Tartarus* steam vessel, which was replaced in the Thames by the *Porcupine*. The *Firefly* was made use of for sounding the Irish Channel, of which there was no accurate chart; the *Lucifer* steamer was appropriated to the east coast of Ireland survey, and the *Sparrow* ketch was given in lieu of hired boats for the survey of the north coast of Scotland. Abroad, with the close of the year, the survey of the Azores and the Madeiras terminated.

In 1845, H.M. ships *Herald* and *Pandora* were despatched to the Pacific to continue the survey of the west coast of America, from the point where that of the *Sulphur* and *Starling* broke off, and the *Avon* steamer proceeded to the Bight of Benin for a similar purpose. At home, the *Dasher* was substituted for the *Fearless* in the Portsmouth survey, and the *Tartarus* was taken from the south coast of Ireland survey, which was continued by means of hired boats.

In June of 1845, the Danish corvette *Galathea*, under Commodore Steen Bille, left Copenhagen for a voyage of exploration round the world, visiting India, China, and the Sandwich Islands. Valparaiso was touched at, Cape Horn rounded and Copenhagen returned to in August, 1847. The main object of the expedition was the survey and colonization of the Nicobar Islands, but a considerable collection of scientific observations resulted therefrom.

In 1846, the survey of the Isle of Man succeeded that of the coast of Lancashire by means of hired boats; and the great interior lakes of Corrib and Mask, in Ireland, were undertaken. Abroad the *Fly* returned from the survey of the Barrier reefs of Australia, leaving the survey to be continued by H.M.S. *Bramble* and a hired vessel. The *Philomel* having finished the survey of the Falklands, joined the squadron in the River Plate. The *Avon* returned from Africa, having completed the work assigned to her; and also the *Plover* from China, leaving the *Royalist* to carry on the remaining operations.

In the autumn of 1846, steam vessels were urgently required for the conveyance of meal, to relieve the famine on the coast of Ireland. In those days Admiralty surveys on the home stations were mostly carried on in small steam vessels. Accustomed as they were to inshore work, both in boats and ships, officers and men performed the relief service most effectually. The vessels were the *Blazer*, *Dasher*, *Firefly*, *Lucifer*, *Porcupine* and *Shearwater*.

At the conclusion of this important duty, these vessels, in 1847, were ordered not to resume their surveying duties, but to return to port and pay off, the officers being directed to carry on their surveys in hired boats with hired crews. Thus were the pick of Sir Francis Beaufort's flock captured *en masse* by the fowler's net of the political economist, much to the chagrin and disappointment of Sir Francis himself. Much time was thus lost, for there can be no comparison between the advantages of a steam vessel for sounding, over boats, or even sailing vessels.

In 1847, abroad, the *Rattlesnake* was sent to prosecute the survey of Torres Strait, in continuation of the work commenced in the *Fly*, and at the close of the year the *Columbia* was ordered home from the Bay of Fundy and paid off. H.M.S. *Acheron* was commissioned to survey the coasts and harbours of New Zealand. At home, in the spring of the year, the *Avon* steamer was established for the *Sparrow* on the coast of Scotland, the survey of which had advanced to Cape Wrath, and in the autumn, the *Blazer*, *Dasher*, *Firefly*, *Lucifer*, *Porcupine* and *Shearwater*, with a new set of officers, were employed in relieving the famine on the shores of Western Ireland.

From returns laid before Parliament in 1848, on the motion of Mr. Hume (Sessional Paper, 1848, No. 232) it was found that the expenditure of the Hydrographical Department (exclusive of Arctic and Antarctic expeditions) had been :—

In 1837-38	£68,517	In 1842-43	£142,235
In 1838-39	£59,202	In 1843-44	£134,126
In 1839-40	£58,862	In 1844-45	£126,583
In 1840-41	£52,517	In 1845-46	£178,782
In 1841-42	£91,832	In 1846-47	£123,678

Home Surveys, which had been interrupted for a while in 1847, were resumed in 1848. Captain Sheringham completed the south side of the Isle of Wight. Captain Bullock finished the coast of Essex and examined that of Kent, eastward of Dungeness; Commander Otter connected the shores of Scotland with the Hebrides; Captain Beechey was employed in the Bristol Channel; Captain Frazer prosecuted the survey of Waterford; Captain Wolfe continued the operations between the old Head of Kinsale and Mizen Head; Commander Bedford proceeding towards Clew Bay; Commander Beechey, the younger, proceeded along the coast between Clew Bay and Achil Head; and Commander Williams having finished the Isle of Man removed to Mount's Bay, of Cornwall.

Captain Graves, in the Mediterranean, directed his attention towards Cyprus. Moulmein River and the Gulf of Martaban had been surveyed by Lieut. Fell, I.N., this officer had also completed the survey of the Coromandel coast, as far north as the Santapilly rocks; in 1848, this officer was engaged surveying the coast of Pegu, between Cape Negrais and Martaban.

Lieut. Montrieu, I.N., continued his surveys of most of the harbours and anchorages on the coast of the southern Konkan and Malabar.

The survey of the south-east coast of Arabia, under Captains Haines and Sanders, I.N., in 1848, was also far advanced.

The sudden death of Lieut. Gordon, R.N., of H.M.'S *Royalist*, caused the survey of the S.W. coast of Borneo and the Natuna Islands to be suspended. Captain Owen Stanley, R.N., of the *Rattlesnake*, who had already surveyed Moreton Bay, Port Curtis and Sandy Island, re-examined Albany Island near Cape York.

Captain Stokes, of the *Acheron*, entrusted with the survey of New Zealand, had already commenced operations in that part of the world.

Captain Bayfield completed the shores of Prince Edward's Island, and continued to Cape Breton Island. Commander Shortland, who had been the assistant of Rear-Admiral W. F. Owen in the Bay of Fundy, was about to resume the survey where the Admiral left off.

Eight of the wind and current charts of Lieutenant Maury had been published in the United States.

Captain Barnett had been engaged on the survey of Antigua, Barbuda and the Antilles, and was to be succeeded, in 1848, by Lieut. Lawrence, hitherto second in command.

In 1849, Captain Sheringham surveyed the vicinity and dangers off St. Alban's Head, Captain Bullock continuing his examination from the entrance of the Thames to Newhaven. Commander Otter remained on the N.W. coast of Scotland and the Hebrides and Robinson followed on the survey from the Mull of Cantyre to the northward.

Captain Beechey was employed investigating the tidal phenomena of the Bristol Channel and the mouth of the Severn; Commander Williams explored the coast of Cornwall, while Ireland remained under the examination of Commanders Frazer, Bedford, and Beechey.

During this year the Hydrographic Office published 92 charts and plans, besides books and tables.

In the Mediterranean Captain Graves was employed in the neighbourhood of Candia; in China, Commander Bate continued on the coast of Borneo, while Captain J. L. Stokes examined the seaboard of New Zealand with regard to ports and places fit for settlement.

Captain Owen Stanley was engaged in the approaches to Torres Strait, having almost completed his examination of the Louisiade Archipelago.

Captain Bayfield continued the southern shores of the Gulf of St. Lawrence; Commander Shortland in the Bay of Fundy; and Lieutenant Lawrence among the West India Islands.

In India, the coast of Arabia had been completed; a survey of the tidal channels of the Indus was finished by Mr. Fennell, of the Indian Navy, and sheets of the entrance to the Red Sea by Haines; the south-east coast of Arabia by Haines and Saunders; and Socotra and the N.E. coast of Africa by Lieut. Grieve engraved and published. A chart of the northern part of the Laccadive Islands by Selby and Taylor; the harbours of Dewghur, Gheriah, Cochin, and Calicut Roads, by Montriou, Taylor, and Moyses, were also published.

In France, Admiral Matthieu succeeded to the directorship of the Hydrographical Office at Paris, he had formerly served, in 1816, under Captain Guattier in the triangulation of certain parts of the Grecian Archipelago. The two first volumes of Colonel Chesney's expedition to the Euphrates and Tigris Rivers in 1835-36-37, were published in 1848.

In 1850, the south and east coasts of England were continued upon by Captains Bullock, Sheringham and Williams; those of Ireland by Frazer, Church, Bedford and R. Beechey; and those of Scotland by Robinson, Otter and Thomas. Captain Frederick Beechey pursued his investigation of the tides of the North Sea in continuation of those of the Channel. Mr. Calver completed a chart on a scale of 27 inches to the mile of the River Tyne to above Shields and Newcastle.

Abroad, Captain Bayfield completed the Gulf of St. Lawrence and commenced that of Breton Island, Commander Shortland continuing in the Bay of Fundy, which was commenced by the veteran, Rear-Admiral W. F. Owen. In the West Indies the Antilles and Caribbee Islands were the scene of Lieutenant Lawrence's labours. Commander Spratt followed up Captain Graves's work in Candia, the ship which the latter had been commanding proving too expensive.

From Australia came the news of Captain Owen Stanley, who commanded the *Rattlesnake* in the survey of the Louisiade Archipelago. Captain Lort Stokes, in the *Acheron*, was reported to have already worn out his vessel in examining the shores of New Zealand, and Commander Drury, in the *Pandora*, was directed to carry out the New Zealand survey to its completion.

The *Royalist* under Commander Bate continued the survey of the China Sea. Captain Kellett made some discoveries in Behring Strait, and Commander Pullen added some islands to the American shore of the Polar Sea.

In 1851 and 1852, the surveying service remained in much the same condition as in 1850. Captain Sheringham retired from active service.

Sir Roderick Murchison had succeeded to the Presidential chair of the Royal Geographical Society, and the yearly account of the services of H.M. Naval Surveyors appears to have simultaneously ceased to be published in the yearly address of that Society's proceedings. On the succession of Lord Ellesmere to the Presidency in 1853, the narrative report of the Hydrographer on this subject is again renewed.

In 1853, the survey of the south coast of England was completed as far westward as the Bill of Portland, including the Goodwin Sands, Spithead and the Needles Channel. Between Portland and the Start Point Lieutenant Cox had succeeded Captain W. L. Sheringham in charge of the survey. Commander Williams having completed the south-west angle of England, was employed to the eastward along the coast of Cornwall.

Lieutenant Alldridge, who had been engaged on the rivers Parrett and Bridgewater, and in Milford Haven, was preparing to undertake the rivers Taw and Torridge.

Mr. E. K. Calver, who had published a treatise on "The Conservation and Improvement of Tidal Rivers," completed elaborate surveys of the Humber and Tees, on the east coast of England.

Mr. Dillon, in H.M. cutter *Gossamer*, was engaged in bringing to a close Admiral Beechey's observations on the tides of the North Sea and English Channel, discussions upon which had appeared in Part II. of the Philosophical Transactions of the Royal Society for 1851.

Lieutenant Thomas had nearly completed a plan of the Firth of Forth.

Commander Bedford was engaged on the coast of Argyleshire, and Commander Wood to the survey of the Minch, Commander Otter having been transferred to the Baltic Fleet.

Commander Church was struggling manfully in the estuary of the Kenmare River against the rains and gales of the south-west coast of Ireland.

Captains Bedford and R. Beechey were engaged on the coasts of Sligo and Donegal.

Mr. R. Hoskyn had minutely laid down Lough Foyle and the entrance of Londonderry River, and was pushing along the north coast towards the Irish Channel.

Captains B. Sullivan and Otter in the Baltic, and Brock and Spratt in the Black Sea, were acting as pioneers to the fleets under Admirals Napier and Dundas.

From China, Commander Bate, in 1853, returned in the *Royalist*, bringing with him a survey of Palawan Island, and was engaged in preparing his charts for publication at the Admiralty. Mr. Richards, in the *Saracen*, had reached Hong Kong, and was about to commence his labours in the Eastern Seas.

In New Zealand, Commander B. Drury, in the *Pandora*, had contributed excellent work, though with inferior means.

Commander Shortland had devoted the summer of the past season to the Manan Islands in the Bay of Fundy.

Mr. Parsons, in the *Scorpion*, had resumed the survey of the West India Islands and shores of the Gulf of Mexico, having succeeded Lieutenant Lawrence in the command, the latter having succumbed to fever in January, 1853, at Santa Cruz. Port Escoces, in the Isthmus of Darien, was Mr. Parsons' first undertaking.

Captain Denham, in the *Herald*, with *Torch* as tender, under Lieutenant Chimmo, had broken ground in the neighbourhood of Fiji and the Friendly Islands.

At the Cape of Good Hope, Lieutenant Dayman, late of the *Rattlesnake* in New Guinea, had completed a careful survey from Cape Hanglip to Cape Agulhas.

Captain Bayfield was engaged on the north-east coast of Nova Scotia, his last work at that time being a chart of Halifax Bay.

A foreigner in his description of the British Admiralty, in the *Reveux des deux Mondes*, of about this time, says, "That to a Committee of Officers such as the Board of Admiralty, that has to consider the movements of the fleet in all parts of the world, the Hydrographic Office acts as a beacon light to their councils! Without it, how could their opinions be formed on many matters concerning those ships? Is a ship overtaken by a hurricane and damaged? Does a ship come into collision with another? Does a ship strike upon a rock? or does she actually get on shore on some foreign coast? How essential for consideration of the circumstances in all these cases is the Chart, and if so, how much more essential that it should be unimpeachable for its accuracy. The Board of Admiralty without such information wherewith to consider the despatches continually arriving from abroad, containing transactions of the fleet in distant seas, would literally be in the dark. Such facts are sufficiently known to the Board, and it wisely keeps not only the charts but also an able superintending officer in the hydrographer to assist in forming its opinion and to light them to their conclusions, or to confirm them in any view they may take as to the measures to be adopted.

"Now these charts compose the first great emporium of hydrography in the whole world, and yet it is one of the most modest dimensions; an office which ministers not only to the safety of the ships of the State, but also those of the Mercantile Marine in the great and important subject of hydrography is cooped up in a few rooms of the upper floor of the Admiralty at Whitehall. Compared with what it was in former years, it is now in a superior condition, but compared with what such an office should be for a great Maritime State like England, it is but the mere nucleus of what it ought to be. Consider the various subjects it includes—the chart of the sea shore, or the ocean itself, its depths, dangers, currents and channels, its shores, their lights, beacons, and buoys, their tides, and the influence of these on the weather, thus throwing into the arena of subjects, that of meteorology, to say nothing of pilotage, the natural offspring of hydrography.

"Were all these subjects duly treated, along with that formidable one, the compilation of Sailing Directions, to accompany them, and the construction of the chart itself, they might well occupy a building the size of the Admiralty itself, and yet not be overdone. And yet all these matters individually and collectively with the daily passing events, relating to them at home and abroad, are constantly going forward under the hydrographer's auspices, without confusion, in some half dozen rooms; which themselves and their connecting passage contain archives, in which are lodged numbers of copies of charts, for distribution to the fleet, as well as to foreign communities and governments. Well ought the Board of Admiralty to treasure up their hydrographical resources, so well known in the remotest corners of the world, and well should they make much of those busy heads, which are daily contributing under their own roof, with their mature judgment, to that solid safeguard which these charts, with their accompanying sailing directions, supply to those who choose to use them.

"Pure and unalloyed hydrography is an invaluable commodity—one that will repay the care bestowed on it, nay, the expenses of providing it, by conducing to the well-being of the country, in the promotion of commerce, in the safety of its fleets and in the despatch and celerity of navigation."

In 1855, when Captain Washington succeeded Sir Francis Beaufort as hydrographer, the foreign and colonial surveys were ten in number and comprised the Baltic (two parties), the Black Sea, China, South Pacific, Rio de la Plata amongst the foreign surveys, whereas the

colonial surveys consisted of Canada, Nova Scotia, the West Indies, Cape of Good Hope and New Zealand.

The home surveys were also ten in number, four of which were employed on the coasts of England, three in Scotland and three in Ireland.

In addition to his numerous duties as hydrographer, Admiral Beaufort was a member of the Committee for the re-construction of the Nautical Almanac, the Tonnage Committee of 1834, the various Arctic Committees, and the Board of Longitude.

The following were amongst the results of his earlier labours:—

Coast of Karamania in six sheets with Sailing Directions.
Plans of Kaloyeri Rocks, port in the Island of Syra, Cape Krio.
Sketch of the city and harbour of Rhodes.
Port Raphti, coast of Greece. Bay of Sighajik. Coast of Anatolia.
Promontory of Boodroom. Ports Sahib, Egri-liman and Sighajik.
Description of south coast of Asia Minor. 8vo. 1817.
Memoir of a survey of the coast of Karamania. 8vo. 1820.

REAR-ADMIRAL ROBERT FITZROY, C.B., F.R.S.

1829-36.

Robert Fitzroy, born in June, 1805, entered the Navy in October, 1819, obtained his lieutenancy September, 1824, and served afterwards under Capts. Sir John Phillimore and Arthur Bingham, in the *Thetis*, on the Mediterranean and South American stations; and in August, 1828, became flag-lieutenant at Rio Janeiro to Rear-Admiral R. W. Otway.

In 1825, the best charts of the South American coasts which had been made by Spain, or by Portugal, were found inadequate, and it was then that France and England undertook to survey those shores for the benefit of the world. The French examined the coasts of Brazil, the English those of Patagonia, Tierra del Fuego, Chile and Peru. In 1825, the *Adventure*, 330 tons, and *Beagle*, 235 tons, were prepared. Captain P. P. King was appointed to the former, in charge of the expedition. Captain Pringle Stokes commanded the latter. They sailed from England May, 1826.

Part of Eastern Patagonia, the greater portion of the strait of Magellan and of the western shores of Patagonia, had been examined, when the death of Captain Stokes caused a suspension of operations. Lieutenant Skyring, whose life was afterwards sacrificed at Murder Bay, on the west coast of Africa, was temporarily appointed to the *Beagle*, but afterwards superseded by the Commander-in-Chief, Rear-Admiral Otway, who placed his flag-lieutenant, Robert Fitzroy, in the vacancy, with the rank of Commander, dated November, 1828.

During 1829-30, the two vessels continued the survey, assisted by a tender, under Lieutenant Thomas Graves.

In the latter part of 1830 they returned to England, and in May, 1831, a paper descriptive of their labours was read before the Royal Geographical Society by Captain King. In the autumn of that year, the *Beagle* was again prepared, under Commander Fitzroy, to continue the same service in the same part of the world. At the end of 1831, she sailed from Plymouth. Charles Darwin, the great naturalist, accompanied the expedition as a volunteer, geology being his principal pursuit. Beginning with the south bank of the Rio de la Plata, the coast to Cape Horn was surveyed on a large scale, by the exertions of Lieutenant J. C. Wickham, J. L. Stokes and Mr. A. B. Osborne, who ran every risk, working night and day in two small decked boats and afterwards a tender. The *Beagle* took parts of the coast to the south, while her detached party were at work between Port Desire and Blanco Bay, and afterwards the Falkland Islands. Westward of Cape Horn, between forty-seven, south latitude and the River Guayaquil, the whole coasts of Chili and Peru were surveyed, no port or roadstead being omitted. Of the Chonos Archipelago, no chart existed. Of Chile,

the Spanish charts were 25 miles in error in latitude. Of the other coasts, a mixture of bad and good description, alternately plagued or assisted. Wherever the eyes of Malaspina, Espinosa or Bauza reached in the expedition of the *Atrevida* and *Dexubierta*, the old charts were correct, but not to be compared in detail with those of Fitzroy, or those in the vicinity of Lima made by the nautical school under Don Eduardo Carrasco and his predecessors. While the *Beagle* was at Valdivia the great earthquake of the 20th February, 1835, took place.

Half the coast of Chile was surveyed in detail by Lieutenant B. J. Sullivan, in a small schooner, lent for the occasion; the coast of Peru was laid down by Mr. Osborne in the same vessel, purchased from her owner and fitted out by the *Beagle*. Meanwhile the *Beagle* examined the Galapagos Islands, traversed the Pacific Ocean and returned to England by way of the Cape of Good Hope.

Making for Tahiti, three new islands were discovered on the way through the maze of the Pacific Archipelagos. Krusensteru's charts and directions were at that time the only ones of any use. Meridian distances being now the primary object (the *Beagle* carrying 22 chronometers), about seven days stay was made at the following places:—Tahiti, New Zealand (Bay of Islands), Port Jackson (Sydney), Hobart Town, King George's Sound, Keeling Islands (which were surveyed), Mauritius, Cape of Good Hope, St. Helena, Ascension, Bahia (Brazil), Pernambuco, Cape Verd Islands, Azores. At Falmouth the *Beagle* arrived in October, 1836. The whole chain of meridian distances round the world exceeded twenty-four hours by 33 seconds only, in a period of five years.

Mr. Osborne returned from Peru by way of Cape Horn; his little vessel of 35 tons burden was sold at Paita for more than her first cost. She had originally been purchased and fitted out and manned at Captain Fitzroy's expense, and he was not afterwards compensated by the Naval authorities for this voluntary act of zeal on the behalf of hydrography.

In May, 1837, Captain Fitzroy, whose post commission bore date December, 1834, was presented with the gold medal of the Royal Geographical Society, for the services he had rendered in the *Beagle* to the science of geography, which services, the Vice-President of the Society in making the award remarked, had entitled the recipient of the honour, "to be enrolled in the list of the most celebrated navigators, whose names adorn the maritime annals of this or any other country."

Captain Fitzroy did not again serve officially afloat, although he then and there stated, that if at any time his humble efforts should be thought useful, "he should be willing and proud to offer them, and prefer public duty to private happiness."

Captain Fitzroy sat, in 1841, as M.P. for the city of Durham; was appointed, September, 1842, Acting Conservator of the river Mersey; and in April, 1843 to 1848, filled the post of Governor and Commander-in-Chief of the colony of New Zealand.

When on the South American station, unwilling to quit his post without rendering his services in every sense complete, Captain Fitzroy had hired two additional vessels to finish off the examination of the coast of the Falkland Islands, and subsequently purchased a third, besides fitting out the *Beagle* to a great extent at his own expense. But as these gratuitous and noble efforts, which cost him several thousand pounds, had not been sanctioned by the Admiralty, he was never re-imbursed. In the latest years of his life his acquirements as a meteorologist induced the Government to institute, under the Board of Trade, a Meteorological Office superintended by Admiral Fitzroy, in the management of which he established the announcement to distant ports of coming storms. The labour which he bestowed in methodising and classifying all the known data, and the skill with which he organised his new system of telegraphic forecasts, and the method he established of storm signals or warnings for the prevention of shipwrecks, deservedly obtained for him the thanks of the country, and specially of all those engaged in mercantile and maritime pursuits.

In the very changeful climate of England his forecasts of storms did not always prove

correct, and this vexed and irritated him. Being of a high strung nervous temperament, and imbued with the highest state of honour and fidelity to his charge and agitated with over work, the strain proved too great for the brain which had surmounted so many difficulties, and led to his sadly terminating his own life.

Admiral Fitzroy was a C.B., F.R.S., Fellow of the Astronomical and Geographical Societies, and a Corresponding Member of the Institute of France. At his death his age was 59 years. Besides the numerous charts of the South American continent constructed under his guidance he was the author of the following:—

Voyages of the *Adventure* and *Beagle* in 1826-36, to the southern shores of South America. 4 vols. 8vo. 1839.

Sailing Directions for South America. Parts I. and II. 8vo.

On the application of Steam to Ships of War. 8vo.

On Great Circle Sailing. 12mo. 1858.

Swinging Ship for Deviation.

Notes on Meteorology.

Explanation of Meteorological Telegraphy and its Basis under trial at the Board of Trade. 8vo. 1862.

The Weather Book, a Manual of Practical Meteorology. 8vo. 1863.

Arrangements for Meteorological Telegraphy. 8vo. 1864.

Several papers in the Journal of the Royal Geographical Society, notably one on the Abrolhos Bank, in the Journal for 1832.

ADMIRAL SIR EDWARD BELCHER, Kt., C.B.

1830-52.

Edward Belcher, born in 1799, entered the Navy in April, 1812, on board the *Abercromby*, Capt. Fahie. While in that ship employed on the coast of France and on the north coast of Spain, he was frequently exposed in her boats to the fire of the batteries on Ile d'Aix, and was concerned in three attempts made by the guardboats to cut the cable of the French flagship, *La Montagne*. From the mastheads of the squadron he executed a survey of Basque Roads, and in so satisfactory a manner that he was complimented by the various Captains. In Feb., 1814, having attained the rating of Midshipman in Dec., 1812, and acted for some time as Aide-de-Camp to Capt. Fahie, he removed for a short time to the *Salvador del Mundo*, Capt. Robert Hall, lying at Plymouth; after which he became Flag-Midshipman in the *Bellerophon* to Sir Richard Keats, Commander-in-Chief at Newfoundland, assisting in the survey of St. John's Harbour. Rejoining Capt. Fahie in 1815, on board the *Malta*, he witnessed, in the course of the same year, the surrender of Naples, and acted as Interpreter and Aide-de-Camp to Capt. Fahie and to Capt. Edw. Brace in their intercourse with the Austrians at the siege of Gaeta. While engaged in the operations at the latter place he constructed a plan of the Bay. Removing to the *Superb*, Capt. Ekins, Mr. Belcher fought in her, as signal-midshipman, at the battle of Algiers, Aug., 1816. After the action he was selected, at the instance of Lord Exmouth, to make a plan of the batteries. When the *Superb*, on her return to England, became the recipient of visits from Admiralty and Royal personages, Mr. Belcher acted as barge-midshipman, and had the satisfaction of finding that the plan and views he had taken at Algiers were worthy the acceptance of H.R.H. the Duke of Gloucester. In March, 1817, he passed his examination at the Royal Naval College. About the same time he appears to have been engaged in the study of naval tactics with Capt. Ekins, who afterwards published a standard work on that subject. He subsequently joined Rear-Adm. Douglas, in the *Salisbury*, at Jamaica, whither he sailed in the *Sybil* with Sir Home Popham; and on the former officer hauling down his flag, he was promoted to the rank of Lieutenant July, 1818. His next appointment was March, 1819, to the *Myrmidon*, Capt. Henry John Collier, with the Algerine ambassador. For becoming the medium of communication between that personage and Capt. Leake, he received the thanks of the Dey, together with a handsome sword. From Algiers he proceeded to the western coast of Africa, where he rendered good service against the slave trade. Furthermore, he discovered that the principal slave-dealer on the coast was one

Capt. Kearney, of the Royal African Corps, who, upon his information, was outlawed. The papers relating to this transaction were laid before the House of Commons. In April, 1820, Mr. Belcher was compelled, by the state of his health, to invalid, and return to England, bearing with him, for his services, the recommendation of the Commander-in-Chief, the thanks of the Governor of Sierra Leone, and the "warmest approbation" of Capt. Leeke. During an interval which he now spent on shore he pursued the study of natural philosophy, and of the French and Spanish languages, and brought under the notice of the authorities a rudder, a gun-carriage, and an anchor, which he had invented. Although anxious for Polar enterprise, he was under the necessity of declining an invitation to accompany Capt. Parry in his expedition of 1821, owing to an arrangement he had made to serve again with his former Captain, then Rear-Admiral Fahie, whom he joined, towards the close of the same year, in the *Salisbury* at Bermuda. Soon afterwards he made a trip, at his own expense, to the United States, and, meeting at Saratoga with Sir Stratford Canning, the British Minister, was invited to accompany him as surveyor, as far as the boundary line. During nearly two years that the *Salisbury* was stationary at Bermuda he was actively employed "in surveying and making himself acquainted with the different intricate channels." It was at this period that he invented a method of "proving channels by boats, and of sounding up to an enemy's works by night." On the return home of the *Salisbury* in September, 1824, he volunteered to accompany Capt. Beechey in the *Blossom*, on a scientific voyage to the Pacific Ocean; and was appointed, in the following January, Assistant-Surveyor to the expedition. During the three years and a half that followed the *Blossom* twice visited the frozen regions for the purpose of co-operating with the expeditions under Franklin and Parry, and made numerous valuable additions to scientific knowledge. Upon every important service the command of the boats was intrusted to Mr. Belcher, who underwent many severe hardships, was wounded, and twice suffered wreck. Many contributions were made by him to the collections at the British Museum and of the Zoological and Geological Societies. He returned to England, and was paid off in October, 1828. His next appointment was to the *Southampton*, bearing the flag of Sir Edward Owen, in the East Indies. From that ship, in which he discharged the duties of Commander and Captain, he was promoted to the former rank, March, 1829. He returned home in the *Java*. In May, 1830, Capt. Belcher commissioned the *Ætna* surveying vessel, the equipment of which gave him the opportunity of introducing his *chronometer pendulous table* and other inventions, and of effecting arrangements, the sanitary character of which was proved by the fact that in three years and a half he did not lose a single man. At first he was employed on the coast of Africa, where his boats were for weeks absent 80 miles up the interior. He was next, in 1831, ordered to the *Douro*, to complete the survey from the bridge of boats to the sea. He continued in the *Douro* for the protection of British interests. As his vessel was endeavouring to escape from the river by night a fire was opened on her from the Sampaio battery, which created a good deal of carnage. At this juncture, Capt. Glascock, the senior British officer in the *Douro*, was appealed to by the Pedroite officers, but refused to interfere. He referred them, however, to Capt. Belcher, who, starting off in his boat, induced the officers at the Sampaio to desist firing, and, after rendering surgical assistance to the wounded on board the vessel, arranged with the forces of Dom Miguel that they should be landed as "distressed French and English subjects, and have conveyance, with full rations, to Lisbon." While he was in the *Douro*, Capt. Belcher carried on every communication between Captain Glascock and the Miguelites—that the direction of the boats on the river was always confided to him—that with the Miguelite General he established signals, through the medium of which British boats were respected—and that he placed British neutrality on such a footing that fresh provisions were supplied to our ships of war, and the officers allowed the free use of an excellent market. So popular was he with both parties that they were in the habit of meeting at his table, and had actually proposed to adjust the settlement of hostilities in his cabin on the very day that orders for his departure arrived from England. He left the *Douro* in April, 1833. After refitting at Lisbon, Capt. Belcher was sent to examine the Skerki shoals, lying between Sicily and Tunis, which occupied the attention of d'Urban, in Lord Nelson's time,

and of Capt. Smyth in 1823-4. The *Ætina* being paid off in Sept., 1833, he was appointed next—to the *Lightning* st.—19 May, 1835, to the *Carron* st.—Jan., 1836, to the *Terror* bomb, which vessel, as also the *Erebus*, he fitted for Arctic service—and Nov. following to the *Sulphur*, surveying vessel, a sixth-rate. We next find Capt. Belcher engaged on a survey of the coast of Lancashire, and suggesting the improvements which were made in the Ribble and at Port Fleetwood and Lancaster. On receiving his appointment to the *Sulphur*, which he joined in Feb., 1837, at Panama, he was ordered a passage in the *Echo* to Jamaica. After serving before Cartagena, under the broad pendant of Commodore Peyton, he proceeded in the *Sulphur* to the Pacific. On that station, in addition to his surveying duties, he was frequently placed in positions requiring the exercise of judgment. Being subsequently ordered to China, he joined in the hostilities there in progress. On 7 Jan., 1841, he united in the operations put into force against the forts at Chuenpee, and the same day effected the destruction, with the *Nemesis* and the boats of the *Calliope*, of 11 out of 13 war-junks. In the following month he led the storming party at the capture of Wangtung. During the advance of the British on Canton, we find the *Sulphur*, in company with three of the *Wellesley's* boats, destroying, on 2 March, near Whampoa, a masked battery, armed with 25 guns, and manned by about 250 chosen Tartar troops; 11 days after which exploit her Captain again acquired much credit for his zeal at the capture of several rafts, and of the last fort protecting the approaches to Canton. Capt. Belcher also distinguished himself by his great zeal at the ensuing reduction of that city; and, indeed, he appears to have been altogether indefatigable in the duties of sounding and exploring the various inlets through which the ships were carried, in their previous progress up the river. On 23 of the following May, at the outset of the operations which immediately preceded the second capture of the same city, Capt. Belcher, by a most spirited and judicious *reconnaissance*, established the practicability of effecting a landing of the troops at a point which had been before-hand selected by Sir Hugh Gough for that purpose. The value of his services on this occasion was warmly attested by the last-mentioned officer and by Sir Humphrey Fleming Senhouse. On the same day he caused the self-destruction of 28 of the enemy's vessels, and, having landed with a party at a mandarin temple at Tsingpoo, spiked and threw into the sea five small guns. He was awarded a Post-commission, May, 1841, a C.B. Oct. following, and Jan., 1843, the honour of Knighthood. On the return home of the *Sulphur* in 1842, he was immediately ordered to the Channel Islands, on secret service of a character which required from him the combined duties of Surveyor and Engineer, Artillery and Naval Officer. Upon the confidential report made by him, the Government acted, and he himself received the thanks of the Admiralty. On 18 Nov., 1842, Capt. Belcher was appointed to the *Samarang*, surveying vessel. In her he sailed for Borneo, on a mission connected with the position occupied by Mr. Brooke. While at that island, the *Samarang*, through no fault of his, became immersed in the waters of the Sarawak, and so remained from 16 July to 3 Aug., 1843, when, contrary to the general expectation, he succeeded, from his own resources, in recovering her. After visiting Brunei, and receiving from the Sultan an offer of the Island of Labuan, Sir Edward Belcher proceeded to the China seas, where he examined and gained the friendship of the natives of, the Madjicosima Islands, a group subject to Loo-choo and Japan, and which had been last visited by Broughton, who was wrecked there in 1797. On 4 June, 1844, he fell in with, in the Straits of Jilolo, and was attacked by a fleet of Illanon pirates. In the conflict which ensued the marauders were beaten. Sir Edwd. Belcher, however (whose conduct met the full approbation of the Board of Admiralty, and was declared highly creditable by Lord Palmerston, and who was thanked by a Court of Inquiry, instituted at the instance of the Dutch, for his forbearance and humanity under the provocation he had endured), received a wound so severe that Sir Wm. Burnett afterwards reported it to be worse than the loss of two limbs. He was, in consequence, granted a pension of £250, and the surgeon who cured him was presented with the Blane medal. He subsequently rescued the crew of the British barque *Premier* who had been wrecked, and had fallen into the hands of the natives on the eastern coast of Borneo, where he concluded treaties with the two Sultans concerned. He next, on arriving at Sooloo, had the good fortune to frustrate the success of a negotia-

Sir Edward Belcher was the author of the following works:—

On the construction of Armour-plated Ships of War. 4to. 1865.

Hong Kong.

Basilan Channel.

* Abridged chiefly from O'Byrne's Naval Biography.

CAPTAIN THOMAS GRAVES, R.N., F.R.S.

1828-53.

This well-known surveyor, who as Port Officer at Malta, fell under the knife of a Maltese assassin, was the son of a gallant naval officer of the same name and rank. Entering the Navy in 1816, and serving in several vessels on foreign stations, he was chosen through his merits to form one of the scientific complement of the *Adventure*, in which ship he played so able a part, that his Captain (afterwards Admiral) W. H. Smyth, and other officers strongly urged his promotion. During the next five years he was a companion of Rear-Admiral Philip P. King in his extensive surveys of the Straits of Magellan and the adjacent shores of South America, and it was only during that difficult service, and in the year 1827, that he was appointed a Lieutenant, *i.e.*, after ten years of arduous probation.

After performing, in conjunction with the Royal Engineers, a survey of Lough Neagh, in Ireland, the next ten years of the life of Captain Graves were spent in surveying the Greek Archipelago, first in command of the *Mastiff*, then the *Beacon*, and next of the *Volage* corvette.

These surveys were suddenly put a stop to on the score of economy by orders from the Admiralty, which both Sir Francis Beaufort and Admiral Smyth considered to be an "inscrutable measure," and a heavy blow was thus temporarily inflicted on this important branch of the naval service.

Whilst compiling about 100 charts and plans of the Grecian Archipelago—as interesting to the antiquary and historian as they are valuable to the navigator—Captain Graves had the singular merit of attracting to the *Beacon* as his friend and companion the well-known naturalist, Edward Forbes, then rising in the estimation of his contemporaries, and who, after passing nearly two years in dredging the Ægean Sea, and in developing the conditions of life and habits of submarine animals of various depths, threw a broad and new light upon geological science.

The name of Graves must therefore ever be associated with that of Edward Forbes. Captain Graves communicated to the R.G.S. a description of Skyros, and was the cause of the R.G.S. Journal being enriched by the instructive papers of his assistants, Spratt, and Leycester.

Ever zealous in advancing knowledge, he also afforded to Sir Charles Fellows assistance in the investigation of the antiquities of Lycia, that was duly acknowledged. Such conduct would appear to have called for some mark of public approbation; but although the Sultan and the King of Greece especially thanked Captain Graves he received no honour from his own country.

The offer of the post of Superintendent of the ports of Malta made by Sir W. Reid, the Governor, was willingly accepted and Captain Graves had carried on his duties in that capacity for three years when he received a mortal stab from a revengeful boatman.

The sad and sudden termination of Captain Graves's life spread a gloom over the whole of the inhabitants of Malta. Captain Graves had been elected a Fellow of the Royal Society in 1826, and he was one of the original members of the Royal Geographical Society. The following charts were published from his surveys:—

Valetta to Marsa Seirocco.
Valetta Harbours.
Montague Rocks.
Venetico to Cape Malea.
'Ieraka and Monemvasia Ports.
Kheli Port.
Hydra Bay, Spezzia, Dhoko.
Poros Island.
Ægina and Methana.
Ægina, Town and Port of.

Megalo-Kastron.
Suda Bay and Khanea.
Santorin Island.
Polykandro, Sikino and Nio Islands.
Milo, Anti Milo, Kimolo and Polino Islands.
Paros and Naxos Islands.
Trio Port, Paros Island.
Patmos, Arki and Lipso Islands.
Lero and Kalimno Islands.
Kos, Nisero and Piskopi Islands.

Kos, Town and Road of.
Rhodes Island.
Cape Eski Stamboul to Koum Kaleb.
Ports in Gulf of Vourlah.
Egri-liman Port.
Chesmeh.
Egrylar, Mersai and Sykia Ports.
Karabaghla, Kappari and Kos Channels.
Cape Krio with Cuidus Ruins.
Makry Port.
Cyprus Island.
Epidavro Port.
Salamis and Elensis Bays.
Peiræus.
Mandri Channel.
Athens Gulf.
Talanta and Orcos Channels with Lithda Islands.
Western Part of Euripo Channel.
Petali Gulf.
Saloniki Bay.
Naussa Port, Paros Island.
Naxia Bay, Naxos Island.

St. Nikolo Port, Zea Island.
Tinos, Mykoni, Rheuea and Belos Islands.
Andros with Stenos Pass.
Gavria Bay, Andros Island.
Skyros Island.
Skopelo Group.
Nikaria Island.
Levitha Islands.
Scarpanto and Casso Islands.
Dardanelles, Entrance and Port of Tenedos.
Dardanelles Narrows.
Sighajik Harbour.
Sighajik Bay to Scala Nuova Gulf.
Samos Strait to Mandelyah Gulf.
Mandelyah Gulf.
Isene Port.
Gumishlu.
Kos, Doris and Symi Gulfs.
Marmarice and Karaghatch.
Karaghatch to Makry.
Benzert Road and Lakes.

LIEUTENANT H. RAPER, R.N.

1830-1858.

Henry Raper, son of Admiral Raper, known for his improvements in maritime signals, born in 1799, entered the Navy at age of twelve on board the *Mars*, of 74 guns, commanded by his father. Shortly afterwards he went to the R.N. College at Portsmouth, where he won the silver medal for his acquirements in mathematics. He then returned to service afloat, and was for some months in the *Nymphen* frigate. In October, 1815, he joined the *Alceste*, of 38 guns; which ship, after conveying Lord Amherst as ambassador to China, was lost on the homeward voyage by striking on a sunken rock in the Strait of Gaspar, on the 18th February, 1817.

Here he participated in all the hardships experienced on the rocky islet Pulo Leat, to which the crew escaped; there they were in danger of death from thirst, and constantly threatened by Malay pirates, whose proas, to the number of sixty, completely blockaded them.

After being relieved from this critical situation by vessels despatched from Batavia, Mr. Raper served successively on various stations in the *Tyne* and *Seringapatam*, till, at his father's express wish he joined the *Adventure*, sloop of war, commanded by Captain W. H. Smyth. The service which this ship was employed upon in the Mediterranean gave him an opportunity of improving his talents in navigation, surveying, and nautical astronomy; and he was placed in charge of the chronometers, in conjunction with his former college-associate Graves (who was afterwards as a Captain murdered at Malta, in August, 1856).

Having been promoted to the rank of Lieutenant on board the *Euryalus*, from which frigate he was shortly afterwards removed to the *Dispatch*, Raper remained in that brig until she was paid off, in 1824.

When Admiral Beechey, who had been one of the *Adventure's* officers, was commissioned to the *Blossom* in January, 1825, for his interesting voyage to Behring Strait, viâ Cape Horn, he placed the filling up of three vacancies in the hands of his former Commander (then Admiral) Smyth. One of these being the post of first lieutenant, the Captain pressed its acceptance upon Raper, and had nearly prevailed; but an erroneous notion that a slight which the Admiralty had shown his father might be visited on him, made him at last decline.

Having thus virtually abandoned the active line of his profession, he betook himself assiduously to the cultivation of its scientific departments; and his efforts were crowned with such success that his name must ever be enrolled among the improvers of hydrographical knowledge.

In 1832, he was selected by the Admiralty to form one of a committee to improve the method of measuring the tonnage of ships; and the Report, which was mainly drawn up by him, was equally clear and convincing.

One of the earliest members of the Royal Geographical Society, he repeatedly served on their council.

In 1840, he published his "Practice of Navigation," a book of sterling merit, for which he received the gold medal of the Society just alluded to. That this prompt appreciation of the work was a just one, was evidenced by its being soon afterwards adopted in the Royal Navy, and by the ships of the East India Company. The third edition of this work was particularly noticed for the useful additions engrafted on its pages, and especially for its admirable and well-organized table of "Geographical Positions" of all the places on the globe; and which with infinite skill and labour he increased from 2,300 to no fewer than 8,800. In this edition he also introduced those significant symbols for the admission of a quantity of information in a limited space; and the whole work bore the unequivocal stamp of the industry, method, and varied attainments of the author.

This highly useful book was to have been followed by a second volume, containing a theoretical discussion of all the data and details contained in the first—in fact, to prove analytically what he had already expounded synthetically. As this work advanced it assumed increased importance, from combining astronomy, geodesy, mechanics, geometry, and physics; but, unfortunately, he did not live to complete it. His manuscripts were left, but their unarranged state debarred them from publication.

Lieutenant Raper became a Fellow of the Royal Astronomical Society in 1829, and not only served upon its Council repeatedly, but for several years filled the important post of secretary, with credit to himself and advantage to the Society. He maintained his habitual cheerfulness and continued his labours to the last. In the year preceding his death he communicated to the Astronomical Society his improved method of "Clearing a Lunar Distance."

He died at Torquay in January, 1859, in the 60th year of his age. His death occasioned a blank in pursuits which required a mind of no common order.*

The following works were published by Lieutenant Raper:—

- Practice of Navigation and Nautical Astronomy. 8vo. 1840.
- Remarks on the modes of determining Longitudes. 8vo. 1839.
- Rules for finding Distances and Heights at Sea. 8vo.
- Tables of Logarithms to six places. 8vo. 1846.
- Maritime Positions. 8vo. 1850.

CAPTAIN F. P. BLACKWOOD, R.N.

1841-46.

Francis Price Blackwood, born May, 1809, was second son of the late Vice-Admiral Hon. Sir Henry Blackwood, Bart., K.C.B.

This officer entered the Navy December, 1821; obtained his first commission August, 1828; joined the *Arachne*, Captain Fred. Marryat, November following; and while serving on board the *Alligator*, Captain Chas. Philip Yorke, was promoted to the rank of Commander, November, 1830. He was appointed to the command, February, 1833, of the *Hyacinth*, on the East India station, which sloop he paid off towards the close of 1836; obtained Post-rank, June, 1838; and, from November, 1841, until 1846, was in command, part of the time with the broad pendant of Commodore, of the *Fly* surveying vessel, on the same station.

* Journal of the *R. G. Society* for 1859, vol. 29, p. cxxvi.

It was in 1841, that H.M. Government having determined to assign the true positions and limits to the Great Barrier Reef which stretches along the north-east shores of Australia, and to mark the most eligible openings through which vessels might pass in comparative safety on their homeward voyages, selected Captain Blackwood to carry out this arduous duty, and for this purpose, therefore, in November, 1841, appointed him to command Her Majesty's ships *Fly* and *Bramble*. The results of this expedition briefly sketched by Mr. Jukes, the naturalist, showed a highly important and valuable addition to hydrography, and enabled the mass of detached work of Cook, Flinders, Bligh, King and Stokes, with other navigators, to be connected.

In the four years Captain Blackwood was thus employed, more than 1,000 miles of sea in length, and 170 in breadth, were surveyed and charted—from Sandy Cape on the east coast of Australia, as far as latitude 21° S., including the Capricorn Islands, Swain Reefs, and the broad passages between them, a tract of 200 miles in length and 100 miles in breadth; the survey of the coast of the mainland and the adjacent sea, from West Hill to the northern part of Whit-Sunday passage, a distance of 100 miles; the outer line of the Great Barrier Reef from lat. $16^{\circ} 40'$ S., to its northern limits in lat. $9^{\circ} 20'$ S., a distance of nearly 500 miles; the survey of Endeavour Strait and of the eastern portion of Torres Strait, from Cape York to the coast of New Guinea, with more than 140 miles of the latter coast, together with the numerous off-lying dangers and wide-spread banks of shoal soundings, and the mouths of the numerous rivers and fresh water channels which intersect those shores in every direction. To mark the most advantageous channel for vessels to pass through the Barrier Chain, the Raine Island beacon was erected by him. This was accomplished with the assistance of twenty artificers and a small cutter under the command of Lieutenant Ince. With no anchorage near, and such material as lay at hand, the Tower Beacon was erected 70 feet in height, 30 feet in diameter, and with walls of 5 feet thickness.

He lost no opportunity of pursuing his taste for science, and even constructed a small observatory in order to study with more effect every branch of practical astronomy which it might be possible to enlist in aid of navigation and geography.

In 1851, he obtained leave of absence and proceeded to Helsingborg, in Sweden, to observe the approaching eclipse of the sun; Helsingborg was on the outer limit of the space where the moon would wholly obscure the sun; the weather was satisfactory, instruments well chosen, and he succeeded in observing the extraordinary projections of flame from the limb of the sun, which had so much excited the curiosity of astronomers; and his modest but accurate account of that phenomenon was published in the memoirs of the Astronomical Society. He died in 1853, aged 44 years.

The following charts were published from Captain Blackwood's surveys:—

Port Bowen.
Halifax Bay to Double Point.
Rockingham Bay to Palm Islands.
Cape Flattery to Cape Sidmouth.

New Guinea (Sheet 3), Bampton Island to Aird River.
Cape Sidmouth to Cape Grenville.
Cape Grenville to Booby Island.
Torres Strait, N.E., and East entrances.

LIEUTENANT BARRAL (French Navy).

1830-1832.

This officer, in *l'Emulation*, continued the hydrographic labours and researches of Roussin on the south-east coast of America, more especially directing his attention to the Brazilian coast.

For the purposes of running meridian distances he carried four chronometers.

This surveying voyage was carried on during the years 1830-31-32, and in the course of it the River Plate was surveyed. Charts were published of the several surveys made.

See Renseignements sur la côté merid. du Bresil, &c. Annal Martim., 1833.

MEMOIRS OF

LIEUTENANT W. ARLETT, R.N.

1833-36.

This officer, whose seniority as a lieutenant was 3rd October, 1825, was appointed to the command of the cutter *Raven* as tender, for the continuation of the survey of the West Coast of Africa, under the orders of Commander Skyring, of H.M.S. *Etna*.

Commander Skyring was foully murdered by the natives at the Caches River, near Cape Roxo, December 22nd, 1833, while executing his duties. Assuming the acting command of the *Etna* Lieutenant Arlett returned to England in 1834, leaving again November 12th of the same year, with his appointment to the *Etna* confirmed, for the resumption of the survey. The command of the *Raven* had devolved on Lieutenant Kellett. The part to be undertaken appear to have been from Cape Spartel to Cape Bojador, together with the islands of the Canary group situated nearest to the coast of Africa.

Santa Cruz was reached November 29th, where permission was obtained from the Governor-General to carry on the necessary operations.

The meridian distances were measured from the Mole-head at Santa Cruz, which was assumed to be in longitude 16° 16' W. of Greenwich.

A triangulation was carried completely round the Great Canary Island, and the latitude and longitude of the Mole-head at Port la Luz found to agree very closely with that assigned to it by De Borda. Allegranza, Lanzarote, Fuerteventura, and Cabras were each undertaken in succession, and Santa Cruz returned to on the 4th of March. After a week spent in re-fitting and rating chronometers, Cape Bojador was arrived at March 14th, and the survey commenced, Mogador, Cape Sim or Ras Tagrivel, Cape Tafelneh, Kuleikat, Cape Ghir or Ras Aferni, and Agadir or Santa Cruz being each described by Lieutenant Arlett.

Remarking that Cape Agulúh of De Borda's chart (which was the most accurate extant prior to this survey), is only a slight rounding of the coast, and having determined its geographical position, terse and valuable remarks follow to Cape Noon, thence to Cape Juby and onward to Cape Bojador.*

On the 16th of May, 1835, with the *Raven* in company, the *Etna* sailed for Gibraltar, touching *en route* at Tenerife in order to measure the meridian distance between Cape Juby and that island. Arriving at Gibraltar June 7th, twelve days were spent in rating chronometers for the survey of the southern part of the coast of Morocco, from Cape Spartel to Mogador.

From the 20th to the 27th of June was spent in examining the Pearl Rock, near Cabrita Point, and the dangerous Cabezos Shoal. Advantage was then taken of a fair wind to measure the meridian distance between the Mole-head at Gibraltar and the British Consulate at Tangier. A survey of this bay had just been completed by the commander of the French brig of war, *Voltigeur*, and a description of Tangier is given in vol. 1 of the *Royal Geographical Society's Journal*.

July 1st the survey was re-commenced at Cape Spartel, thence to Arzilla, White Cliff, Al Araish, Mehediah, Sla' or Sallée, and Rabatt, having a hydrographic description rendered them.

Following the coast to the south-west we have a brief description of Mansoria, Point Fidallah, Dar-al-Beida, Azamor and Mazagan, and a somewhat more exhaustive account of Cape Blanco. Continuing from Cape Blanco, Cape Cantin or Ras al Hudik, North Cape, Wad Teusift and the lofty Jebel Hadid or Iron Mountains are described. The survey terminated at the Botof Sandhills. During 5 months (from March to August), the time occupied in the survey of the coast from Cape Spartel to Cape Bojador, 750 miles, no day passed in which the *Etna* was not at least 12 hours at anchor, at a distance of from 4 to 5 miles from the shore, in positions, therefore, well adapted for observing currents which were constantly attended to. The *Raven* was constantly sent to a distance of 20 or 30 miles from the land, when fixed and conspicuous objects in the triangulation afforded opportunities for ascertaining her exact position. Thus valuable observations on the tides and currents were obtained.

* Journal of Royal Geographical Society, vol. vi., 1836.

The original chart of this survey is laid down on a scale of one inch to a mile, minutely detailing the features of the coast and the soundings.

Lieutenant Arlett does not appear to have again served in the surveying service. The following charts were published from his surveys:—

Cape Spartel to Azamor, with plans of El Arish,
Rabat and Sali.
Azamor to Santa Cruz.
Cacheo River.
Bijuga Islands (the Jeba Channel).
Porto Praya (Canary Islands).

Mogador or Suirah Harbour.
Santa Cruz to Cape Bajador.
Bijuga Islands (sheet 2).
Jeba and Bolola Rivers, and Bissao, Arcas, and
Bulama Channels.

CAPTAIN GEORGE A. FRAZER, R.N., M.R.I.A.

1837-52.

This officer entered the Navy March 18th, 1817, and served on board the surveying vessels *Shamrock*, Captain Martin White, *Leven*, Captains Bartholomew and Baldey, and *Hasty*, Master-Commander Lewis R. Fitzmaurice.

Under these officers he was employed surveying the English Channel, west coast of Africa, Cape de Verde, Canary, Madeira and other islands, Milford Haven, the Irish Channel, and the English Channel from Calais to Havre.

After passing his examination for a Lieutenant in 1824, he proceeded to Canada to assist in completing the surveys of Lake Huron and Superior, under Commander Bayfield. The details of these surveys he was working out at the Admiralty when promoted to the rank of Lieutenant, 6th April, 1827.

In March, 1828, he was directed to survey the Irish coast, under Commander William Mudge, on whose death, in July, 1837, he took personal charge of the survey. On the 13th October, 1841, he was advanced to the rank of Commander. His succeeding appointments were—15th July, 1842, to the *Comet*, 12th February, 1844, to the *Lucifer*, 22nd October, 1847, to the *Crocodile*, receiving ship at Cork, and 2nd April, 1849, to the *Sparrow*, of 6 guns.

He attained the rank of Captain 29th April, 1851; continued in the *Sparrow* until that vessel was paid off in January, 1852, and was then borne for upwards of twelve months on the books of the *Fisgard*.

During the eleven years he was attached to the *Comet*, *Lucifer*, *Crocodile*, *Sparrow*, and *Fisgard* Captain Frazer was employed in surveying the northern, eastern, and southern coasts of Ireland as far as Cork, including a minute and elaborate examination of all the rivers, harbours, and outlying dangers within those limits; particularly the banks and shoals that line the western shores of the Irish Channel.

Of so much importance to the trade of Dublin was the latter work considered, that Captain Frazer received the Freedom of the City from the Corporation, with a public expression of the sense entertained of his eminent services. He was placed on the retired list 15th May, 1861.

Captain Frazer was elected a member of the Royal Irish Academy in 1837. He was occasionally employed in examining and reporting on public works. He laid down the electric telegraph cable between Holyhead and Dublin; was appointed member of the Dublin Marine Board in 1857; and prepared for publication "Sailing Directions for the coast of Ireland."

The following charts were published by the Admiralty from surveys made under his direction:—

Dublin to Carlingford.
Dublin Bay.
Kingstown Harbour.
Dublin Bar and River Liffey to Carlisle Bridge.
Howth to Drogheda.
Ballycotton Bay.
Kinsale to Brattin Head.

Youghal Harbour.
Dungarvan Harbour.
Brattin Head to Wexford.
Waterford Harbour.
Wexford Harbour.
Wicklow to Dublin.

CAPTAIN OWEN STANLEY, R.N., F.R.S., F.R.A.S.

1837-1850.

Owen Stanley, born June, 1811, was eldest son of the Bishop of Norwich, and nephew of the former Lord Stanley, of Alderley. His brother was the late Dean Stanley, of Westminster.

This officer entered the Naval College, Aug., 1824; and embarked, Jan. 1826, as a Volunteer, on board the *Druid*, Capt. Chambers, stationed in the Channel. In the following March he became Midshipman of the *Ganges*, fitting for the flag of Sir Robt. Waller Otway, in South America; where he removed, in Dec., 1827, to the *Forle*, Capt. Coghlan, and in Jan., 1830, joined the *Adventure* sloop, Capt. Philip Parker King, employed in surveying the Strait of Magellan. Returning to England in the ensuing Nov. he was next (he had passed his examination 28th June, 1830) nominated March and June, 1831, Mate of the *Belvidera* and *Rainbow*, both in the Mediterranean. He left the latter ship, July in the same year, having been advanced to the rank of Lieutenant May, 1831; and was subsequently appointed July and Oct., 1831, Oct., 1832, and March, 1834, to the *Kent*, Capt. Pym, *Procris*, Capt. John Talbot, *Malabar*, Capt. Hon. Josceline Percy, and *Mastiff*, Lieut.-Commander Thos. Graves, all in the Mediterranean; May, 1836, to the *Terror* bomb, Capt. Back; and Dec., 1837, to the command of the *Britomart*. In the *Mastiff* he assisted in surveying the Grecian Archipelago; and in the *Terror* he had charge of the Astronomical and Magnetic Observations during the Polar Expedition which sailed from the Orkneys June, 1836, and returned to Lough Swilly Sept., 1837. Between those dates he surveyed, for the first time, the north-eastern shore of Southampton Island, and made various views of the coast. While in the *Britomart*, in which vessel he remained until April, 1843, Stanley, whose promotion to the rank of Commander took place 26th March, 1839, aided in forming the colony of Port Essington, made a track survey of the Arafura Sea, and visited and surveyed various harbours in New Zealand and the Tenasserim province. He attained Captain's rank Sept., 1844; and in Sept., 1846, took command of the *Rattlesnake*, another surveying-vessel. He died at Sydney, March, 1850.

Captain Owen Stanley's first initiation as a nautical surveyor was in the *Adventure* with Captain P. P. King. After his promotion to a Lieutenant's rank he was appointed to assist his friend, Graves, in the *Mastiff* in the Mediterranean, where he examined the Gulf of Lepanto in a small boat, which he afterwards hauled over the isthmus of Corinth, rejoining his ship at Vourlah after an absence of eighty-four days. In the *Terror*, 1836, with Sir George Back, he had charge of the Astronomical and Magnetic Operations. In command of the *Britomart* he aided in forming the ill-fated colony at Port Essington, and made a track survey of the Arafura Sea, with other work of a similar description. The *Rattlesnake*, 28, a small frigate, he expressly fitted out for a survey of Torres Strait and the eastern shores of New Guinea and the Louisiade Archipelago, in 1846. He devoted great energy to all his hydrographic labours, and was fond of scientific works generally, beyond the usual acquirements of an ordinary nautical surveyor—a class of which he proved himself, by his works, an able and distinguished example. His health had been declining under the fatigues and anxieties attendant upon the arduous labour of surveying in tropical climates among coral reefs, strange currents and many physical and moral evils; and he had complained of illness on his passage from the Louisiade Islands to Port Jackson. At Cape York he heard of the death of his brother, a Captain in the Royal Engineers, and on his arrival at Sydney he was informed of the decease of his father. These bereavements preyed upon his mind, and acting upon a debilitated system had a fatal termination, and brought his valuable life to a sudden close on the 13th March, 1850, aged 39. His remains were interred in the cemetery at Sydney, with the ceremonials due to his rank, and expressive of the great esteem in which he was held. A marble tablet to his memory was erected in St. Thomas's Church, Wilmington, Sydney. Near to his grave, in the same cemetery, is that of the late Commodore Goodenough, who was not unlike Owen Stanley in many respects.

Captain Owen Stanley's hydrographical labours may be summed up as follows:—A running survey of the Arafura Sea, Port Essington, Simons Bay, Twofold and Botany Bays, entrance to Port Jackson, plan of Port Curtis and entrance to Moreton Bay, north-east coast of Australia in eleven sheets, from Rockingham Bay to Jarvis Island, marking the inner route between the great Barrier reef and the main land. He also examined eight channels through Torres Strait, five of which were not previously known, and charted them on a scale of half-an-inch to the mile of latitude, as well as the south-east coasts of New Guinea and Louisiade Archipelago. He was a Fellow of the Royal, Geographical, and Astronomical Societies.

The account of the *Rattlesnake's* voyage was compiled in two volumes, by Mr. Mac Gillivray, the naturalist of the expedition, and includes the narrative of Mr. E. B. Kennedy's expedition for the exploration of the Cape York peninsula. Under him sailed Yule, in the *Bramble* tender (now doing duty as a lightship at the entrance to Port Jackson), Dayman, and Brooker, all more or less distinguished afterwards as nautical surveyors. Professor Huxley served in the *Rattlesnake* as an Assistant-Surgeon R.N., and acted as naturalist.

See Voyage of the *Rattlesnake*, 2 vols., octavo. T. and W. Boone, London. 1852.

Among the charts published from Captain Owen Stanley's labours by the Admiralty were—

Maulmain Harbour.
Arafura Sea, Ports Banda, Ki Doulan, Dobbo
and Dilhi harbours; Kissa, Olliet and Letti
anchorages.
New Guinea, Fresh Water Bay to Round Head.
Round Head to Orangerie Bay.
Orangerie Bay to Bramble Haven.

Bramble Haven to Rossel Islands.
Port Albany.
Torres Strait (Western Channels).
N.E. Coast of Australia.
Cape Tribulation to Cape Flattery.
Double Point to Cape Tribulation.

ADMIRAL J. L. STOKES, &c., &c.

1841-1863.

John Lort Stokes entered the Navy, 20th Sept., 1824, on board the *Prince Regent* 120. From Oct., 1825, until Nov., 1830, he aided, as Midshipman of the *Beagle* 10, Capt. Robt. FitzRoy, in surveying the Straits of Magellan; and from June, 1831, until Nov., 1836, he was employed as Mate and Assistant-Surveyor in the same vessel, under Capt. FitzRoy, in examining and defining the coast of South America. He obtained his first commission 10th Jan., 1837; and on being re-appointed, 25th Feb. following, to the *Beagle*, then commanded by Capt. John Clements Wickham, he sailed on a voyage of discovery to Australia, whence he returned to England and was paid off 14th Oct., 1843. In Dec., 1840, he was severely wounded in an affray with the natives. In March, 1841, Capt. Wickham's health obliging him to invalid, he succeeded to the command of the *Beagle*; and on 16th August following his appointment was confirmed.

He became a Post Captain in July, 1846, and in October, 1847, fitted out the *Acheron* steam paddle surveying vessel, with Commander Richards (afterwards Hydrographer) as second in command, and Mr. F. J. Evans (afterwards Hydrographer) as Master, for surveying service in New Zealand. After completing almost the whole of the coasts and shores of that, in those days, young colony, the *Acheron* returned to England in 1853, and afterwards find Captain Stokes for some time employed on the south coast of Devon, where, among other works, he executed a survey of the Tamar river.

At the death of Rear-Admiral Washington, the Hydrographer in 1863, his name, with those of Captains Spratt and Richards, were before the Board of Admiralty for the position of Hydrographer, the latter officer being the one selected. Shortly afterwards he retired from active service afloat.

He became a Rear-Admiral in 1864, Vice-Admiral in 1871, and Admiral in 1877, and is still alive.

Admiral Stokes is author of a book termed "Discoveries in Australia, with an account of the Coasts and Rivers explored and surveyed during the voyage of H.M.S. *Beagle*, in the years 1837-43." 2 vols., 8vo. 1846.

He also wrote a pamphlet on "Steam Communication with the Southern Colonies." 8vo. 1856.

The latter was read before the Royal Geographical Society, May 12th, 1856, and is published in the Journal for that year.

The following charts were published from Admiral Stokes's surveys:—

Tamar River (Tasmania).
New Zealand, general chart.

" " (sheet 1).

Wangeroa Bay.

Bay of Islands.

Wangaruru Harbour.

Monganui Bluff to Manukau.

Wangari Harbour.

Abercombie, Fitz-Roy, and Tofino Ports, Catherine, Wangaparapara and Okupu Bays in Great Barrier Island.

Kawau Island.

Middle Island, Cook Strait anchorages (sheet 1)

Ditto ditto (sheet 2)

Cape Campbell to Banks Peninsula.

Lyttleton or Victoria, Levy or Kokorara ports,

Pigeon or Wakaroa and Erskine Bays.

Sheet 10, Otago to Matura River and Ruapuke Island.

Awarua or Bluff Harbour and New River.

Awarua River to Waiau River.

Preservation and Chalky inlets.

Auckland Harbour entrances.

Tamar River (Devon).

Auckland Harbour.

Coromandel Harbour.

Poverty Bay to Cape Palliser.

Cook Strait and coast to Cape Egmont.

Cook Strait.

Entry anchorage, Porirua Harbour, and Mana Island.

Port Nicholson.

Manukau Harbour to Cape Egmont.

Nelson anchorage.

Sheet 7, Cape Foulwind to D'Urville Island.

Cape Campbell, Welds anchorage, Flaxburn approaches, Gore Bay, &c.

Akaroa Harbour.

Ninety miles beach to Otago.

Otago Harbour or Port Chalmers.

Sheet 12, Foveaux Strait to Awarua River.

Dusky and Breaksea Sounds.

Daggs Sound to Caswell Sound.

Waiau River to Cape Foulwind.

Foveaux Strait and Stewart Island.

Paterson Inlet and William Port.

Pegasus and Adventure Ports, and Lords River.

South-coast of Devon.

VICE-ADMIRAL SIR B. J. SULLIVAN, K.C.B.

1839-1857.

Bartholomew James Sullivan, son of Capt. Thos. B. Sullivan, R.N., entered the Navy 4th Sept., 1823; and having passed his examination in 1829, obtained his first commission 3rd April, 1830. He then served, from 25th June, 1831, until the close of 1836, in the *Beagle* surveying vessel, Capt. Robt. FitzRoy, on the South American station; was appointed to the command, 30th Nov., 1837, of the *Pincher* schooner, at Chatham; and from 12th April, 1838, until 1839, was again employed in South America in command of the *Arrow* ketch. He attained the rank of Commander 14th May, 1841; served in that capacity in the *Philomel* surveying vessel, on the S.E. coast of America, from 2nd April, 1842, until paid off on his return to England in 1846; and subsequently had his name borne as a Supernumerary-Captain, for surveying service, on the books of the *Victory* 104, flag-ship at Portsmouth. His promotion to Post-rank, which was effected in March, 1846, by a commission dated back to 18th Nov., 1845, was made a reward for the conduct he had displayed in command of the southern division of the ships engaged in the battle of the Parana; where the combined squadrons of France and Spain, after a hard day's fighting, destroyed four heavy batteries belonging to General Rosas, at Punta Obligado, also a schooner-of-war mounting six guns, and twenty-four vessels chained across the river. "I should be unmindful," writes Capt. Chas. Hotham, the senior British officer present on the occasion, in his official report of the proceedings addressed to the Commander-in-Chief, "of the ability and continued zeal of Commander B. Sullivan, did I not bring him particularly to your notice; by his exertions we were furnished with a chart, which enabled us to complete our arrangements for the attack."

In a pamphlet, dated April 5th, 1858, termed "Proposal for organising a scientific corps of Naval Officers," Captain Sullivan makes some original and valuable suggestions. He therein remarks that "If the surveying service is to be kept in an effective state, so as to supply the general service with a staff of surveyors in time of war, there must be more inducement held out to officers to adopt that branch of the service."

"With the exception of those who have been promoted for war service in China, Parana, Black Sea, and Baltic, promotion has been much slower for surveyors than for good officers, without interest in the regular line of the service. . . . I do not," he says, "allude to home surveyors, but to men like Commander Dayman and like Commander Skyring, some years since."

"No service on home surveys will, I am convinced, give the practice necessary to make officers what is required for surveying duties during war on an enemy's coast."

"Our foreign surveys are gradually reducing, and some are under masters, so that there will be less and less opportunity of training a body of surveying officers from the mates and lieutenants, and there will be a danger of the surveying work being done entirely by the masters, and so establishing more firmly the sad idea that no other class need seriously attend to navigation and pilotage, which I believe now to be the bane of our service."

"The only way to insure having at all times a staff of surveying officers who shall be to our Navy what the engineers are to the Army, is to establish a regular and separate branch of the service, with certain advantages in pay and promotion, sufficient to make it an object of ambition to the best young officers."

"Besides the number employed in surveying vessels, there would, during peace, be employment for some on home surveys."

"All Admirals and senior officers would also have one or more attached to their command."

"However much we encourage a higher scale of education for our officers, it will be in a great measure thrown away if all connected with navigation, surveying and pilotage, is not found necessary afterwards when in command."

Capt. Sullivan also, in 1859, published a pamphlet of 23 pages, entitled, "Proposals for Improving the Lists of Officers and System of Promotion," to which many suggestions since carried out in this respect in the Navy are no doubt to be traced.

Subsequently to his service in South America Captain Sullivan held the post of what is now termed "Marine Adviser to the Board of Trade." His services were often called in by the Admiralty as a member of various committees, and he took an active part, we believe, in quelling the disturbances and allaying the discontent shown by the sailors of the fleet immediately prior to the Russian War.

As Captain of the *Lightning* in the Baltic, he held the post of "head of the Surveying and Pilot services" of the Baltic Fleet, and gave efficient aid to the Admiral on all possible occasions. His first assistant at this time was Mr. F. J. Evans (afterwards Hydrographer).

The *Nautical Magazine*, vol. 23, page 498, has an amusing anecdote which occurred to Captain Sullivan when in command of the *Lightning*, which happened at Ledsund, and had to do with the capture at Ledsund of a Russian policeman, or spy, upon whom he completely turned the tables, and then made a prisoner of.

Captain Sullivan was always a strong advocate for training officers of the General Service as Nautical Surveyors, and to his views on this point we owe the attempt made to utilise certain vessels as auxiliary surveying vessels, viz., the *Gannet* in the West Indies and *Serpent* in China, in 1865.

His last service afloat was in the *Merlin*, commissioned for service in the Baltic in January, 1855. Lieutenant C. Bullock trained under Bate in China, and afterwards a well-known surveying officer served as third Lieutenant of the *Merlin*, which vessel on one occasion suffered severe damage by the blowing up of an infernal machine or submarine mine, brought to bear or placed for her by the Russians.

Sir Bartholomew Sullivan wrote a description of the Falkland Islands, which was translated into French by M. de Coriolis in 1850, and also "Proposal for Organising a Scientific Corps of Naval Officers," 8vo. 1858, which has already been alluded to.

He was made a Rear-Admiral in 1863, Vice-Admiral in 1870, Admiral in 1877, and is still living, a K.C.B. and Flag Officer on Reserved Half-Pay.

The following charts were published from his surveys:—

Falkland Islands.	Part of Rio de la Plata.
Egmont Port, Keppel Sound.	Saucé Point to Martin Garcia Island.
Stanley Harbour, with Ports William and Harriet.	Parana and Uruguay Rivers.
Fitzroy and Pleasant Ports.	Uruguay River, Martin Garcia to Salto Grande.
Choiseul Sound.	Fogle Fiord (Baltic).
Bull Road.	Bomarsund Channels.

LIEUT. M. A. BÉRARD (French Navy).

1831-32.

In the years 1831-32, M. A. Bérard was employed by the French Government of that period in surveying the Coast of Algiers.

He made Algiers the position of the principal meridian of the survey, determining its meridian distance from the Marine Observatory, Toulon, in longitude 5° 55' 54" E. He is reported to have seen the Coast of Spain at a distance of 25 leagues, owing to refraction.

In the memoir of his survey of the Coast of Algiers are given numerous heights, remarks on sounding in very deep water, on the dip sector, steering compass, &c.

See Description nautique des côtes de l'Algérie. Paris, 1837.

The Admiralty Chart of the North Coast of Africa, from Cape Ferrat to Cape Bougaroni, with plans of Mostaghaneur, Tenez, Shershel, Arzeu, Tipaza, Dellys and Bougie anchorages is from the survey by Lieutenant Bérard.

VICE-ADMIRAL SIR RICHARD COLLINSON,* K.C.B.

1841-49.

Admiral Sir Richard Collinson, the third son of the Rev. John Collinson, rector of Gateshead, and afterwards of Boldon, both in the county of Durham, was born in the year 1811. When twelve years old he was put into the Royal Navy, by a happy accident; for he was a born sailor, and had, as a school-boy, shown the pluck and determination which is the characteristic of that profession. Early in his naval career he took to the scientific line, beginning as a Midshipman in 1828, with Captain Forster in the *Chanticleer*, on a voyage of scientific surveying round the coast of South America, in the course of which a careful examination was made of the levels of the Isthmus of Panama. In 1834 he was with Captain H. Austin, in the *Medea*, one of the first war-ships in which steam was employed. Next, as a Lieutenant, he was appointed one of the surveying officers of the *Sulphur*, under Captain Beechey,—again on the coasts of Central America.

By this time he had established a name in the Hydrographic Office of the Admiralty, whose then able superintendent, Captain Beaufort, was from that time till his death, a sincere admirer and firm friend of Richard Collinson. Captain Beaufort's good opinion of him led to his being selected, on the outbreak of the first Chinese War in 1841, to act as surveying officer to the fleet. This duty, which was a somewhat novel one, was, in the hands of Lieutenant Collinson, raised into an important branch of the war enterprise; he had a small vessel given him, the *Bentinck*, and in consort with his old shipmate and friend, Captain Henry Kellet, who happened to arrive in China at that time from a surveying expedition on the American coast, these two acted as the pilots to the fleet in the harbours and rivers into which the expedition had necessarily to penetrate. The course of the war

* From the journal of the R.G. Society, 1883.

compelled the fleet to enter more than one large river, and among these was notably the Yang-tsze-kiang, now well known to all the seafaring world, but then an *aqua incognita* absolutely; and not only were its waters unknown to them, but they were in ignorance of the preparations of defence made by the Chinese. In advancing up this river Captain Kellet and Lieutenant Collinson had to keep ahead of the fleet, buoying out the channel day by day; by their help the ships successfully reached nearly 200 miles from the mouth. Operations like these involved an amount of personal labour requiring great activity, endurance and zeal. In them, Lieutenant Collinson showed such capability in the more warlike as well as in the scientific branches of his profession, that Admiral Parker, the naval commander of the expedition, took him into his confidence, intrusted him with various important duties, and valued his opinion greatly. The result on the whole was that Lieutenant Collinson came out of the war a post-captain and a C.B.

On the conclusion of the Chinese War there arose a desire to have the coast of China surveyed to enable merchant ships to take advantage of the openings gained by the war into the various new ports in that country. The duty was handed over to Captain Collinson in the *Plover* (as the *Bentinck* was renamed), and with him was associated his friend, Lieutenant Bate, in a small schooner called the *Young Hebe*. These two little vessels for three years worked along the Chinese coast, from Chusan to Hong Kong, including the Island of Formosa.

His next scientific service was the one in connection with which he is most widely known—the search after the missing ships of Sir John Franklin's expedition in the Arctic Seas. It was in 1849, on the return of Sir James Ross from one of the fruitless attempts in this search on the eastern side, that the Government determined to make another from Behring Straits on the western side of the north-west Passage; and, again, on the recommendation of Sir Francis Beaufort, Captain Collinson was placed in command of the expedition, which consisted of the same two vessels employed under Sir J. Ross, namely, the *Enterprise* and the *Investigator*, the latter commanded by Captain M'Clure.

After passing into the Pacific Ocean, the two vessels were separated, and Captain M'Clure in the *Investigator* arrived first at the Straits; that officer proceeded on at once, taking a course according to his own judgment, without waiting for the decision of the commander of the expedition. This action, however conscientiously taken, judging by the results, had an unfortunate effect on the proceedings of both ships; for though the *Investigator* was the first to discover a north-west passage, she had to be abandoned in the ice, a monument of her own discovery. The *Enterprise* made the same discovery shortly afterwards, and was fortunate in returning safe to demonstrate it.

Captain Collinson, on arriving at Behring Straits, and finding that his consort had gone on, attempted to pursue the line of search he had previously determined on following. That was to keep along the coast of North America, where the river water coming from the south kept an open channel in the ice every autumn, and by which he hoped to reach the passages south of Peel Sound, where it was generally expected some traces of Sir J. Franklin would be found. He was too late in the season to effect this, but in the following year he succeeded in penetrating along this route as far as Victoria Straits, in longitude about 100° west; the ship having got as far as Cambridge Bay, longitude 114°; in the course of this work the *Enterprise* was shut up in the Arctic Seas for three years and a half, thus being left a longer time to her own resources than any other ship in modern times. He then had the mortification to find that owing to an error of calculation in England, the supply of fuel was coming to an end. But for this, he would have remained, and, had his consort been with him, would have, in all human probability, succeeded in the object of his search, as his exploring parties were almost in sight of the spot where, three years afterwards, the boat of the missing expedition was found by Captain M'Clintock's party. Although, owing to those mishaps, the officers of the *Enterprise* just missed both the honour of that discovery and also that of the north-west passage, they had the satisfaction of having virtually made the passage, by overlapping in longitude the tracks of other vessels which had come from

the west side, the end of each track being connected with the other track by a navigable channel; and also they had the credit of bringing the ship safe home after this long and protracted expedition. There were difficulties Collinson had to contend with on board his own ship in the way of discipline, which hampered his action.

The Royal Geographical Society showed their high appreciation of the service he had performed in examining the coast-line of Arctic America and in opening up a fresh field for whalers, by conferring on him, in 1858, their Founder's gold medal, and making him a member of Council. He was employed for a short time on certain commissions connected with the naval service, such as the naval defence of the Canadian Lakes, and the defences of the United Kingdom generally.

Subsequently Admiral Collinson was elected a Younger Brother of the Corporation of the Trinity House. He was promoted to be an Elder Brother in 1862, and in this capacity he so gained the esteem and confidence of his colleagues, that, thirteen years after, on the death of Sir Frederick Arrow, he was chosen to be the Deputy-Master, a most unusual honour to be paid to an officer of the Royal Navy.

The Corporation of the Trinity House was first established in the reign of Henry VIII., for the purpose of assisting the mercantile marine of the country, and it has continued down to the present day without intermission, although its functions have now been limited to the care of the lights and marks of our harbours, and to the superintendence of pilotage, and of the examination of officers of merchant vessels, and attendance at the Admiralty Court. It has been managed by a board of "Elder Brethren," as they are called, elected by themselves from the masters of merchant vessels, and occasionally from the officers of the Royal Navy. The head of the House, or "Master," as he is termed, has been for many years chosen from among the highest personages in the kingdom. The Duke of Wellington, Lord Palmerston, and Prince Albert each held the office, and at the present time our sailor prince, the Duke of Edinburgh, is Master. Under him is the "Deputy-Master," who is really the working head of the establishment, and a responsible and anxious office it is. He has to see that the working of the different standing committees of the Elder Brethren for the different departments of the whole business are carried on harmoniously together; and to preside at the meetings of the whole body, held twice a week, and see that their decisions are carried out; and he is the commander of the considerable fleet of steamers and of the large body of keepers connected with the lighthouses; besides being also in constant communication with the Board of Trade, under which department the Corporation is now placed. And as the efficiency of the lights and marks on the coast depends on constant watchfulness, and any temporary obstructions, such as wrecks, have to be looked to immediately, the Deputy-Master cannot be long away from his post.

After some years' unremitting fulfilment of these duties, his health failed, and he began to suffer once more from both the scurvy engendered by his three years in the dark north, and the fever and ague implanted in him on the China coast. But the same determination to persevere with his duty to the utmost of his ability, which had carried him through the work in China and the Arctic Sea, now kept him at his post in the Trinity House, until, at last, he was reduced to such a state of weakness, that it was beyond the power of all the skill and all the care which could be brought to bear on the case, to prevent the downward progress of his vital power.

During the greater part of the last twenty-six years of his life, besides taking an active part in the management of the Royal Geographical Society, he was also a member of the Council of the United Service Institution, and from his position at the Trinity House became an *ex-officio* member of the Thames Conservancy Board, and of the National Lifeboat Institution, besides other public bodies connected with the royal and mercantile marine of the country. He was one of the first supporters of the "Army and Navy Co-operative Society," and at its foundation and for some years afterwards he was Chairman of the Board of Directors. He was for some years a member of the Local Board of Ealing, and had been a churchwarden both of Christ Church and St. John's, and up to the last he

was a member of the Ruri-Decanal Association of the Church district, and of the Committee for the Management of the Elementary Schools of the district. For all these subsidiary duties to his main one at the Trinity House he had the same desire to throw himself into the work heartily, and apply all the power he possessed towards it. Whether it was in the scientific societies or public offices in London, or in the local institutions in Ealing, there was the same original thoughtfulness, practical good sense, and firm determination to forward the real business of the institution to the utmost of his ability through all difficulties. He was a fair specimen of the determined, yet careful, life-enjoying, simple character of the British sailor, and, as far as in him lay, endeavoured to be "upright, and one that feared God and eschewed evil."

He died at Ealing on the 13th September, 1882, and was buried at the neighbouring village of Perivale on the 17th. Among the numerous mourners who headed the long funeral cortège, were his two Arctic colleagues, Admirals Sir G. Richards and Sir Leopold M'Clintock, besides Mr. Murray and Mr. Belither, his shipmates on board the *Enterprise* in its long Arctic voyage. Miss Cracroft, the niece of the late Lady Franklin, deposited on the coffin a wreath with the inscription:—"In Grateful Memory of Arctic Service in the Search for Sir John Franklin, and of never failing Sympathy and Aid given to his widow, Jane, Lady Franklin. Whatsoever his hand found to do, he did it with his might."

The following charts were the results of the surveys of Admiral Collinson:—

Hong-Kong to Chelang Point.	Min River from entrance to Fu-chau-fu.
Mirs Bay.	Ragged Point to Pih-ki-shan.
Chelang Point to Chauan Bay.	Sam-sah Bay.
Han River Entrance, Swatow Port.	Namquan Harbour.
Namoa Island.	Pih-ki-shan to Hie-shan Islands.
Chauan Bay to Matheson Port, including the	Hie-shan Islands to the Yang-tse-kiang.
Pescadores Islands.	San-mun Bay and Sheipu Harbour.
Tongsang Harbour and Hutan Bay.	Chusan Archipelago (south).
Amoy Harbour and approaches.	Ting-hai Harbour.
Hoo-i-tan and Chimmo Bays.	Chusan Archipelago (north).
Chinchu Harbour.	Kintang Channel.
Pescadores Islands.	Yung River from the mouth to Ning-po.
Formosa Island and Strait.	Chapoo Road.
Matheson Port to Ragged Point.	Yang-tse-kiang to Nankin, with sketch of Silver
Hai-tan Strait.	Island.

The voyage of Bellingshausen, the Russian explorer, was translated from the Russian, under the superintendence of Admiral Collinson, as was also the translation of a Russian paper on the River Amur and adjacent districts, published at p. 376 of R. G. S. Journal for 1858. Of the Hakluyt Society's books he brought out, "Voyages in Search of a North-West Passage."

CAPTAIN RICHARD LLOYD,* I.N.

1833-1841.

This officer, who eventually succeeded Captain Daniel Ross as Marine Surveyor-General for India, was born in 1798, and joined the East Indian Surveying Establishment under the officer just mentioned in 1823, continuing as his first assistant until 1833, when, Ross resigning, Captain Lloyd took his place.

In 1883, he had one brig with which he conducted a survey of the inland navigation of Arakan, especially near Ramree, of which harbour he executed a plan. After the first season his operations were put a stop to by severe illness, contracted by much exposure. Among his assistants were James Young, Fell, Rennie, and Montriou.

On restoration to health he, in 1835, surveyed the River Hugli from Saugor Island to Calcutta, carefully connecting his work with the base line measured by Colonel Everest on the Barrackpur Road.

In 1840, he completed the survey of the sea face of the Sunderbunds from Chittagong

*Chiefly from Markham's Memoir of the Indian Surveys, page 27.

westward, the results of which he submitted to Government in the form of carefully drawn charts and a valuable and interesting Memoir, termed "The Nautical Remarks to accompany a Survey of the Sea face of the Sunderbunds," by Captain Lloyd, dated February, 1841; these are preserved in the Geographical Department of the India Office, in manuscript.

He compares the state of the coast at the dates of different surveys, and his remarks, in showing the changes that are taking place, prove the urgent necessity for periodical revisions of the surveys.

He also describes the "Swatch of no ground" at the head of the Bay of Bengal. It is a deep chasm, open to seaward, and very steep on the north-west face, with depths of about 400 fathoms, similar to that reported by Captain Selby, off the mouths of the Indus.

Lloyd also surveyed the Chittagong River, and added to Ross's survey of the Mergui Archipelago, a short account of which he published at the time. Ross had laid down the outer islands between 1827 and 1830, and Captain Lloyd filled up the inner portions and delineated the coast line.

On the retirement of Captain Lloyd in 1840, the Marine Surveyor-Generalship at Calcutta was abolished; but Captain Fell was employed from 1841 to 1848 on board the brig *Krishna*, in finishing detached surveys of the Coromandel coast. Captain Lloyd died November 19th, 1877, aged 79.

An old surveyor and brother officer, in writing of his last days, says:—"I had seen him as lately as November 5th, and then he had quite recovered his memory, articulation, clear sight, &c., and as we spread charts before him, he pointed out with his poor helpless fingers—deformed and twisted by rheumatic gout—various circumstances connected with his former work, and seemed to retain as vivid a recollection of all he had surveyed as far south as Mergui, as if he had only just come on shore. It is curious, however, he had never kept a single copy of any of his charts."

"On the morning of the 20th November I received a note to tell me he had died the previous day, and on Saturday, the 25th, I was one of the seven persons who stood at the grave in Highgate Cemetery; and there the good old veteran rests, with scarcely room for a headstone to indicate the spot, so closely packed are all the spaces. I think we might inscribe to his memory, '*Sans peur et sans reproche.*' His works will be his only memorial—they are surely the best."

The following charts were published from Captain Lloyd's labours:—

Hoogly River, Calcutta, to Saugur Point. 2 sheets. 1836.	Mergui Archipelago, Iron Island to Sayer Islands. 2 sheets. 1828.
Soonderbunds, sea face of. 3 sheets. 1840.	Mergui Harbour. 1840.
Chittagong or Kornaphuli River. 1840.	Ramree Harbour. 1831.
Balasore Roads. 1841.	Chittagong River to Foul Island. 1841.
Arakan River. 1832-45.	

CAPTAIN H. C. OTTER, R.N.

1842-1863.

Henry Charles Otter entered the Navy 12th January, 1822, and passed his examination in 1828. When a midshipman his heroic exertions saved the lives of a boat's crew; and in 1845 he again displayed great courage by jumping overboard from the *Sparrow*, which vessel he then commanded, for the purpose of affording assistance to some of his crew who had been capsized.

He obtained his first commission December 5th, 1831, and was for some time borne on the books of the *Ocean* and *Howe*, at Sheerness, as a Supernumerary Lieutenant, being appointed in March, 1832, as assistant to Lieutenant Michael Slater on the survey of the north-east coast of England. In this capacity Lieutenant Otter continued until the premature death of Lieutenant Slater, which occurred on 2nd February, 1842, and was caused by falling from the cliff, known as Holburn Head, when engaged making a theodolite station. Lieutenant Otter then succeeded to the charge of the survey.

March 5th, 1844, Lieutenant Otter was appointed to the command of the *Sparrow* ketch, for a continuation of the survey of the coast of Scotland. In August, 1844, he was promoted to Commander's rank, continuing in command of the *Sparrow* until January, 1847, when that vessel was replaced by the *Avon*, paddle steam vessel of 160-horse power.

The coast of Scotland remained under Captain Otter's surveying charge, with two slight breaks, until 1863, when he retired. Different vessels were used for the purposes of the survey, and numerous assistants were engaged under him.

In the year 1854, Capt. Otter was made a Post Captain.

His survey of Beaulieu Firth, near Inverness, called forth great praise from Sir Francis Beaufort, and the local authorities allude to it as follows:—"We have been much gratified with the extent, accuracy, and minuteness of this survey, so highly creditable to the officers of the *Sparrow*, and which could only be done by parties accustomed to such difficult and delicate operations."

In the *Porcupine*, during the last Russian War, Captain Otter, with Lieutenant Burstal as his first Lieutenant, performed excellent service in piloting the Baltic fleet, and making surveys, especially near Bomarsund. At the close of the war, he resumed his surveying operations in Scotland.

On the occasion of the landing of the first Atlantic electric telegraph cable, he took an active part in the operations in Newfoundland, where he had been specially sent to render aid and advice. To the Nautical Magazine, he contributed a lively and characteristic account of the operation of landing the shore end of the cable in Trinity Bay, in which the solemnity and the importance of the occasion are not lost sight of.

"It was Captain Otter who surveyed the bay of Bull's Arm, and who guided the cable ship safely through all the intricacies of the passage the night of our entrance into Trinity Bay. To him, and to Captain Dayman of the *Gorgon*, who acted as our escort and pilot from mid-ocean to the American terminus of the line, the Atlantic Telegraph Company are largely indebted. It is doubtful if the British Government could have selected from its long list of naval officers two who have proved themselves more capable of performing the work with which they were entrusted, or two who were more earnest in their exertions to promote the success of the great undertaking."

Captain Otter was the author of—

Sailing Directions for the North and East Coast of Scotland, which are incorporated in the North Sea

Pilot. Part II.

Also, Sailing Directions for the Sound of Harris, 8vo. 1858.

The following charts resulted from his surveys:—

Part of west coast of Scotland.	Dornoch Firth.
Loch Lomond.	Baro Sound and Ronskär Harbour (Baltic).
Mull of Cantyre to Ardnamurchan.	Raasay Sound.
Aline Loch.	Ru Ruag to Gruinard Bay.
Mull Sound and Sunart Loch.	Loch Broom.
Ardnamurchan Point to Loch Bhreatail.	Hebrides Islands, Western Port.
Skye, including Sleat Sound.	Barra Sound.
Sleat Sound.	Loch Boisdale.
Loch Hourn.	Loch Skipport.
Kyle Rhea.	Lochs Eport and Maddy.
Isle of Skye north of Loch Ainneart.	Monach and Haskeir Isles.
Kyle Akin Harbour.	Tobermory Harbour, Mull Island.
Harris Sound.	Ardnamurchan to Summer Isles.
The North Minch.	Stornoway Harbour.
Loch Inver to Loch Broom.	Scarpa Island to Barvas.
Lochs Inver and Roe.	Roag Lochs.
Eddrachilles Bay, including Cairn Bhn and Glencoul Lochs.	Pentland Firth.
Laxford and Inchard Lochs.	Thurso to Cape Wrath.
Scourie Bay.	Loch Eriboll.
Cromarty Firth.	Bull Arm (Newfoundland).

VICE-ADMIRAL SIR HENRY KELLETT, K.C.B.

Henry Kellett, born 2nd Nov., 1806, entered the Navy 7th Jan., 1822, and from 1823 until 1826 served in the West Indies on board the *Ringdove*. Towards the close of the latter year, after having accompanied a body of troops to Lisbon in the *Gloucester* 74, he joined the *Eden* 26, Capt. Wm. Fitzwilliam Owen, under whom he was employed on the coast of Africa for the colonization of Fernando Po, until his return to England in the summer of 1831. He had command during part of that time of the *Cornelia* tender, and was on board the *Eden* at a period of dreadful sickness, when forty-six men were laid up with fever without a surgeon, and only two officers besides himself were left to perform duty. Being next appointed, 7th Nov., 1831, to the *Ætna* surveying vessel, Capts. Edw. Belcher, Wm. Geo. Skyring, and Wm. Arlett, he returned to his former station, where, at the time that Capt. Skyring was murdered, he held the post of First Lieutenant, and was afterwards detached in charge of the *Raven*, tender to the *Ætna*. Oct., 1835, shortly after the latter vessel had been paid off, Lieut. Kellett assumed the command of the *Starling* cutter, of 105 tons, and was ordered upon surveying service to the west coast of South America. While there, he held the acting command, from July, 1836, until Feb., 1837, of H.M.S. *Sulphur*, during the interval which elapsed between the resignation of Capt. Beechey and the advent of Capt. Belcher. He then went back to the *Starling*, and in that small vessel, on his return to the Pacific after a voyage round Cape Horn, he proceeded to China, visiting *en route* the Marquesas and Tahiti, and touching at the New Hebrides, Salomon Islands, Borneo, &c. Arriving at his destination in Dec., 1840, Lieut. Kellett (whose vessel on her passage had been struck by lightning and dismasted) joined in the warfare then commencing against the Chinese, in which, as will be seen, he bore a very eminent part. On 7th Jan., 1841, we find him uniting in the operations against the enemy's forts at Chuenpee; and in the course of the same day serving with the *Nemesis* and the boats of the *Calliope* under Capt. Belcher, by whom he was spoken of in terms of high commendation, at the destruction of 11 out of 13 large war junks, an exploit which was achieved in admirable style.* He next, on 26th Feb., acquired the thanks of Sir Gordon Bremer for his gallantry and zeal in the action which preceded the capture of the forts at the Boca Tigris.† During the operations of March against Canton he acquired every favourable consideration for his useful exertions in sounding, conjointly with Lieut. Collinson, and Mr. Browne, Master of the *Calliope*, the various inlets through which the ships had to pass, and conducting them in safety to an anchorage off that city. In the discharge of these duties Mr. Kellett was indeed indefatigable.‡ At one period, in addition to his own vessel, the *Algerine*, and the *Young Hebe* and *Louisa* tenders, were simultaneously placed under his orders. In May, 1841, when the British renewed hostilities against Canton, Kellett, whose promotion to the rank of Commander took place on 6th of that month, again found opportunity of distinction. Proceeding afterwards to the northward, he succeeded, on the night previous to the attack upon Chapoo, 18th May, 1842, in thoroughly sounding (with the assistance of Capt. Collinson) between the anchorage of the ships and the shore, and thus enabled the *Cornwallis*, *Blonde*, and *Modeste*, while the troops were landing, to take up excellent positions against the sea batteries. In the ensuing June he appears to have again, with much zeal and perseverance, co-operated with Capt. Collinson in surveying the channel before Woosung. After the fall of Shanghai, to her position in front of which place he had piloted the *North Star* 26, Capt. Kellett proceeded with Capt. Bouchier 30 miles up the river into the interior, and contributed to the destruction, on 20th June, of two batteries mounting 5 guns each. He was also present in all the operations up the Yang-tse-Kiang, where he led the Commander-in-Chief's ship to Nankin. As a further reward for his particularly useful services Capt. Kellett was advanced to Post rank 23rd Dec., 1842, and nominated, the next day, a C.B. He obtained leave to return to England in Aug., 1843; but in Feb., 1845, was again afloat, as Captain of the *Herald* 26, engaged in surveying in the Pacific.

In this vessel he left England June 26th, 1845, and after examining different parts in Chili

* *Vide Gaz.* 1841, pp. 1162, 1222. † *V. Gaz.* 1841, p. 1498. ‡ *V. Gaz.* 1841, pp. 1504-5.

and Peru, he commenced the survey of the coast of Columbia, between Guayaquil and Panama, till then only known from the accounts of Dampier and other older authors. This survey was completed with the aid of Commander James Wood, R.N. During the progress of the work the *Herald* made three voyages to the Arctic regions through Behring Strait, in aid of the expedition in search of Franklin. The first in 1848, the next two in the succeeding years. To the *Herald*, Mr. T. Edmondson was appointed as naturalist, but was unfortunately shot by the accidental discharge of a gun in the Bay of Atacamas, January, 1846. He was succeeded by Dr. Berthold Seemann, a well-known name, who became the historian of the *Herald's* voyage.

Returning to England in the *Herald*, in 1851, Kellett was appointed to command the *Resolute* in 1852, and during the two years following the north face of the Parry group was completed. In the spring of 1853 the *Resolute* was abandoned and her officers and crew returned to England in the *Phoenix*.

A court-martial held upon the officers and crew of the *Resolute*, at Chatham, for the loss of that ship; fully acquitted Captain Kellett and his officers, returning to him his sword.

In 1854, he was appointed Commodore of Port Royal, Jamaica, in the West Indies, and on vacating that post, received from the merchants of Jamaica a handsome service of plate in recognition of their estimation of his character.

From 1864 to 1867 he was Admiral Superintendent of Malta Dockyard, and his final appointment afloat was that of Commander-in-Chief of the China Station, whence he returned to England in 1872 much debilitated in constitution from the effects of the climate.

He died at Clanocody, near Clonmel, March 1st, 1875.

The narrative of the *Herald's* voyage was by Dr. Seemann, the naturalist, as has already been stated; Admiral Kellett wrote, however, the eventful voyage of H.M.S. *Resolute* to the Arctic regions in search of Sir John Franklin, 1852-54. 8vo. 1857.

Charts as follows were published from Admiral Kellett's various surveys by the Admiralty:—

China.
Chauan Bay to Matheson Port.
Amoy Harbour and approaches.
Formosa Island and Strait.
Matheson Port to Ragged Point.
Hai-tan Strait.
Min River.
Ragged Point to Pih-ki-shan.
Pih-ki-shan to Hie-shan Islands.
Hie-shan Islands to the Yang-tse-kiang, including Chusan Islands.
Chapoo Road.
Yang-tse-kiang to Nankin.
Cape Marzo to Mariato Point.
Panama Bay.
Chepo River entrance, Perlas, Bayoneta, and Pedro Gonzales Islands.
Chamé Bay.
Panama Gulf to Parida.
Nuevo Port.

Parida and Palenque anchorages.
West Coast America.
Payta to Ayangui Point.
Guayaquil River.
Ayangui Point to Verde Point.
Salango Island anchorage, Caracas River, and St. Elena Bay.
Santiago River, Posa Harbour, San Lorenzo, and Atacames Bays.
Verde Point to Buenaventura.
Buenaventura Port.
Buenaventura to Cape Marzo.
Octavia Cupica, and Cabita Bays, Utrio Port, and San Juan River Mouth.
Guaymas.
Cerros Island.
Cape Mendocino to Vancouver Island.
Juan de Fuca Strait with Admiralty Inlet, and Puget Sound.

CAPTAIN LA PLACE (French Navy).

1829.

In December, 1829, Captain La Place, in *le Favorite*, sailed from Toulon with three chronometers, calling at Goree, St. Denis, Bourbon, Sable or Tromelin Island, Seychelles, Pondicherry, Madras, Masulipatam, Nicobar Islands, Malacca, Singapore, Manila, Macao, making numerous additions to the hydrography of Torrane Bay, Tinhosa, Natunas and Anambas. Passed too far from St. Esprit, St. Barbe, and St. Julian to fix them, but

considered Horsburgh's latitude correct. Called at Lubeck, Sourabaya, Hobart Town, New Zealand, Masafuera, Valparaiso, and Rio de Janeiro. Captain Le Marquis de la Place returned to France in his vessel, *le Favorite*, in 1832.

This was the same officer, who in 1837-40, undertook another voyage of circumnavigation in *l'Artemise* frigate.

See Voyage autour du Monde sur la Favorite en 1830-32, 4 vols. 8vo. and folio Atlas. Paris, 1833.

Also, Campagne de Circumnavigation de la Frégate l'Artemise pendant les Années, 1837-40, 6 vols. 8vo. Paris, 1841-54.

LIEUT.-GENERAL SCHUBERT (Russian).

1833.

In the above year, by order of the Emperor of Russia, a steam vessel with 56 chronometers, was placed at the disposal of Lieutenant-General Schubert, Directeur des Dépôts de Cartes, &c., for the purpose of visiting, during the summer, the most important positions of the Baltic, and of determining their longitude.

That a great number of points might be visited during the short period of the northern summer, observers were sent beforehand to the various places, to determine the time, by means of transit and other instruments, which give the time with precision. By these means, General Schubert had only occasion to stop at each point the time necessary to compare the chronometers with the astronomical clock there established, of which the rate was known by prior and subsequent observations, and was not obliged to wait for fine weather at each place.

He was thus enabled, in one summer, to make the circuit three times of all these points.

To give greater extent to the undertaking, the Russian Government entered into communication with the Governments of Prussia, Denmark, and Sweden, who, on their part, also sent observers to the most important points of their territories washed by the Baltic. It is thus that Stockholm, Altona, and Lubeck were comprised in the chain of points of which the longitudes were determined by this expedition. All the longitudes were reduced to the meridian of Greenwich. The latitudes, as ascertained by former astronomical observations, or determined by the last triangulation, were also executed under the direction of Lieut.-Gen. Schubert, as well as by observations made during this expedition.

Altona Observatory was found to be in longitude $9^{\circ} 56' 39''$ E. The corrections afforded by this voyage do not often exceed 3 seconds of time, but in a few cases amount to 16 seconds.

Notice of the Chronometric Expedition of Lieutenant-General Schubert, executed in 1833, to determine the longitude of the most important Points on the Coast of the Baltic.—Journal of Royal Geographical Society, vol. vi. p. 413.

CAPTAIN S. B. HAINES, I.N.

1833-1839.

In the survey of the Persian Gulf, Guy succeeded Maughan; and Brucks, who was a good sailor, though unfortunately not a scientific surveyor, succeeded Guy. Haines acted as the chief surveying assistant to Brucks, and with him were Kempthorne, Cogan, Pinching, Ethersey, Whitelock, and Lynch. The survey occupied ten years, or from 1820 to 1830, and Lieutenant Haines also examined the Mekran coast. The results are given in 14 charts. A "Memoir descriptive of the Navigation of the Persian Gulf," was written by Captain Brucks himself. Later on, this Persian Gulf survey was found not sufficiently accurate for modern requirements.

On the return of the *Palinurus* to Bombay, early in 1833, the examination of Hadramant, or the southern coast of Arabia, was commenced, the Indian Government being desirous of establishing coal depôts at Macullah and the island of Socotra for the line of steamers

from Bombay to Suez. So little of the coast of Hadramant was known that there was an inaccuracy of eighty-five miles in the latitude of Macullah, and there were other errors in the topography of the Kooria Moorla group. The charge of the survey was entrusted to Commander Haines, whose officers were Lieutenants T. G. Carless, J. R. Wellsted, and J. P. Sanders; Midshipmen F. Jones, J. S. Grieve, C. J. Cruttenden, J. Rennie, and A. Ford. Commander Haines quitted Bombay in the *Palinurus*, in October, 1833, and, after running up the Gulf with despatches, about the middle of November reached his ground off Cape Isolette, called also Ras Madraka and Ras el Jezirat, in $57^{\circ} 51'$ east longitude. He employed from 5 to 8 chronometers, Bombay flagstaff being assumed to be in $72^{\circ} 54' 26''$ E. He had finished about one hundred miles of the coast in about a month's time, when, in pursuance of fresh orders, he proceeded to Kisseen, in order to obtain permission to survey Socotra from the principal chiefs of the Moharah tribe, to whom the island owed nominal allegiance.

Commander Haines anchored at Kisseen on the 28th of December, and on the 31st, had a conference with two young chiefs, Ahmed Ibn Said and Abdullah Ibn Affick, who gave him full powers to do all he thought necessary, and also a firman, directed to the chiefs, to show him every civility. The *Palinurus* sailed from Kisseen on the 4th of January, 1834, and, on the 9th, arrived at Tamarida, the chief town of the island. On the following day, Commander Haines commenced a trigonometrical survey, which he continued without intermission until the 14th of March, when he returned to Tamarida, having made the circuit of the island. It was a laborious task, on account of the weather and baffling winds, and the short period occupied in its execution, Commander Haines being anxious to fulfil the wishes of the Directors, who requested that the plan of the island might be sent home by the first steamer. He and his officers worked incessantly, Sundays not excepted, and Commander Haines did justice in his report to their self-denying zeal.

When Commander Haines had completed the survey of half the island of Socotra, he received a letter from one of the Sultans, requesting him to discontinue the work, and join him at Kisseen, to hold another conference; but Commander Haines, who was familiar with the Arab character for intrigue, paid no attention to this request. He continued the survey to its completion, and a chart of the island and coasts was published.

The survey of the south-coast of Arabia by Commander Haines in the *Palinurus* was suspended for a period of thirteen months, while the survey and negotiations regarding Socotra were going on. Early in 1835, he resumed the survey from the strait of Babelmandeb to Misenaat in long. $50^{\circ} 37'$ E. The result was an excellent chart on a scale of six inches to a degree, together with numerous plans and a valuable memoir, which was published in Vols. IX. and XV. of the *Royal Geographical Society's Journal*.

In February and March, 1836, Haines surveyed the Kooria Moorla Islands, and an interesting paper by Dr. Hulton appears in the R. G. S. Journal, Vol. XI., and Commander Haines adds further details in his private journal.

A few months later Mocha Roads were surveyed, and Dr. Hulton soon afterwards died from the effects of a journey to Sanaa, an account of which by Mr. Cruttenden appears in the "Transactions of the Bombay Geographical Society," Vol. II., as well as in Vol. VIII. of the Journal of the R. G. S.

In May, 1837, the survey of the south-east coast of Arabia was suspended owing to Captain Haines's services being required in a political capacity in connection with the acquisition of Aden, but was resumed in 1844 by his Assistant Commander, J. P. Sanders, by orders of the Government. Commander Haines now returned to Bombay, and, in October, was again despatched to Kisseen in the *Palinurus*, with instructions "to negotiate with the chiefs, who held the sovereignty of Socotra, for the purchase of that island;" "you will also," continue the instructions, "receive for the above purpose 10,000 German crowns, but the Governor-General of India in Council trusts that you will be enabled to buy this island for a much smaller sum, and the less money you pay the more credit you will

derive. Your personal knowledge of these chiefs and their character will enable you to negotiate with advantage to them." Commander Haines was also given a draft of the treaty he was to negotiate, and was directed to proceed, on its completion, to Socotra, for the purpose of taking "formal possession in the name of the Hon. East India Company." He was further informed that in all probability, on his arrival at Socotra, he would find British troops in possession, when he was to make over charge to the officer in command.*

Captain Haines bore an unblemished character during his career, first as one of the most accomplished of that scientific band of surveyors for which the Indian service was so famous, and, after the conquest of Aden, as its first Governor for a period of fifteen years. Captain Haines was the first to point out the advantages of the "Gibraltar of the East," both as a coal depôt and military station. He carried on the negotiations that led to its sale, and was present at the capture as Political Officer.

Under the title of President he was a power in those regions, where his firmness taught the Arab tribes to fear the British power, while his sagacity and moderation rendered his name one "to conjure with" among the lying, treacherous Sheikhs and rulers on both sides the Straits of Babelmandeb.

For his many services the Court of Directors presented their old and valued servant with a sword of the value of 200 guineas. But Captain Haines was no man of business, and while he was always soliciting the Government to send him accountants, having no staff for the purpose, he took little account of the expenditure and the balance in the treasury. In an evil hour the Government, which had turned a deaf ear to his solicitations, sent an officer to count the cash, when it was found that there was a very large deficiency. Neither Captain Haines nor his Assistant, Commander Cruttenden, could account for this deficiency; and, though no one who knew either of those officers, whose character for integrity was unimpeachable, attempted to accuse them of peculation, Captain Haines was, of course, responsible, and he was, therefore, sent under arrest to Bombay, and brought to trial by Government, but acquitted by two juries. And there he lingered for six years, notwithstanding that he offered to make good the deficiency with his private fortune (not accumulated savings), and also proposed to sacrifice his pay. But the Government turned alike a deaf ear to his offers, to the prayers of friends—who pointed out that he was being slowly killed by the miserable place in which he was confined—and the urgent remonstrances and recriminations of the press; and it was not until the 9th of June, 1860, a few days after the arrival of Sir G. Clerk, the new Governor of Bombay—whose first act was this Christian-like deed of charity and justice—that this old and distinguished officer was released from prison. But it was too late, and he died on the day week of his release, or the 16th June, 1860.

The following charts emanated from Captain Haines's surveys:—

Entrance to the Red Sea.	Battnah and Barkah Coast.
S.E. Coast of Arabia from Straits of Babel	Entrance to the Gulf of Persia.
Mandeb to Misenaat.	Coast of Arabia from Ras Goverhindee to Ras
Bays near Cape Aden.	Soaote.
S.E. Coast of Arabia from Misenaat to Ras	Entrances to Rivers at the Head of Persian
Sangra.	Gulf.
Gulf of Aden (two sheets).	Coast of Persia from Basliore to Bassadore.
Kooria Moorla Bay and Islands.	Clarence Straits.
Island of Socotra.	Coast of Persia and Belorchistan from Kooe
Harbours of Muttra and Muscat.	Mubarrack to Kurrachee.

Also, Memoir of the South and East Coasts of Arabia. R. G. S. Journal, vol. ix. and xv., pp. 125 and 104.

Description des Côtes Méridionales d'Arabe depuis l'entrée de la Mer Rouge, jusqu'à celle du Golfe Persique. 8vo. Paris, 1849.

* History of the Indian Navy, vol. ii., page 526.

HYDROGRAPHY.

41

REAR-ADMIRAL M. S. NOLLOTH, R.N.

1832-50.

As a Lieutenant in H.M.S. *Satellite*, on the East Indian Station, Nolloth assisted and was the main worker in the surveys on the east coast of the Bay of Bengal, undertaken by Captain Laws commanding that vessel, more especially in the neighbourhood of Cheduba Strait and Ramree Island.

Subsequently, when in command of H.M.S. *Frolic* on the west coast of Africa, he undertook surveys of Saldanha Bay and other anchorages, with an examination of the coast south of the Orange River and immediately northward of the Cape of Good Hope. Robbe Bay, or Port Nolloth, was named after him. These surveys were in a measure repeated in later years by Navigating Lieutenant Archdeacon, R.N.

In China, Captain Nolloth, whenever opportunity offered, added to the hydrography of the ports he visited, amongst which, the Saddle group, is worthy of mention. For three years, from about the year 1865, he was Commodore at Hong-Kong.

He never hoisted his active flag, and died at an advanced age about the year 1879. He wrote a report published in the Nautical Magazine for 1855, termed "Examination of the Namaqualand coast, south of the Orange River, in H.M.S. *Frolic*."

CAPTAIN T. S. BROCK, R.N.

1837-1848.

Thomas Saumarez Brock entered the Navy 9th Feb., 1815; passed his examination in 1822; obtained his first commission 12th May, 1827; and was appointed, 4th Feb., 1828, to the *Blonde* 46, Capt. Edm. Lyons, under whom he served for some time at the blockade of Navarin, and in co-operation with the French at the reduction of Morea Castle, where his zeal and intelligence, at the landing of the guns, 18th Oct., 1828, were very conspicuous. On leaving the latter ship he was uninterruptedly engaged in the survey of the Mediterranean—first, from Nov., 1830, to May, 1836, in the *Mastiff*, *Meteor*, and *Beacon*, as assistant to Lieut. James Wolfe and Capt. Rich. Copeland—then for nearly six years in command of the *Magpie*—and, from the 5th March, 1844, in command, also, of the *Bonetta* brigantine. He was advanced to Commander's rank while in the *Magpie*, 7th March, 1842.

The sole charge of the Mediterranean survey fell to Captain Thomas Graves on the retirement of Captain Brock from active employment. Captain Brock, besides being a talented surveyor, was a superior water-colour artist, and a beautiful series of marine and other views, bound together in two volumes, and termed "Brock's Contribution," form one of the most elegant and valuable of the collections to be found in the Hydrographic Department of the Admiralty.

The following were amongst the charts published from the surveys of Captain Brock:—

Xyli Bay.	Fowini Islands.
Vatika Bay and Cerir Island.	Samos Strait, or Boghaz.
Petali Islands and anchorages.	Gallipoli Port (Kos Gulf).
Siphano, Serpho, Thermia and Jura Islands.	Shehir Oghlan Islands.
Amorgo and Denua.	Deremen Port.
Tinos, Mykoni, Rhenea and Belos.	Yedi Atala.
Skopelo Group.	

VICE-ADMIRAL T. A. B. SPRATT, C.B., F.R.S.

1835-1863.

This officer, the eldest son of Commander James Spratt, the latter, a veteran whose plucky action fittingly finds a place amongst "Deeds of Naval Daring,"* entered the Navy in June, 1827.

* See page 362, vol. 2, of "Deeds of Naval Daring," published by J. Murray, Albermarle Street, London, 1854. At the Battle of Trafalgar, James Spratt swam from the *Defiance* to the *Aigle*, climbed the rudder chains, entered the stern port, and fought his way single handed to the poop of that vessel, and hauled down the French colours. In performing this service he killed three French grenadiers, and had his leg shattered from the musket of a fourth.

From 1832 to 1863, without interruption, from Midshipman to Post Captain, Thomas Spratt was employed in the naval surveying service of the Mediterranean. In the *Mastiff* and *Beacon*, under Captain Thomas Graves, he received his early training, and it may be said that he remained the fast friend of that officer to the day of his cruel assassination by a Maltese boatman.

In October, 1837, he plunged overboard from the *Beacon*, and at great risk saved the life of a Marine who had accidentally fallen into the sea, for which he was publicly thanked on the inspection of the *Beacon* by the Commander-in-Chief of the Mediterranean, by order of the Admiralty.

Promoted to the rank of Lieutenant in 1841, the private secretary to Lord Haddington, in writing to his father, observed that "His Lordship directs me to make known to you the great satisfaction it has afforded him to recommend to the Board for this promotion a young officer so highly spoken of as your son has been, both by Captain Beaufort, the hydrographer of the Admiralty, and Captain Graves."

From March 1st, 1847, until April, 1848, Lieut. Spratt commanded the *Volage*, surveying vessel in the Mediterranean, which had taken the place of the *Beacon*.

Having passed a first-class examination in steam at Woolwich, he shortly afterwards succeeded Captain Graves as Commander of the *Spitfire*, which had succeeded the *Volage* as the principal surveying ship on the same station.

Season succeeded season, of excellent surveying work, during which, the classical and geological history of the various ports and islands of the Grecian Archipelago and coasts of Asia Minor received able treatment at his hands. Without any particular interest to push him he reached the highest position of the Mediterranean; and the surveying officers of those days required something more than a knowledge of the sextant and measuring chain. Spratt had been well educated as a lad, and never failed to turn his early training to account. Had he been less confident of his own powers, less zealous in the use of those powers, more mediocre as a man, he might have proved even more successful; but he could never stoop to obtain the more marketable description of scientific fame.

When war broke out with Russia, the services of the *Spitfire* became the admiration of the fleet under Lord Lyons, and letter after letter of thanks poured in upon her Commander. These culminated in January, 1855, in Commander Spratt's promotion to Post rank. Sir Francis Beaufort on that occasion wrote the following characteristic letter, which clearly marks the tone existing at that period between the hydrographer and his Captains abroad:—

My Dear Spratt,—There are few persons so dull and cold as not to feel pleasure in giving or receiving mutual wishes for each other's happiness at the beginning of every new year; but how much is the charm of those friendly wishes enhanced and heightened when they amount to fruition and are accompanied by matter of fact. And so, my good friend, shall my hearty new year's day wishes for your happiness be accompanied by the official announcement that your long career of unswerving fulfilment of your various duties, your modest but industriously acquired and always rightly applied knowledge, and the dashing and exemplary zeal you have displayed since hostilities began have been this day crowned by the Posting the *Spitfire*, and giving her command to my worthy and cherished fellow labourer, Tom Spratt.

Yours faithfully, F. BEAUFORT.

This was followed by two similarly desirable letters from the first Lord of the Admiralty and from the Commander-in-Chief, which ran as follows:—

Sir,—The reports which I have received of your conduct while in command of the *Spitfire* are highly satisfactory, and the services which you have performed both in surveying and before the enemy reflect much credit on you and deserve my entire approbation. I have therefore had much pleasure in concurring with this Board in promoting you to the rank of Captain.

I have the honour to be, Sir, yours faithfully,

JAMES GRAHAM.

Captain Spratt, R.N.

My Dear Spratt,—You owe your promotion to your own zeal and ability and to your conscientious and cheerful manner of bringing these excellent qualities into play. I congratulate you with all my heart and soul.

Yours sincerely,

E. LYONS.

In the early part of the war, the discovery of the Erekli coal mine in the Black Sea was due to Spratt, who also discovered the great military bridge known as "Chongor Kupree," across the central part of the Putrid Sea, which had been secretly made by the Russians ten years before, and connected with the roads of the Crimea. This bridge was unknown to our Consuls, and had not been used for traffic. For this Lord Raglan wrote a letter of warm thanks to the discoverer.

In 1857, having been appointed to survey the mouths of the Danube for the International Commission, Captain Spratt became dangerously ill, but perseveringly stuck to his post, or as Sir Francis Beaufort quaintly put it—his "body yielded to the supremacy of his mind."

At the close of the war, Spratt became a C.B., and had his seniority been a little greater rumour asserted he would then have received the K.C.B. for his excellent war and scientific services combined. Under him worked Wilkinson and Brooker, able artists, and observant surveyors.

Finished surveys, eye sketches, ground plans and bird's eye views, rapidly accumulated, some of which were made under the enemy's fire. The *Spitfire* was an intelligence department in herself, and as the flag captain (Mends) remarked, "he looked upon Spratt as the main-spring of all the operations, whilst Lord Lyons held the key."

After the conclusion of the Russian war, Captain Spratt continued as chief of the Mediterranean surveys in the *Medina* until the close of 1863, or the year in which Rear-Admiral Washington, the hydrographer who had succeeded Sir Francis Beaufort, died. In that year the President of the Royal Geographical Society remarked, in his address to that society, that "no stronger proof of the high estimation in which Captain Spratt is held by men of science and art can be given, than that he was last year selected as the first out of many candidates in the list of the nine persons who are annually admitted into the Athenæum Club as "*eminently distinguished*, in science, letters, and the arts, or public service."

Numerous reports and works have been published by Captain Spratt.

As far back as 1838, a paper by him will be found in the *Royal Geographical Society's Journal*, "On the supposed situation of Minoa and Nisæa," and in 1846, he published a volume of "Travels in Ancient Lycia," Milyas, and the Cibyratis, conjointly with Professor Forbes, in two volumes.

In 1854, a report by him, "On the Geology of Malta and Gozo," was published.

In Vol. XXIII. of the Nautical Magazine, page 345, will be found, Remarks by Captain Spratt on the Roadstead of Kosloo, the Anchorage off Erekli, and a Report on the Turkish Coal Mines near Erekli.

In 1856, a paper on the Investigation of the Movements of Teignmouth Bar.

Reports on Deep Soundings in the Mediterranean Sea, east of Malta, in 1856-57; with remarks on the best means of obtaining Deep Soundings. 8vo. 1857.

Remarks on Serpent Island in Report on Delta of the Danube.

Remarks on the comparative conditions of the different Mouths and Branches of the Danube. *Folio*, with plans. 1858.

Experiments and Results on the Currents of the Sea of Marmora, Dardanelles, &c. 8vo. 1858.

Report on the Delta of the Danube, with plans and sections. 1858.

Investigation of the effect of the prevailing Wave Influence of the Nile's Deposits. 1859.

Dissertation on the true position of Pelusium and Farama. 1859.

Sailing Directions for the Island of Crete or Candia. 8vo. 1861.

On the evidences of the rapid sinking in progress at Port Said, the entrance to the Suez Canal. 8vo. 1870.

In his Inquiry into the Soundness of M. de Lessep's Reasonings and Arguments on the practicability of the Suez Canal, published in 1858, it is known by many that Captain Spratt was averse to that undertaking, and had the courage to boldly state his opinions and their basis. Those who know, however, how often he was almost instinctively correct in his opinions, will allow that this was the one exception, confirming the rule, that he was almost always right and certainly most scrupulously straightforward in any professional advice he ever offered.

The last book written by him was "Travels and Researches in Crete," in two volumes, 1864. Sir Roderick Murchison, in his address to the Royal Geographical Society, in 1865, thus alludes to it:—"The 'Travels and Researches in the Island of Crete,' by Captain T. A. B. Spratt, R.N., is a work which will rivet the attention and enrich the minds of various readers, whether they be antiquaries and scholars, or geographers and men of other sciences. Well may I have spoken elsewhere in this address, of that highly-instructed branch of the Royal Navy, the Surveyors; for here we see produced by one of them a masterly illustration of the physical geography, geology, archæology, natural history, and scenery of the diversified Island of Crete. In his accurate nautical chart, giving the outlines of the land, and the soundings around this broken and deeply-indented island, as seen in the geological maps published in these volumes, the author clearly sustains, by data exposed along the shores of Crete, the law laid down by De Saussure on the southern side of the maritime Alps, that the highest and steepest parts of a coast are always flanked by the deepest waters. Detailing the geological structure of the island, from the older rocks which rise to the summit of Mount Ida to the most recent deposits on the sea-shore, Captain Spratt adduces physical evidences to prove that considerable elevations of the island, as seen in many places, have taken place within the historic period. This is demonstrated by the marks of the old sea-level, made when the sea covered the ancient port of Phalasarna, which has been raised up and constitutes dry land. In this way the importance of geological knowledge to guide archæologists is demonstrated; for our associate explains to us the changed form and outlines of old ports and cities, in a way which his predecessors, however learned, could not have applied, for want of geological knowledge. This work must indeed be warmly welcomed by all comparative geographers; and if that great scholar, our deceased associate Leake, were still among us, he would be the first to eulogise it.

"When we consider the severe nautical duties which have been performed by Captain Spratt, and know that he is the officer, who, called away from peaceful, scientific efforts, so distinguished himself afterwards in the late war, by boldly and accurately determining the soundings along the coasts of the Crimea, and under the enemy's batteries at Kinburn, thus leading in our fleet to act with effect, we cannot too much admire the many fine qualities which are combined in this gallant seaman. Let me say, as a geologist, that no portion of these most-interesting volumes has more sincerely gratified me than the manner in which the author enunciates and identifies himself with the views and observations of that profound naturalist, Edward Forbes, who was for some time his companion. We must never forget, that without the deep sea soundings and dredgings conducted by Captain Spratt, we should never have obtained the grand views of Edward Forbes on the submarine zones inhabited by different classes of animals, which established an entirely new phase in the inductive reasoning of geologists, who, after all, are but physical geographers of former conditions of the earth's surface."

Captain Spratt, who is retired from the Active List, became a Rear-Admiral in October, 1872, and Vice-Admiral in March, 1878. He has since held the post of Commissioner of the Irish Fisheries, and is at present chairman of the Mersey Conservancy Board. The Vice-Admiral is a Fellow of the Royal, of the Geological, of the Zoological and Geographical, as well as of the Society of Antiquaries.

The following charts resulted from his numerous surveys in the Mediterranean :—

Malta and Gozo Islands.	Dardanelles (Narrows).
Comino Channels.	Marmara Sea.
Valetta to Marsa Scirocco.	Buyuk Chekmejh Bay.
Valetta Harbours.	Princes Islands.
Xeros Islands.	Pyrgos or Burghaz Gulf.
Baklar Port.	Varna.
Candia or Crete Island (two sheets).	Baljik Bay.
Anchorage in Standia Island.	Delta of Danube River and entrance to Razem Lake.
Khersonesos and Eremopoli Bays, Hierápetra or Girapetra.	Mouths of the Kilias Branch.
Crete, Sitia and Grandes Bays, also Kalo Limniones.	Sulina Mouth, Fido Nisi Island.
Kustenjeh anchorage.	Balaklava Port.
Kustenjeh to Chernavoda and Rassova, with the Karasú Lakes.	Ras Bulaou to Alexandria.
Poro Bay and Port Nikolo.	Gharah Island to Dernah.
Ports Grabusa, Rhithymno, Lutro, and Kutri.	Koslu Bay.
Tigani Port, Samos Island.	Bender Erekli.
Stampalia Island.	Ali-agma Port.
Maltezana Port.	Smyrna Harbour.
Scarpanto and Casso or Caxo Islands.	Budrum.
Dardanelles entrance and Port of Tenedos.	Dernah to Ras Bulaou.
	Tripoli Harbour.

CAPTAIN C. G. ROBINSON, R.N.*

1835-48.

Charles Gepp Robinson entered the Navy 13th May, 1819, on board the *Hasty*, on the North Sea station. From 1821 until 1826 he was employed in the *Leven*, Capt. Wm. Fitzwilliam Owen, on the survey of the east and west coasts of Africa. He was one of the few officers of that expedition who ever returned to England. On 30th Sept., 1826, he was promoted to the rank of Lieutenant; and in the course of the following year he again, in the *Eden*, sailed with Capt. Owen for the coast of Africa, for the purpose of forming a settlement at Fernando Po, in the Bight of Biafra, where every gun-room officer but himself fell a victim to the climate. While on this service he was chiefly employed in a tender in cruising after slavers, three vessels of which description he succeeded in capturing. The "prompt zeal" he displayed on one occasion in proceeding to sea under peculiar circumstances in the *Horatio* schooner had the effect of procuring him, in Jan., 1828, the thanks of the Government of Sierra Leone. From March, 1829, until April, 1835, he served with his name on various ships, books, in the surveying service, chiefly on the coast of Wales, as Assistant to Capt. Henry Mangles Denham. He was then placed in charge of the survey on the Welsh coast, whence he afterwards repaired to the coast of Scotland. Having attained the rank of Commander, 28th June, 1838, he was appointed in that capacity, 13th Dec., 1842, to the *Gleaner* steam-vessel, fitting at Woolwich. From 31st Jan., 1843, until paid off at the close of 1847 he commanded the *Shearwater* steamer of 160 horse-power, again on the coast of Scotland. He was employed during that period in attendance on the Queen on the occasion of one of Her Majesty's visits. He attained his post rank 9th Nov., 1846, and continued to serve in the surveying service until December, 1854, when he was appointed for special service to the *Ceylon* in the Mediterranean, and was succeeded in his charge in Scotland by Commander Bedford. He took a prominent part in connection with laying the Mediterranean electric cable.

* This officer's name should not be mistaken for that of Commander Frederick Robinson, who served from 1835 to 1844 in the *Comet*, under Captain G. A. Frazer, on the coast of Ireland, and afterwards in the *Penelope*, on the west coast of Africa, and in the *Bonetta* surveying brigantine, in the Mediterranean, under Captain T. S. Brock, whence he returned as First Lieutenant. He subsequently served in the *Investigator*, discovery ship, under Captain E. J. Bird, in the Arctic regions.

The following charts were the chief results of Captain Robinson's labours :—

Scotland, West Coast.
Solway Firth to Loch Ryan.
Kirkcudbright Bay.
Loch Ryan.
Ardrossan Harbour.
Gigha Sound.
Firth of Clyde and Loch Fyne.
Firth of Clyde.
Toward Point to Whitefarland Point.
Clyde River from Greenock to Dumbarton.
Kyles of Bute, Strivan, and Ridun Lochs.

Inchmarnoch Water.
Loch Gilp. East Loch Tarbert. Millport.
Loch Fyne.
Loch Crinan to Cuan Sound.
Mull of Cantyre to Ardnamurchaw.
West Loch Tarbert.
Swen and Killisport Lochs.
Islay Sound.
Frith of Lorn or Luing I. to Mull Sound.
Oban Bay.

CAPTAIN W. L. SHERINGHAM, R.N.

1830-1853.

William Louis Sheringham entered the Navy 13th June, 1808, on board the *Saturn* 74, Captain Lord Amelius Beauclerk, under whom he continued, chiefly employed on the Home and North American stations, in the *Royal Oak* and *Hannibal*, 74's, and again in the *Royal Oak*, until January, 1815. While on the books of that ship he was present, as Midshipman, in the attack upon Flushing, and was for some time lent to the *Ætna* bomb., Captain Gardner. After serving for about two months with Sir Alex. Cochrane in the *Tonnant* 80, he was nominated, 28th March, 1815, Acting-Lieutenant of the *Ardent* prison-ship at Bermuda, Captain Sir Wm. Burnaby. From May to July, 1816, he was borne as a Supernumerary Acting-Lieutenant (while proceeding from the latter place to Halifax, and thence to England) on the books of the *Akbar* 50, bearing the flag of Rear-Admiral Edward Griffith, and *Buffalo* store-ship. He next, in August, 1819, and Sept., 1822, joined, in the capacity of Midshipman, the *Superb* 74, and *Creole* 42, bearing each the broad pendant of Commodore Sir Thos. Masterman Hardy, on the coast of South America, where, from 29th April until 18th October, 1823, he served as Acting-Lieutenant and Lieutenant in the *Beaver* 10, Captains Bouchier and Dance.

From August, 1830, until 1836, he was borne on the books of the *Royal George*, *Ocean* and *Howe* flag-ships at the Nore, but was engaged for a short time in assisting Captain Francis Beaufort, the Hydrographer at the Admiralty in the compilation of Sailing Directions and re-organisation set going by that officer in the Hydrographic Department. He was then appointed to the charge of the survey of the north coast of Wales, and continued until 1837, when, having completed, he continued between Milford Haven and Cardigan Bay, of South Wales. In 1839 he moved southward to the coast of Cornwall, but in 1841, owing to circumstances requiring an immediate survey of Portsmouth and Spithead, he was appointed to the steam vessel *Rocket* for that duty with Lieutenants Otter and Church, and Mr. Wood, Mate, R.N., as his assistants.

In 1841, Lieutenant Sheringham was made a Commander, and on this occasion, the various officers engaged under him in the survey, subscribed for, and presented him with a handsome sword, in token of the estimation in which he was held.

In 1843, the *Rocket* was replaced by the *Fearless*, which latter again gave way for the *Dasher* in 1845, Commander Sheringham continuing in charge throughout.

In the autumn of 1846, steam vessels were urgently required for the purpose of relieving the famine on the coast of Ireland, and amongst others the *Dasher*. The *Dasher* was never allowed to return to the surveying service.

On the 9th October, 1847, Sheringham was made a Post Captain, continuing his operations as surveyor in charge on the south coast of England, and carrying out on adequate scales, the various surveys, from which the English channel sheet from Owers to Christchurch was constructed.

In 1852, he published a pamphlet, entitled "Suggestions for manning the Navy with Volunteer Seamen."

The Naval Coast Volunteers now merged into the Coastguard were re-organised mainly from his suggestions.

Captain Sheringham gave up his surveying command at the end of December, 1853, and was followed on the south coast of England by Commander Cox. His name then appears on the books of the *Fisgard*, at Woolwich, as a Captain, borne for service in the Naval Coast Volunteers.

Captain Sheringham contributed numerous reports to the Nautical Magazine, amongst which may be mentioned the following:—

- Regarding a floating Light for Carnarvon Bar. Report on Harbour of Porthdynllaen. 1838.
- On Holyhead Harbour as a Packet Station. 1839.
- Plan of a Jury Rudder for steam ships. 1839.
- Report on St. Ives Bank. 1840.
- Report on Fog Signals. 1842.
- On the Tides between Owers and Portland, made during the survey of the South Coast of England. 1851.
- Also, suggestions for Manning the Navy, 1852 and 1856.
- Sailing Directions from the Start Point to the northern entrance to Torbay, Teignmouth, and Exmouth Harbours, and the coast from the Needles to Selsea Bill. 1856.
- Portsmouth and its Bar; with observations on Southampton considered as a Naval Station. 1864.

Of charts made from his surveys, the following are still extant:—

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|---|---|
| Owers to Christchurch, with Spithead and the Isle of Wight. | Trevoze Head to Dodman Point. |
| Portland to Portsmouth. | Poole Harbour. |
| South Yarmouth. | Bristol Channel to New Quay. |
| Needles and North Channels. | Ramsey Sound with the Bishops and Clerks. |
| Portland to St. Alban's Head. | Fishguard and Newport Bays, Cardigan Port. |
| Start Point to Portland. | Gynfelin Patches, Aberystwith and New Quay Bay. |
| Exmouth Harbour. | Aberdovey and Barmouth. |
| Teignmouth. | Sarn-Badrig, Sarn-y-Buch and Madoc Port. |
| Tor Bay. | St. Tudwall and Pullheli Roads. |
| Dartmouth Harbour. | Porth-dyn-Ueyn. |

CAPTAIN GEORGE WILLIAMS, R.N.

1846.

George Williams entered the Navy 1st Sept., 1819, passed his examination in 1827, and was promoted to the rank of Lieutenant 26th May, 1831. His succeeding appointments were chiefly on surveying service—6th Dec., 1831, to the *Fairy*, Capt. Wm. Hewett, in the North Sea, which vessel was totally lost; 28th Aug., 1834, to the *Medea* steamer, Capt. H. T. Austin, in the Mediterranean; 4th July, 1836, to the *Beacon* 8, Lieut.-Commander Thos. Graves, on the same station, where he was superseded in Nov., 1839; 7th Feb., 1843, as Additional, to the *Lucifer* steamer, Capt. Fred. Wm. Beechey, on the coast of Ireland; and 17th Nov., 1843, in a similar capacity for surveying service, with his name on the books of the *Royal Sovereign* at Pembroke. He was advanced to Commander's rank 2nd July, 1846.

After assuming charge of a survey, the scene of Captain William's labours was confined chiefly to the neighbourhood of the south-west part of England, where he worked in hired boats, and latterly in a small paddle steam vessel named the *Bann*.

Captain Williams was advanced to post rank on the 1st January, 1855, and retired from the Active List at the close of 1865.

The following charts were published by the Admiralty from his surveys:—

Dodman Point to Start Point.

Plan of Eddystone Rocks.

Looe Harbour.

Fowey Harbour.

Approaches to Falmouth.

Falmouth Harbour.

Trevoze Head to Dodman Point.

Helford River.

Manacle, Runnelstone and Longships Rocks.

The Lizard and adjacent Rocks.

Penzance Bay.

St. Ives Bay.

Scilly Islands.

REAR-ADMIRAL A. B. BECHER, F.R.A.S.

1841-64.

Alexander Bridport Becher, born 12th June, 1796, entered the Royal Navy College in April, 1810, and embarked Nov., 1812, as Midshipman, on board the *Barham*. In that ship he continued to serve until July, 1814, latterly in the capacity as Master's Mate. He then joined the *Cordelia*, and was afterwards, from Dec. in the same year until June, 1817, employed, under Commodore Edw. W. C. R. Owen and Capt. Wm. Fitzwilliam Owen, chiefly in surveying the lakes of Canada. He became attached, in Feb., 1818, as Admiralty-Mate, to the *Superb*, whom he accompanied in the first guardship cruise; was transferred, in a similar capacity, 2nd Sept. following, to the *Leven*, Capt. David Ewen Bartholomew; and after a period of twenty months, spent in surveying the whole of the Azores, part of the African Coast, and some of the Cape de Verde Islands, joined the *Conway*. In the latter ship he accompanied Capt. Basil Hall in his interesting cruise in the Pacific, in 1820-1-2, the narrative of which was afterwards published by that officer. Mr. Becher, who had been promoted May, 1822, paid the *Conway* off as First-Lieutenant, March, 1823. He was senior afterwards in the North Sea, from 30th March to 31st Dec., 1839, of the surveying-vessel *Fairy*, Capt. Wm. Hewett, which was lost in the following year, with all on board. On 23rd Nov., 1841, he was promoted to the rank of Commander. His last appointment afloat was to the *Mastiff*. In that vessel, which he commanded from 1st Feb., 1847, until 6th April, 1848, Capt. Becher completed the survey of the Orkneys. He was advanced to Captain's rank 20th March, 1856.

With the exception of the time served in the *Fairy* and *Mastiff*, Capt. Becher was employed, from May, 1823, to 1864, in the Hydrographic Department of the Admiralty, where the original charts—between 20,000 and 30,000 in number—were arranged and classified by him upon a system which renders them accessible to immediate reference.

His 80 years of life were industriously spent, and his useful work remains a permanent memorial of his existence.

In his early days he saw much active service, and his frequent employment on the work of nautical surveying aroused in him a strong desire to improve the seamen's chart. On being offered by Sir Francis Beaufort employment in the Admiralty to arrange and catalogue the vast number of documents, manuscript charts, maps, and plans all relating to hydrography, he gladly undertook the task, and successfully completed it in the course of three years; thus introducing order amongst a mass of papers, &c., which had previously been of little value, owing to the confused state into which they had gradually fallen. Upon the completion of this work, he obtained a permanent appointment in the Hydrographic Department, next to the hydrographer.

While in this office, he employed much of his time in literary pursuits, and in 1832 brought out the first number of the Nautical Magazine, managing and editing it subsequently for a period of 39 years.

In the early days of the Nautical, an annual grant was made by Government to assist to keep it up, so imperfect were the hydrographical records in those days. The sum of £50 a year was paid out of Naval Funds, and £50 a year out of the Mercantile Marine Fund.

Even to this day, the Admiralty refer for many of their hydrographic records to the

early numbers of the Nautical Magazine. At the death of Admiral Becher, however, the Nautical Magazine changed hands, the Government subscription having been previously withdrawn.

By means of Admiral Becher's early labours in connection with this Magazine, the seamen's chart has been vastly improved, and many supposed dangers expunged, while others more real have been clearly pointed out.

It has been said of Admiral Becher, who died in 1876 at the ripe age of 80 years, that he was a kind friend, a good man, a hard working and painstaking officer, an ornament to his profession, and a valuable public servant. Among many writings undertaken during his life-time may be mentioned:—

- Voyage to the South Atlantic Ocean in H.M.S. *Chanticleer*, in the years 1828-30, under Captain H. Foster. 2 vols. 8vo.
- Brief account of the various Expeditions to the Arctic Regions. 8vo. 1835.
- Tables for reducing Foreign Linear Measure into English, and *vice versa*. 8vo. 1842.
- Description of an Artificial Horizon for Sea and Land. 8vo. 1844.
- The Storm Compass, or Seaman's Hurricane Companion. 12mo. 1853.
- Tables of Mast-Head Angles. 12mo. 1854.
- The Binnacle Compass corrected by itself. 12mo.
- The Landfall of Columbus in 1492; with a translation of the Baron Bonnefoux's History of his previous life. 8vo. 1856.
- Navigation of the Atlantic and Indian Oceans, and the China and Australian Seas. 8vo. 1856.
- Navigation of the Pacific Ocean; with an account of the Winds, Weather, and Currents throughout the year. 8vo. 1864.
- Winds and Currents of the Mediterranean, with remarks on its Navigation at different seasons of the year. 8vo. 1864.

North Ronaldsha Firth, in the Orkney Islands, was surveyed by him, and he also acted as chief assistant surveyor to Captain W. Hewett in the *Fairy*.

CAPTAIN W. T. BATE, R.N.

1848-57.

William Thornton Bate, born in 1819, was son of Captain Bate, R.N., for some time, about the year 1833, Governor of the Island of Ascension.

He entered the Navy in September, 1831, and served on the Cape and African station in the *Isis*, *Thalia*, *Trinculo*, and *Pelican*.

In 1839, having passed his examination, he served as Mate of the *Melville* 74, exchanging in March, 1841, into the *Blenheim* 72, Captain Herbert, and *Wellesley* 72, flagship of Sir Gordon Bremer. In the assault upon Canton, in May, 1841, he had a pistol knocked out of his hand by a gingall ball; for this he was promoted to Lieutenant's rank in October of the same year.

As additional Lieutenant of H.M.S. *Plover*, Captain Richard Collinson, he was employed on shore at the capture of Chapoo, 18th May, 1842, on which occasion, after assisting in landing the troops, he accompanied them on their advance, and by his exertions succeeded in making prisoner a Chinese officer holding the rank of colonel.

He had volunteered as Captain Collinson's assistant for the China Survey into the *Plover*, and commanded the *Young Hebe*, tender to that vessel, from July, 1843, to February, 1846.

After the fall of Amoy, Captain Collinson says, "here he received his first and only lesson in nautical surveying which I had ever occasion to give him. We landed together at our first station, and putting up the theodolite, I took a round of angles, he noting for me. I then put the instrument out of gear—let him level it, take a few angles, and put it in the box. He next was ordered to take up a series of stations, so as to carry out the triangulation round the bay; and on plotting our work that night I found at once I had obtained an efficient and trustworthy assistant."

The war being over and "the survey of the coast of China from the Chusan Archipelago to Hong Kong having been delineated with great labour on 95 sheets of drawing paper," Bate having declined the command of his former small craft the *Young Hebe* (ill-adapted as she was for the continuation of the survey of the China coast), returned to England as First Lieutenant of the *Plover*. He then spent two years at the Royal Naval College, and at length, through the intervention of a friend who happened to be in a position to wield some political influence, obtained his long-deserved promotion to the rank of Commander on the 5th February, 1848. He was selected by Sir Francis Beaufort to resume the survey of the China Sea, and proceeded for this purpose overland to join H.M.S. *Royalist*, in which he was employed from 1849 to 1854 in surveying the Palawan passage and island. The *Royalist*, which had been engaged in China for some years before, was very old, and was said to abound with the usual cockroach and other vermin which attach themselves to vessels which have been long in the tropics. At Hong Kong, in 1854, this vessel was surveyed and found no longer adapted for the work, but after a month's repair at the hands of the Chinese caulkers and European artificers she was sent to England, where Bate arrived at the end of May, 1854, after five years of arduous surveying service, during which the island of Palawan, with the now well-known Palawan passage, was correctly charted. Expecting his promotion, having been strongly recommended on all sides, Bate was informed that his only chance lay through the Hydrographer, who at that time had a captain's vacancy at his disposal every second year.

He was now engaged for some months at the Admiralty in completing his charts, and in compiling Sailing Directions, upon the finish of which, having determined to leave the surveying for the general service, Bate was offered the command of either the *Mariner* in the West Indies, or the *Bittern* in China (1856). He chose the latter, and left by the P. and O. packet, arriving at Hong Kong in April, 1856. In August of that year, without his wishes being consulted in the matter, he was appointed to the command of the *Actæon*, which had been sent out from England with the gunboat *Dove* as tender, to carry out a survey of the coast of Tartary. Lieutenant C. Bullock, who had served as a midshipman in the *Royalist* under Bate, commanded the *Dove*.

Captain Bate was promoted to post rank in February, 1857, for distinguished service, having been first in the breach at the attack upon Canton, on which occasion a telescope was knocked from under his arm by a grape-shot, which also slightly wounded him. He was very popular in China with the merchants, and all classes of the community.

A round robin was forwarded to him from H.M. Consuls in China, amongst other congratulations, which ran as follows:

This is to certify to Captain Bate, R.N., that his health was this day drunk in committee, and all further promotion and honours wished to him by his faithful friends.

THOMAS WADE,

(Now Sir Thomas Wade, late Minister at Pekin).

W. WOODGATE.

HARRY L. PARKES,

(Now Sir Harry Parkes, Minister at Pekin, late of Japan).

The Consuls, congratulations only echoed the feeling of the whole fleet.

When the ships were withdrawn Captain Bate was placed in command of the Macao fort, which was attacked every night, until the Chinese found that their attempts to re-capture it were in vain. He continued to take an active part in subsequent hostilities in China.

When H.M.S. *Transit* was reported "lost," and the *Actæon* also on shore near Singapore, Captain Bate was despatched to the scene in H.M.S. *Inflexible*. Having found and relieved the *Transit's* crew he assumed the command of the *Actæon* at Hong Kong, August 21st, 1857.

On the morning of the capture of Canton, 29th December, 1857, he was killed by a gingall ball, while reconnoitring a suitable spot for placing the scaling ladders. He was then in his 39th year.

As a tribute to the public services and private worth of Captain Bate, a subscription was raised throughout the fleet, and at Hong Kong, for a memorial, which took the form of a monument erected at that place.

In writing of him it has been said, "He was one of those glorious men whom one so seldom meets—of rare mental powers, a fine commanding person and manly face, at the same time with a benevolence of expression, that to see him was to yearn to know him, and to know him was to love him."

The following charts were published from Captain Bate's surveys :—

Palawan Island.	Second Bar Pagoda to Whampoa.
Ulugan Bay, or Banog.	Whampoa Channel to Canton.
St. Paul Bay to Emergency Point, including Port Barton.	Dalawan, Clarendon, and Calandorang Bays (Balabac Island); North and South Harbours (Balambangan Island).
Malampaya Sound.	Mongchow to Hong Kong.
Royalist Port.	Yung River, from the mouth to Ningpo.
Canton River.	
Tiger Island to Second Bar Pagoda.	

Also Sailing Directions for Palawan Island and Passage.

COMMANDER W. H. CHURCH, R.N.

1848-55.

William Harvey Church entered the Navy, March, 1827, as Midshipman, on board the *Victor*, Capt. Geo. Woolcombe, on the Irish station, where he continued to be employed until 1831, in the *Semiramis*, Capts. Rowley and Berkeley, and *Pike* schooner, Lieut.-Commander J. G. Wigley. From the latter date until 1838 he served on board the *Ætna* surveying-vessel, commanded successively by Capts. Belcher, Skyring, Arlett and Vidal; and, during that period, was at first employed in the River Douro for the protection of British interests during the Pedro and Miguel hostilities; also in examining, latterly as Assistant-Surveyor, different parts of the Mediterranean and of the coast of Africa, including the Canary Islands; and was on shore at Cape Roxo when Capt. Skyring was killed by the natives. He passed his examination in Sept., 1833; obtained his commission June, 1838; and, from that period until the end of 1846, employed, under the Hydrographic Department of the Admiralty, as Lieutenant and Assistant-Surveyor, on board the *Sylvia* and *Hind* cutters, and *Tartarus*, steam-vessel, Capts. Sheringham and J. Wolfe.

After his promotion to Commander's rank, he was employed with Lieutenant Veitch on the south-west coast of Ireland surveying in the neighbourhood of Cape Clear. In 1856, having mapped the shore of Kerry, from Ballinskelligs Bay to Port Magee, and having laid down and sounded round the Skelligs (those precipitous rocks which rise almost perpendicularly to a height of 700 feet above the sea, and on which bursts the full force of the Atlantic swell), on his way to Ireland, after depositing his charts at the Admiralty, he was suddenly taken ill at Bristol, and died three days afterwards.

His worn out frame had toiled for many years under an African sun, and his work on the coasts of Kerry and Cork had been of a particularly trying nature.

Skilful, energetic, zealous, of unbending integrity, and a thorough seaman, he combined all the qualities of an accomplished nautical surveyor, and so long as the Fastnet Rock and Cape Clear continue to be the landfall of vessels crossing the Atlantic from America, the mariner will have cause to bless the skilful hand of Commander Church, which, by accurately defining the dangers of that iron-bound coast, has converted them into friendly landmarks, for which the sailor may safely steer.

The charts published from Church's latter surveys were :—

Kenmare River.	Bantry Bay.
Plans of Sneem, Kilmakilloge, Ardgroon Harbours and Quoylach Bay.	Dunmanus Bay.

CAPTAIN F. T. POWELL, I.N.

1834-1839.

When the survey of the Red Sea was decided upon in 1829—Moresby to undertake the northern half in the *Palinurus* and Elwon the southern half in the *Benares*—Powell at that time a midshipman, formed one of the staff of Assistants in the *Benares*.

At the completion of the Red Sea survey in April, 1834, he followed with his chief, Moresby, to the survey of the Maldive Islands, and was appointed to the command of the *Royal Tiger* as the second ship of the expedition.

The crew of the *Benares* (Moresby's ship) suffered severely from fever, and necessitated his return to Bombay, leaving the *Royal Tiger* behind at Cochin on the Travankor coast, of which they completed a survey.

In June, 1837, the Maldive Island survey was completed, and Lieutenant Powell in the *Royal Tiger* continued to the Chagos Archipelago, of which he made an interesting report. Before the survey was finished, Captain Moresby was directed to proceed to Madras, and on the 29th June the two vessels anchored in Madras roads.

In compliance with an application from the Madras Government for a survey of the Paumben Passage and Gulf of Manaar, a project set on foot by General Monteith,* supported by the Right Hon. J. Stewart Mackenzie, the Governor of Ceylon, Lieutenant Powell was detached for the purpose with Lieuts. Ethersey, Grieve and Christopher, and Felix Jones as draughtsman.

The survey was commenced on the south side of Adam's Bridge, but owing to the high surf they were compelled to quit this part and proceed to the westward of the Paumben Pass, and continue surveying along the coast of Madura.

By the end of April, 1838, when the whole party were recalled, Lieutenants Powell and Ethersey had completed the survey of the Gulf of Manaar, Palk Straits and the west coast of Ceylon.

Subsequently the operations of the Punjab campaigns led to the formation of an Indus flotilla, under the command of Captain Powell, to ascertain the capabilities for navigation both of the Indus and its Punjab tributaries.

On the 10th August, 1843, the steam frigate, *Memnon*, under the command of Captain Powell, was totally wrecked off Cape Guardafui, but without loss of life. A court martial, held 3rd April, 1844, fully acquitted Captain Powell of all blame. In 1858, while Captain George G. Wellesley, R.N., was Commodore of the Indian Navy, Captain F. T. Powell's name appears as the Assistant Superintendent.

There were two other Powell's in the Indian Navy, viz., F. W. and P. J. Powell, with which the name of the above officer should not be confounded.

The following charts resulted from his surveys:—

(With Captain Moresby).

Maldive Islands.

Chagos Archipelago.

Principal Groups in the Chagos Archipelago.

(Without Captain Moresby).

Coast of Madura.

Western side of Palk Straits.

Paumben Passage.

Islands of Ramisseram and Manaar.

West coast of Ceylon (4 sheets).

Palk Strait and Gulf of Manaar (2 sheets).

* General Monteith had proceeded in the preceding February, with a party of Madras Sappers and some convicts, to excavate a navigable channel through the ledges of rock extending from Ramisseram Island to the coast of Madura, and he succeeded, to the extent, that country craft of light draught, and the steamers *Nemesis* and *Pluto*, on their return from China in 1842, came by this route. (History of the Indian Navy. Vol. 2, p. 79).

REAR-ADMIRAL E. J. BEDFORD, R.N.

1849-1870.

Edward J. Bedford, born 1810, entered the Navy in February, 1824, on board the *Snap*, under Lieut. Commander Frederick Bullock, employed in surveying the coast of Newfoundland. In 1827, he joined the *Alert* on the South American station. Passing his examination for Lieutenant in 1830, he acted as such in the *Alert* and also in the *Seringapatam*, in which latter he returned home in 1832. In March, 1832, Mr. Bedford as a Mate entered the Admiralty coast-survey of Great Britain, and was continuously employed in that capacity until 1838. He was made a Lieutenant in June of that year, and was afterwards employed in the survey of the coast of Scotland, between 1843 and 1847, as First Lieutenant of the *Shearwater*, under Captain C. G. Robinson, and afterwards with his name on various ship's books. In 1846 he was made a Commander, H.R.H. the late Prince Consort having honoured his particular labours with his approval on more than one occasion. In June, 1853, he succeeded to the charge of the survey of Argyleshire, and in 1854 became a Fellow of the Royal Geographical Society.

Captain Bedford continued in the prosecution of the survey of Scotland until 1864, when he was transferred in H.M.S. *Lightning* to various other parts of the shores of the United Kingdom, until 1870, when he accepted retirement. He became a Captain on the 1st of January, 1863, and a Rear-Admiral on the Retired List on the 31st December, 1878. He is the younger brother of the late Admiral G. A. Bedford, who was for some years professional adviser to the Marine Department of the Board of Trade.

The following charts resulted from the surveys of Rear-Admiral E. J. Bedford :—

Scotland, west coast.	King Road.
Loch Crinan to Cuan Sound.	Frith of Lorn.
Anchorage on east coast of Jura.	Mull Sound and Sunart Loch.
Islay Sound.	Treshnish Point to the entrance of Sound of Mull.
Colonsay and Oronsay Isles.	Loch Linnhe (south part).
Buy and Spelve Lochs.	Lochs Etive and Creran.
Iona Sound.	Loch Linnhe (north part), and Aber, Leven, and Eil Lochs.
Scridain Loch.	Loch Awe.
Tuadh Loch and Isles.	Cardiff and Penarth Road.
Oban Bay.	
Nash Point to New Passage.	

COMMODORE T. ELWON, I.N.

1829-1834.

At an early period of his Indian career Commodore Elwon had been obliged to proceed to England owing to the effects of the climate, but resumed his duties in 1819. Ten years later he was appointed to the command of the *Benares* for the survey of the southern portion of the Red Sea, or from Jiddah to the strait of Babelmandeb. The points of departure being Khor Shenab, or Mishmish, an extensive inlet on the coast of Nubia, in latitude $21^{\circ} 21' N$.

Markham says of this survey, "No expense was spared in fitting out the expedition, and all the surveying appliances of the day were provided, besides ample supplies of well-found boats and tenders. The latter were native craft with Arab crews. The Red Sea was then practically unknown, and great dangers and privations were inseparable from such a service. The first base was measured by chain at Suez by Captain Moorsby in 1830, and the survey was steadily continued without other interruptions than were necessary to refit the ships and refresh the crews to its completion, in 1834, by a system of triangulation down either shore. The work was verified by frequent bases, by almost daily azimuths, by latitudes observed on shore, and by chronometric differences. The original charts were drawn on a scale of one inch to a mile; but in places where the complicated nature of the channels required

greater nicety, scales as high as ten inches were employed. The original drawings were mostly by Felix Jones. The noble resolution of all the officers was that the Red Sea survey should be as perfect as labour and skill could make it, and it has served well to guide thousands of steamers up and down one of the most important, and at the same time, one of the most intricate routes in the world."

In the *Benares*, under Captain Elwon, were Lieutenants H. N. Pinching and F. D. W. Winn; Midshipmen F. T. Powell, J. A. Young, C. D. Campbell, J. G. Johnston, R. Riddell, W. Christopher, W. C. Barker and A. Macdonald.

In April, 1831, the *Benares* returned to Bombay in a very shattered state from having been aground 42 times on coral rocks, experiencing a heavy gale off the port for three days, during which the vessel was hove to, very leaky, pumps constantly going.

Lieutenant Pinching, the senior Assistant-Surveyor, succumbed to the effects of the climate, as did a great number of the men.

In September, 1831, the *Benares* returned to the scene of her former labours, which were continued until 1833, under Captain Elwon, who then transferred his command to Captain Moresby, who had been engaged in the *Palinurus* in the northern part of the Red Sea and Gulf of Suez, and eventually brought the whole survey to a close in April, 1834.

In October, 1833, Commodore Elwon succeeded Henry Wyndham in command of the Persian Gulf Squadron, but did not long enjoy the post, which proved fatal to so many incumbents. He expired at Bassadore on the 17th of June, 1835, after a few days' illness, in the forty-first year of his age. More than once the Indian Government had expressed to him its thanks for the masterly manner in which he conducted the survey, and in offering him the Commodore's appointment in the Persian Gulf, which was in some respects regarded as the "blue riband" of the Indian Naval appointments of those days, may be considered a further token of their approval.

Unhappily he turned a deaf ear to friendly councillors, who warned him that a respite from active duty was essential for the maintenance of his health, and too soon he paid the penalty by an early death in the service of his country.

The chart of the Red Sea in two sheets was exhibited for its excellence at the loan collection of Scientific Instruments, &c., at the South Kensington Museum in 1875.

Besides geographical papers written by Wellsted and Carless, Captain Elwon kept a very complete journal during the progress of the Red Sea survey, containing a mass of nautical, meteorological, statistical, and topographical information, which was deposited with the Bombay Geographical Society, and supplied its volumes with valuable materials.*

The following charts were published from Captain Elwon's survey:—

Southern part of the Red Sea, in two sheets.

Harbours in the Southern part of the Red Sea.

Also, Sailing Directions for the Red Sea, by Captain Elwon and Commander Moresby, 1841.

COMMODORE R. ETHERSEY, I.N.

1836-37.

This officer formed one of the staff of the *Psyche* in 1820, under Captain Brucks, which vessel formed the second ship engaged in the old survey of the Persian Gulf.

He was afterwards engaged in the *Royal Tiger*, under Lieut. F. T. Powell, in the Gulf of Manar and Palk Strait, with the Paumben Passage.

In 1833, Lieut. Whitelock, a veteran of the Persian Gulf, commenced a survey of the coast of Katiawar, during which he died.

* Chiefly abridged from Low's History of the Indian Navy. Vol. 2.

It was then (in 1836) that Lieut. Ethersey took up the work where Whitelock had left off, and surveyed the coast round the head of the Gulf of Cambay and down the east side to Surat, including the mouths of the Rivers Saburmattey, Mahi, Dhardur and Nerbudha, as well as the north Konkan coast from St. John's to Bassein. He performed this work in a miserable native pattimar, called the "Bhowany," with the water washing up to his ankles under the cabin table.

During this service Ethersey laid down the dangerous shoals of Surat, known as the Malacca Banks, on which Captain Sharpey was wrecked in 1607. He also attentively observed the "bore,"* or rushing tide at the head of the Gulf of Cambay for two successive seasons, and explored the fossiliferous tertiary formations on the island of Perim.

Besides his charts, the results of his survey are recorded in two valuable memoirs.

Between the years 1846 and 1849 he commanded the *Moozuffer*, for some time the finest ship in the Indian Navy.

In 1855, Captain Ethersey, at that period the Superintendent of the Indus flotilla, was appointed to the Commodoreship of the Persian Gulf Squadron, to which he was gazetted 12th April, 1855. He was relieved, however, by Captain Sir Henry Leeke, R.N., on the 8th November of the same year.

After the capture of Bushire, Ethersey again became senior officer in the Persian Gulf, but immediately prior to the attack upon Mohamra, or on the 17th of March, 1856, committed suicide while suffering under mental aberration.

The sad state of nervous depression to which Commodore Ethersey had been reduced was fully stated before the Court of Inquest. "If there was one officer more than another who commanded the respect and confidence of the entire service, as in every way calculated for a high command by reason of his antecedents, great experience, and indomitable courage and resolution, it was Richard Ethersey, 'Grim Dick' as he was called; but failing health had unstrung his nerve, and he who some ten years before would have rejoiced at the opportunity of earning distinction at the cannon's mouth, shrunk from responsibility and was full of chimerical fears."†

The following charts were published from Ethersey's manuscripts:—

Katiáwar coast, from Diu Head to Perim Island.
Gulf of Cambay.
Malacca Banks.

A part of two sheets of the West coast of India.
Paumben Passage, Palk's Bay and West coast of Ceylon.

COMMODORE T. G. CARLESS, I.N.

1838 to 1848.

This officer sailed in the *Palinurus*, under Captain Moresby, for the survey of the Red Sea in 1829, and continued, to the close of the northern half of that important work in 1833. The original drawings from which the chart of the northern part of the Red Sea was compiled were chiefly made by him, and the literature of the Red Sea‡ is mainly from his pen and that of Wellsted.

In October, 1833, we again find him as Senior Lieutenant and First Assistant, under Captain Haines, engaged on the south-coast of Arabia. Between the 4th of January, 1834, and 14th March, he carried out a complete triangulation round the Island of Socotra, working incessantly, Sundays not excepted.

In 1836 he was engaged in surveying the River Indus.§

* Journal of the *Royal Geographical Society* for 1838, page 196.

† History of the Indian Navy, page 350.

‡ Memoir on the Gulf of Akabah, from notes during the survey by Moresby in 1833, by Lieut. Carless, I.N. Bombay G.S. Journal. Vol. I.

§ See a Paper in Vol. VIII. of the Journal of the R.G. Society on the Delta of the Indus, by Lieut. T. G. Carless.

In October, 1837, he was despatched to and completed the survey of a large portion of the coast of Africa about Cape Guardafui, work which was satisfactorily accomplished. Grieve and Selby were his assistants. He first proceeded to the mouths of the Indus, erecting beacons to facilitate the navigation of the Hujamree and Kedywarree mouths, and after surveying Kurrachee Bay and Sonmeance, left the former place for Ras Hafoon (the surrounded) in February, 1838, and from Ras Hafoon continued westward to Ras Gulwainee. He was then (about April, 1838) forced to suspend operations, owing to scurvy breaking out among the crew, proceeding to Mocha, and thence to Bombay.

This survey was not published until 1843, when the *Memnon* was lost in the neighbourhood, having only been supplied with a small sketch survey of Captain Owen, although the excellent survey made by Carless was available long before.

He continued to be variously employed, and was for some time the senior naval officer at Aden. In 1846, he went to the Persian Gulf with eight chronometers to test some of the longitudes. He found Bassadore nearly correct as regards Bombay, but Bushire was ascertained to be eight miles too far west. Captain Carless commanded the *Sesostris* at the time of the fatal hurricane known as the "Cleopatra Cyclone," in which the Indian Naval vessel of that name was lost. This occurred in April, 1847. On that occasion he wrote a paper which appeared in Vol. VIII. of the Transactions of the Bombay Geographical Society, and was also published in Vol. XIX. of that of the R.G.S. in 1849.

Captain Carless, who also served in the first Burmese War, died at Bushire on the 16th of December, 1848, of small-pox, complicated with an affection of the lungs, in his forty-second year. He had only succeeded to the command of the Persian Gulf squadron in the preceding April.

Besides the memoirs and descriptive papers alluded to as having emanated from this officer, the following charts resulted from his labours:—

Northern part of the Red Sea.

N.E. coast of Africa, from Ras Gulwainee to Ras Hafun (two sheets).

An M.S. map of the Indus, from Hyderabad to the Sea.

VICE-ADMIRAL G. A. BEDFORD.

1844 to 1870.

George Augustus Bedford, born 8th Feb., 1809, was eldest son of Lieut. Fred. Bedford, R.N., for some time the senior Lieutenant of Greenwich Hospital, who lived to a great age.

This officer entered the Navy 23rd Dec., 1823, on board the *Investigator*, Master-Comm. Geo. Thomas, employed in surveying the North Sea; became Midshipman, in Sept., 1826, of the *Wolf* 18, Capt. Geo. Hayes, on the Channel and Mediterranean Stations; was for a short time, in 1829-30, attached to the *Victory*, at Portsmouth; passed his examination in the course of the latter year; then joined the *Protector*, and afterwards the *Fairy*, both engaged, under Capt. Wm. Hewett, in the survey of the North Sea; obtained his first commission 19th Dec., 1834; and, on 9th Dec., 1835, assumed command of the *Raven*, employed in surveying the coast of Africa, in which vessel he continued until the close of 1838. From 1839 to 1843 finds him under Captain Bayfield in the Gulf of St. Lawrence. He was advanced to the rank of Commander, 14th September, 1843; and from July, 1844, conducted the survey of the west coast of Ireland, with his name on the books of various ships. He was advanced to the rank of Captain on the 2nd January, 1854, and continued in that capacity in charge of the survey of the west coast of Ireland, until at the retirement of the late Mr. Michael Walker from the post of Assistant-Hydrographer, in 1863, he was selected to succeed him.

Captain Bedford did not, however, long remain in the position of Assistant-Hydrographer (afterwards termed Superintendent of Charts), for, on the retirement of Admiral Sullivan

with a pension, from the post of Marine Adviser to the Board of Trade, he was appointed as his successor.

He died a Vice-Admiral on the retired list in 1878, aged about sixty-nine years.

The following charts were published from the surveys of Vice-Admiral G. A. Bedford:—

Larne to Bloody Foreland.
Kinnagee Bay to Dunaff Head.
Lough Swilly.
Mulroy Bay and Lough.
Sheephaven.
Horn Head to Bloody Foreland.
Horn Head to Rathlin O'Birne Island.
Arran Island to Dawros Head.
Bloody Foreland to Arran Island.
Teelin Head to Downpatrick Head, including Donegal Bay.
Killybegs, Donegal, and Teelin Harbours.
Donegal Bay.
Sligo and Ballysadare Bays.
Sligo and Killala Bays.
Ballysadare Bay.

Achill Head to Slyne Head.
Roonagh Head to Dooghtry Point.
Ballynakill and Killary Bays.
Inishbofin and adjacent coast of Galway.
Clifden and Mannin Bays.
Galway Bay.
Mutton Island, Doonbeg Bay, and parts adjacent.
Slyne Head to Liscanor Head.
Slyne Head and adjacent coast.
Roundstone, Birterbuy, Kilkieran, Greatman, and Cashla Bays.
Arran Isles.
Galway Harbour.
Tralee Bay to Liscanor Bay, including river Shannon.

COMMANDER JAMES WOOD, R.N.

1847 to 1860.

James Wood entered the Navy on the 24th May, 1825. He began his career as a maritime surveyor at Fernando Po, under the late Admiral Fitzwilliam Owen, in the year 1827. He afterwards served in the *Hecla* in the Bight of Benin, and then went to the coast of California. He next joined the *Etna*, Captain Sir Edward Belcher, and assisted in his surveys on the African coast, on the Bar of Oporto, and on Skerki Bank off Tunis. He again returned to the coast of Africa in 1834 with Commander Skyring, and, after the death of that officer, he joined the *Raven*, and was employed in the survey of the west coast of Morocco and the Canary Isles. In 1836, Lieutenant Wood served with Captain Hewitt in the North Sea survey, and in 1837 joined the survey of the coast of Wales and the south coast of England. From this station appointed to command the *Pandora*, he accompanied Captain Kellett in the *Herald* to continue the survey of the west coast of America, and took share in the examination of the coasts of Columbia, Guatemala and California, as far as Vancouver Island. On the return of this expedition to England, Lieutenant Wood was promoted to the rank of Commander, and then served on the Home Station as Assistant to Captain Louis Sheringham. In 1855 he was given charge of the survey of the N.W. coast of Scotland, and some of his plans of the Isle of Skye were exhibited on several occasions before the R.G. Society. The climate of the North of Scotland proved too severe for a constitution weakened by exposure for many years under a tropical sun; his health gave way, and he rapidly sank on the 12th April, 1860, at the early age of 47. In the Admiralty Charts of Africa, N.W. America, and the north-west coast of Scotland, he left a name that will long be gratefully remembered by the mariner who has to navigate those coasts.

The following charts were published from the surveys of Commander Wood, his name appearing as the chief assistant in many others:—

Buenaventura Port.
Coiba or Quibo Island.
Playa Maria Bay, Port San Bartolomeo, Asuncion Passage.
Santa Cruz, San Rosa, Santa Catalina, San Miguel, and Anacapa Bay and Islands. Becher and Raper Bays, Cuyler Harbour, and Pandora Cove.

San Juan Port, Duncan Rock, and Neeah Bay.
Ardnamurchan to Summer Isles, Inner Channel and part of the Minch.
Ardnamurchan Point to Loch Bhreatal.
Avasaig Harbour.
Alsh and Duich Lochs.
Isle of Skye, north of Loch Ainneart and Sleat Sound.

COMMANDER JAMES WOLFE, R.N.

1833 to 1849.

This officer entered the Navy in the summer of 1814, and having served in the *Morgiana* on the coast of Africa, at the request of her Captain (Sandilands), early in 1821, joined H.M. surveying ship *Adventure*, in the Mediterranean, under Captain W. H. Smyth; continuing in the same vessel, under Captain Beechey. When the latter officer removed to the command of the *Blossom*, in 1825, for her celebrated voyage round the world, Wolfe continued as a mate, with Captain Beechey.

In 1829, he was promoted to the rank of Lieutenant, and from that time to the day of his death he was actively employed in the surveying service, chiefly in Ireland.

In February, 1830, he joined the *Meteor*, surveying vessel, Captain Richard Copeland, in the Mediterranean as a Supernumary Lieutenant, and in November of the same year the *Mastiff*, in which he continued to serve until paid off in the spring of 1832.

He was then placed on the books of the Guard-ship at Plymouth for hydrographic duty on the west coast of Ireland.

In August, 1842, he became senior Lieutenant of H.M.S. *Shearwater*, Captain John Washington, but did not remain long, being superseded in October of the same year.

He was promoted to the rank of Commander, 15th February, 1843, and from December, 1843, to 1846, commanded the *Tartarus*, surveying steamer on the coast of Ireland.

From 1846 to 1849 he was borne on the books of the Commodore's ships at Woolwich as an additional Commander for surveying duty. He died in 1849 in the forty-ninth year of his age.

His principal charts were the River Shannon from entrance to Limerick on seven double elephant sheets; Upper and Lower Lough Erne, Bantry Bay, Bear Haven, and the Cove of Cork.

Also, the south coast of Ireland from Cork to Bantry Bay on seven or eight large sheets, which was probably the most complete of his surveys.

The following were the Admiralty Charts published from Commander Wolfe's surveys:—

Upper Lough Erne.	Bantry Bay. (Sheet 2).
Lower Lough Erne.	Mizen Head to Kinsale.
Tralee Bay to Liscannor Bay.	S.W. coast of Ireland with Crook Haven.
River Shannon. (Seven sheets).	Long Island and Baltimore Bays.
River Fergus, from Ennis to the River Shannon.	Castle Haven and Glandore Harbour.
Lough Derg.	Clonakilty Bay.
Lough Ree.	Courtmacsherry Bay.
Valentia to Cape Clear.	Kinsale Harbour and Oyster Haven.
Valentia Island.	Cork Harbour.
Valentia Harbour.	Queenstown and Cork Outer Harbour.
Port Magee.	Port of Cork.

Commander Wolfe contributed a paper, which will be found published in the R.G.S. Journal, Vol.

III., page 77, 1833, termed "Observations on the Gulf of Arta," made in 1830.

Also, Sailing Directions for the River Shannon and Lough Derg. 1850.

Report on Valentia (Ireland) as a Packet Station. 1851.

CAPTAIN JOHN BALLENY.

1838-39.

Graham Land and Enderby Land had been found in the southern ocean on about the parallel of the Antarctic circle, and 110° of longitude apart.

In 1833, Mr. Biscoe was wrecked in the *Tula* brig, of Messrs. Enderby, in endeavouring to make Antarctic researches, in combination with a south-sea sealing voyage. Nothing discouraged by this failure, the schooner, *Eliza Scott*, of 154 tons, commanded by Mr. John Balleny, and the dandy-rigged cutter *Sabrina*, of 54 tons, Mr. H. Freeman, were vessels selected for the same purpose, and having three chronometers on board, sailed from London July 16th, 1838.

Sighting Madeira, the two vessels touched at Amsterdam Island in the Indian Ocean, and on the 3rd of December anchored in Chalky Bay, in the South Island of New Zealand.

After preparations for the coming voyage, the vessels left Chalky Bay, January 7th, and anchored on the 11th in Perseverance Harbour, Campbell Island, where, by a curious coincidence, they met with Mr. John Biscoe, R.N., in command of the *Emma*, on a sealing voyage. On the 17th, they sailed to the south eastward; on the 27th, the track of Captain Bellingshausen, of the Russian corvette, *Vostok* (in 1820), was crossed in latitude $63^{\circ} 37' S.$, longitude $176^{\circ} 50' E.$ Continuing to the southward the vessels over the very spot where compact ice had forced the Russian navigator to alter his course to the eastward.

On the 1st of February, Balleny reached his extreme south point in lat. $69^{\circ} S.$, long. $172^{\circ} 11' E.$, full 220 miles southward of the point which Bellingshausen had been able to attain about this meridian; thus adding one more proof, that ice in these regions, even in the immediate neighbourhood of land, is very far from stationary.

Between February 1st and 9th, Balleny's vessel was engaged in working to the N.W. to clear the ice against a strong westerly wind, which, contrary to the received opinion, was found to prevail in these high latitudes.

On the 9th of February, land was sighted in the shape of three islands in lat. $66^{\circ} 44' S.$, long. $163^{\circ} 11' E.$, and termed Balleny Islands, and February 12th, Captain Freeman landed and obtained a few stones, but was up to his middle in water, there being no beach or proper landing place. The land was of a tremendous height, at least 12,000 feet, and covered with snow; smoke was observed arising from the mountain-tops. It is (Balleny remarks) evidently volcanic, as the specimens of stones and cinders proved.

On February the 13th, the Balleny Islands were seen for the last time. The group consists of five islands, three large and two small, the highest of which, named Young Island, was that upon which the Commander of the *Sabrina* landed. The islands and peaks were named respectively after Messrs. Young, Borradaile, Buckle, Sturge, Brown, Row and Beale, or the merchants who united with Mr. Enderby in sending out this expedition.

February the 16th, taking advantage of a fine breeze and clear sea, the vessels ran rapidly for 170 miles to the south-west, till the weather becoming foggy, obliged them to heave-to till the morning of the 18th, when it cleared up, and they again stood to the southward as far as lat. $64^{\circ} 32' S.$

On the 27th, at noon, the lat. was $64^{\circ} 37' S.$, long. $130^{\circ} 32' E.$, and the *Eliza Scott* continued standing to the north-west until the 13th of March, on which day, a block of rock, about 12 feet in height, was found adhering to an iceberg, the position of which was distant 1,400 miles from Enderby's Land, which bore W.S.W. of it.

On the following day the vessels crossed the track of Cook (1773), and continuing to the northward, again crossed that of Bellingshausen in 1820. They now crossed Biscoe's track in April, 1831, being the third of the parallel routes, all running to the E.N.E., which occur here within about 5° of latitude. On the following day a heavy gale was encountered. At midnight of the 24th of March, the cutter, *Sabrina*, burnt a blue light, which was answered immediately by another from the schooner, but the sea was running so high that she could not close on the cutter.

March 25th. Strong gales and squally weather. At daylight, says Captain Balleny, "No signs of the poor cutter being in sight; I trust she may be safe." At 9h. a heavy sea broke on board the schooner, staving both boats, and sweeping everything from the decks, and laying the vessel on her beam-ends. She gradually righted, however. On the following day the gale moderated, and April 1st, standing towards the Mozambique, the 45° parallel of latitude was crossed, and the *Eliza Scott* reached the port of London on the 17th of September, 1839, on the eve of the departure from England of the *Erebus* and *Terror*, under Captain James Ross, which had shortly before been fitted out by Government for an Antarctic voyage.* The cutter also survived, though almost a wreck.

* Journal of R.G. Society, vol. 9, for the year 1839.

CAPTAIN CHARLES WILKES, U.S.N.

1838-42.

The act of Congress which authorised the United States Exploring Expedition being undertaken was dated May, 1836, but it was not until March, 1838, that it devolved upon Lieutenant Charles Wilkes to re-arrange, and arrest it from failure. The ships composing the New Expedition were the *Vincennes* sloop, 780 tons; the *Peacock* sloop, 650 tons; the *Porpoise*, a gun-brig, 230 tons; and two tenders, formerly New York pilot-boats—the *Seagull*, 110 tons, and the *Flying Fish*, 96 tons.

The coast of South America had been examined and surveyed by the English Admiralty, so that little was left for the Expedition to add to hydrography in that part. The central portions of the American west coast were not approached; the first examination was that of various points on the coast of Upper California, and many particulars were gathered respecting that country. Capt. Beechey, however, having previously surveyed its principal port, this portion is of less importance. The Columbia River was visited by the Expedition, and a survey made of its entrance. Capt. Belcher had also surveyed it, but its changing character renders a chart of little value for any length of time. Puget Sound was surveyed, and Lieut. Wilkes bears ample testimony to the accuracy of Vancouver's delineation of that inlet.

It is in the islands and Archipelagoes of the Pacific that the results of the American Exploring Expedition become more apparent. The centre of operations was the Hawaiian group. Of this they constructed a large and detailed chart, and many most interesting particulars are given in almost all branches of science, respecting the physical and social character of the various islands composing it, especially of Hawaii and its geological features.

The Low Archipelago, or Paumotu group, was partially surveyed in its north-western portion, and the south-western range correctly placed on the charts. In these islands many discrepancies were reconciled, and a true estimate formed of their area and form. Portions of the Society Islands, Tahiti, Eimeo, Huaheine, &c., also received their share of attention.

The Fiji group, however, is the great harvest of the Expedition. D'Urville had been here and partially surveyed it in 1827; but Captain Wilkes made a survey of it in all its parts, and gave the world a fairly correct notion of the extent and productions of this Archipelago. The details of the customs and former ferocity of its inhabitants are given with most intense interest in vol. iii. of the Narrative.

The Tonga or Friendly Islands were also visited, as was the Samoan or Navigator's group. The collection of islands now named the Union group were also correctly ascertained as to numbers, character and position.

The Phoenix group was surveyed. The islands comprising Ellice's group were severally examined and delineated. The Gilbert Archipelago, or, as it is here termed, the Tarawan or Kingsmill group, received a large share of attention. In the still imperfectly known Marshall Archipelago, the Radack and Ralick Channels of Kotzebue, several of the groups forming portions of it, were examined and surveyed.

This embraces almost all the general results of the Expedition in the central portions of the Pacific. To this may be added the examination of the several portions of New Zealand, and the visits to Sydney. The longitudes obtained are generally dependent on the accuracy of the twenty-nine chronometers (all but two of which went well), and thus deserve all confidence.

One great point in the Expedition in the result of the antarctic cruises, is the claim to priority in the discovery of the antarctic continent.

See Narrative of the U.S. Exploring Expedition in six volumes, with a Hydrographical Atlas. New York, 1845.

CAPTAIN WILLIAM ALLEN, R.N., F.R.S.

1832-1855.

This officer entered the Navy in October, 1805, on board the *Standard*, and served in that vessel and the *Majestic* on the Mediterranean and Baltic stations until 1810. He was present in the former ship at the passage of the Dardanelles under Sir Thomas Duckworth, and also assisted at the capture of the Italian brig of war, *Friedland*, in the Adriatic.

His next employment was in the *Leda* in the East Indies, and was for 2½ years in that vessel engaged in blockading the Island of Java. During that period he was constantly detached on special service and lost the use of a finger, but was the only individual who escaped sickness on board the *Leda* when a third of those on board were carried off.

In June, 1813, he took part in a successful attack on the piratical settlement of Sambas in Borneo. In March, 1815, he was made a Lieutenant, and after officiating in that rank on board the *Hesper*, returned to England the same year.

In June, 1832, he volunteered to accompany Lander's Expedition up the Niger on his own resources, but the Admiralty were pleased to grant him double full pay on the occasion. During this Expedition his health suffered materially, and he was one of the nine survivors who lived to see their native land of the forty-seven of which the Expedition consisted.

On returning to England in April, 1834, the Admiralty ordered his promotion to the rank of Commander, but as his name had not appeared on a ship's books, he was appointed to the *William and Mary* yacht, and employed under Captain Bullock in surveying the Thames and Medway until June, 1836, when he duly received his Commander's commission.

On a second Niger Expedition being set going, late in 1840, he again volunteered his services. This expedition consisted of three iron steam vessels, the *Albert*, *Wilberforce* and *Soudan*, as had been recommended by Sir Edward Parry, the late Hydrographer. These sailed to the west coast of Africa for the purpose of exploring the River Niger in 1841.

The three Commanders were Captain H. D. Trotter, Commander W. Allen, and Commander Bird Allen (the West Indian Marine Surveyor). The objects of the expedition were in part diplomatic, and to extend and establish trade, but the instructions of Captain Trotter stated "That should an opportunity be offered, the vessels were to explore the upper part of the Quorra (Kwarra) towards Busah, where the lamented Mungo Park lost his life, and also the Chadda, as far as water communication would admit of, and thus open the road to the missionary, the merchant, and the man of science."

After concluding treaties with King Obie of Eboe, and Attah of Idda, the expedition arrived at the confluence of the Chadda with the Niger, about 270 miles from the sea. Fever then broke out, causing the return to Ascension of the *Soudan* and *Wilberforce*; afterwards Captain Trotter was seized, and all the officers except the two doctors, one of whom worked the engine, while the other steered the *Albert* down the river, proceeded to Fernando Po, arriving at that island October 17th, 1841. In all, 44 lives were lost.

On the return home of Captain Trotter on sick leave, Captain Allen became the senior officer, and made arrangements for the further prosecution of the undertaking. Instructions for the return of the expedition arrived, however, on the eve of the day he had fixed for re-ascending the river. He made his dispositions accordingly, and sailed for England in the *Kite*, which vessel had brought out directions from the Admiralty to that effect.

Captain Allen reaches England in September, 1842, having been posted in January of the same year.

He was elected a fellow of the Royal Society in April, 1844, having joined the Royal Geographical Society nine years previously, in the proceedings of which latter he always took an active part.

In the R.G.S. Journal for 1838 a paper was published, written by Allen, "On a new construction of a map of a portion of Western Africa, showing the possibility of the Rivers Yéu and Chadda being the outlet of Lake Chad."

Also, Narrative of the Expedition sent to the River Niger in 1841, published by Bentley, in 1848; and in the year 1855 a work in 2 vols. on the Dead Sea and the overland communication with the east, in which he advocated cutting a canal so as to admit the Mediterranean into the Dead Sea, and entered extensively into a comparison between this route and that by the proposed Suez Canal.

He published a pamphlet in 1846, termed "Mutual Improvement," or a scheme for the self-adjustment of the social machine; and in 1849, "A plan for the immediate extinction of the slave trade."

Captain Allen died in the year 1864. The following charts resulted from his explorations:—

Kwavra River from the Sea to Rabba, with part of the Chadda River.
Cameroon River, with plans of Ambas and Nicoll Islands.

COMMODORE M. F. MAURY, U.S.N., LL.D., &c.

1842-73.

Matthew Fontaine Maury was born January 14th, 1806, in Spottsylvania County, Virginia. In Maury's fourth year, his father emigrated to Tennessee, establishing himself near Franklin, a village in the vicinity of Nashville. In his sixteenth year, Maury entered Harpeth Academy.

In 1825, he was appointed midshipman in the Navy of the United States, making his first voyage in the frigate *Brandywine*, on the coast of Europe, and in the Mediterranean. This first cruise across the Atlantic was rendered memorable by tempestuous weather, and the presence of General Lafayette as a passenger to France.

In 1826, the *Brandywine* returned to the United States, and Maury was transferred to the sloop of war, *Vincennes*, for a cruise around the world. At the expiration of this cruise he passed with credit the usual examination, and, in 1831, was appointed Master (Navigator) of the sloop of war, *Falmouth*, then fitting out for the Pacific. He did not complete the commission in this vessel, being transferred to the schooner, *Dolphin*, in which he served as acting first Lieutenant, until transferred to the frigate *Potomac*, in which vessel he returned to the United States in 1834. He then published his first work, "Maury's Navigation," which was adopted as a text-book in the Navy.

From the time of entering upon a sea life, Maury exhibited those characteristic traits and qualities, which finally rendered him famous throughout the world. He was elected as Astronomer, and offered the appointment of Hydrographer to the Exploring Expedition to the South Seas, then preparing to sail under Lieutenant Wilkes. These posts he declined.

In 1837, after thirteen years' service, he was promoted to the rank of Lieutenant, and not long afterwards met with the painful accident by which he was lamed for life. For several years, unable to perform the active duties of his profession, he devoted his time to mental culture, to the improvement of the Navy, and to other matters of national concern. His views, forcibly stated, were published in the *Southern Literary Messenger*, of Richmond, Va., under the *nom de plume* of "Harry Bluff," and under the general heading of "Scraps from the Lucky Bag." The influence of these essays was effective. To them may be justly ascribed the subsequent reforms made in the U.S. Navy, as well as the establishment of a Naval Academy. He also advocated the establishment of a Navy yard at Memphis, Tenn.; which was carried out by Act of Congress. Under his direction, were made at that point, by Lieutenant Marr, since lost at sea, the first series of observations upon the flow of the Mississippi. He proposed a system of observations, which would enable the observers to give information, by telegraph, as to the state of the river and its tributaries, to the Captains of steamers and all others who might be interested.

He advocated the enlargement of the Illinois and Michigan Canal, that vessels of war might pass between the gulf and the lakes. For this he received the thanks of the Legislature of Illinois. He suggested to Congress, plans for the disposition of the flooded lands along the Mississippi belonging to Government; which, as has since become evident, would have been fruitful of good results had they been adopted. In the interests of commerce he successfully advocated, in a series of papers, what is known as the "Warehousing System."

In 1842, in the 36th year of his age, he was appointed Superintendent of the Depôts of Charts and Instruments at Washington. Up to this time, the field in which Maury had laboured was limited to his own country. Placed in a position which afforded the necessary means to the full employment of his powers, he was not slow to develop and execute the plans, which, in the course of his reflection and experience he had thought useful.

The Depôt for Charts and Instruments was transformed into an observatory. Surrounded by such men as Ferguson, Walker, Hubbard, Coffin, Keith and other faithful workers, whom he inspired with his own enthusiasm, he made the Washington Naval Observatory, national in its importance and relations to the Astronomical world.

This accomplished, he added to the labours of the astronomer, fruitful in results for future years, the task of endeavouring to unravel the winds and currents of the ocean, and of measuring its depths. In pursuance of these objects, he collected from the log books of ships of war, long stored in the government offices, and from all other accessible sources, the material suited to his purpose. By numerous assistants (junior officers of the Navy) these were tabulated, and by him discussed; and yet, when Maury offered his first chart to navigators with his "Fairway to Rio," as he afterwards delighted to term it, they doubted, hesitated, declined.

The new route was that which all had been taught to avoid. And here it may be proper to state that the promontory Cape St. Roque, the most eastern projection of the South American continent, divides the waters of the great equatorial current flowing westward, turning one branch to the Caribbean Sea, the other to the South Atlantic, while the general trade winds blow from the south-east. Sea captains, therefore, had inferred, that if on the passage from the North to the South Atlantic, a ship should fall to leeward of the Cape, she would be unable to beat round it. And this opinion was confirmed by the results of the common practice of tacking to the eastward, even when still far from the Cape, whenever there appeared the slightest chance of lacking margin to pass. In all such cases, voyages were prolonged; in some instances, to double the usual time. Hence to avoid this danger, they crossed the equator further east than was necessary, and in so doing not unfrequently fell into a region of calms, or those contrary winds from the south-west, now known as "Maury's monsoons." But Maury discovered that the inshore current of St. Roque was comparatively feeble, and that the winds favoured the navigator as he approached the land; and so he said, "Stand boldly on, and if need be tack and work past the Cape, under the land." Captain Jackson, of the ship, *W. H. Wright*, of Baltimore, was the first to adopt and demonstrate the accuracy of the new route. Inferences were supplanted by facts, and the maritime world hastened to acknowledge the benefit of Maury's system.

The Brussels Conference, of which Maury was the author, marked the era of international adoption of his system of observation.

Maury also instituted a system of Deep Sea Sounding, rendering easy in accomplishment operations of that character since undertaken, and leading to the establishment of telegraphic communication between Europe and America by cables laid on the bed of the ocean. The investigations of which the foregoing were the first fruits presented materials for the well-known work, "The Physical Geography of the Sea," afterwards translated into many continental languages.

Humboldt declared Maury to be the founder of a new and important science. The powers of Europe recognised the value of his services to mankind, bestowing upon him

orders of various descriptions and other honours. The Academies of Science of Paris, Berlin, Brussels, St. Petersburg, and Mexico, conferred the honour of membership.

When Virginia, seceded from the Union, he resigned his position in the Federal Navy, and was selected one of the Council of three, appointed to assist the governor in that important crisis, and so served, until the Army and Navy of Virginia were incorporated with those of the confederacy.

When it became known in Europe that he had resigned his position of the Federal service he was invited to Russia and to France, to continue in either of those countries the great work to which his life had been devoted. These offers, from a sense of duty, he declined. The government of the Confederate States, however, employed him abroad invested with suitable powers on their behalf, which he continued to exercise, with his usual ability, until the close of the war.

In anticipation of a large emigration from the Southern States to Mexico he then proceeded to that country, where he was cordially received by the Emperor Maximilian, who appointed him to a place in his cabinet. Thence he was sent on a special mission to Europe. The revolution terminating his relations with that country left him in straitened circumstances. He then resumed as a means of support his scientific and literary labours, pursuing those studies that to him were most congenial. To these he added experimental researches, having for their object, the perfecting of new applications of electricity, in which he was eminently successful, and in preparing his *Manual of Geography*, subsequently published in this country. He was then made LL.D. of Cambridge, and France invited him to the Superintendency of the Paris Observatory. He preferred the Chair of Physics in the Virginia Military Institute. In reply to the letter conveying this appointment he wrote, "You have marked out a great field for me—much broader than one would imagine. I am willing to enter upon it." The "Physical Survey of Virginia" in connection with new rail routes, and of a free water way uniting the east and west, and in connection with foreign commerce by his familiar pathways on the sea. A system of observations also in connection with the crops of the world, and which is now represented in that division of the public service of the United States which has for its special object the benefit of agriculture and commerce—such were the aims which engaged the mind of Maury.

The benefits he conferred upon mankind cannot be measured by any estimate of their pecuniary value, great as that value may be. Passionately devoted to the study of natural phenomena, he strove to convey to others knowledge of those things which filled him with admiration and joy.

After this succinct summary of the most important events of his life, it only remains to record the circumstances of his last illness and death.

During the summer of 1872, he received an invitation to address an Agricultural Society of Massachusetts. This invitation he accepted, and leaving the Institute on the 12th September, addressed the society at the village of Norfolk, near Boston. Returning to New York he took an excursion to Niagara, Detroit, Chicago, and St. Louis, having accepted an invitation to address the State Agricultural Society of Missouri at its annual fair. Here his reception was most enthusiastic, but he was so much exhausted that he could not read his address in an audible tone. After spending a fortnight in Missouri, he returned to Virginia to meet an appointment to address the Seaboard Agricultural Society, on the 23rd October, at Norfolk. The condition of his health admonished him not to undertake this task, and he returned home to the Institute to which he was attached.

About the middle of December he called in extra medical aid, and every expedient to arrest his disease was tried in vain. At length he requested his medical advisers to desist from further effort on his behalf. He expired February 1st, 1873, aged 67 years, peacefully and without any apparent pain.

Thus passed away this illustrious man—full of years, honours, and fame. His death was officially announced, and his memory mourned over the whole of the civilised world.

Of the works contributed by Maury indirectly towards hydrography were the following :—

- Theoretical and Practical Treatise on Navigation. 8vo. 1845.
- Refraction and other tables. 4to. 1846.
- Abstract Log for the use of American Navigators. 4to. 1848.
- Notices of the W. Coast of the United States. 8vo. 1851.
- Letter concerning Lanes for steamers crossing Atlantic. 4to. 1855.
- Sailing Directions to accompany Wind and Current Charts, 2 vols. 4to. 1858.
- Investigations of the Winds and Currents of the Sea. 4to. 1851.
- Wind and Current Charts (Gales in the Atlantic). 1857.
- Nautical Monographs. 4to. 1858.
- Physical Geography of the Sea. 8vo. 1856.
- Address to the National Agricultural Congress at St. Louis, May, 1872. 8vo.
- On the necessity of a universal system of Marine Meteorological Observations. 8vo. 1856.

COMMANDER ALFRED MILES, R.N.

1833-48 (about).

Alfred Miles, born 31st Dec., 1796, entered the Navy 21st Sept., 1811, on board the *Ulysses*, flag-ship of the Prince d'Auvergne, on the Jersey station. Rejoining, as Midshipman, in Sept., 1812, on board the *Dannemark*, he served for a time with the fleet in the North Sea, and afterwards escorted convoy to and from the Cape of Good Hope; on his return whence he became attached, in April, 1815, to the *Impregnable*, bearing the flag of Sir Josias Rowley, in the Mediterranean. After a servitude of three years at Plymouth, in the *Spencer*, and again in the *Impregnable*, under the flag of Lord Exmouth, he successively joined, in the capacities of Midshipman and Mate, the *Severn* coast blockade ship, when he was employed at Dungeness and in the neighbourhood of New Romney—23rd Feb., 1821, and 20th Dec., 1823, the *Chanticleer* 10, and *Adventure*, Capt. Wm. Henry Smyth, both on the Mediterranean station, where, in the vessel last mentioned, he aided in surveying the coast of Sardinia. Feb., 1825 (for a passage to the West Indies), the *Ferret* 10, Capt. Wm. Hobson—and 21st June, 1825, the *Kangaroo*, Master Commander Anthony De Mayne. Under the latter officer we find him for upwards of two years employed on surveying service in the Crooked Passage, Bahamas, and on the coast of Cuba. In Sept., 1827, owing to his Commander having been accidentally left behind, Mr. Miles, who during the last three months had filled the post of Assistant-Surveyor, brought the *Kangaroo* home and paid her off. He was promoted to the rank of Lieutenant 8th Nov. following; and was afterwards appointed, in the capacity of Assistant-Surveyor—27th May, 1830, to the *Ætina* 6, Capt. Edw. Belcher, stationed on the west coast of Africa, whence he returned in Oct., 1831—and 9th Jan., 1842, and 1st Jan., 1843, to the *Fearless* 1, and *Tartarus* 2, both commanded by Capt. Fred. Bullock, with whom he served on the river Thames until 11th Feb. in the latter year. He attained Commander's rank 15th Jan., 1846.

From Feb., 1833, until June, 1842, Commander Miles was employed as an Assistant in the Hydrographic Office at the Admiralty, to which he was reappointed 12th Feb., 1843.

He continued in the capacity of a Naval Assistant to the Hydrographer until suddenly stricken down by severe illness, the results in a great measure of overwork. He was said to have been carried out of his room in the Hydrographic office in a dying state.

Commander Miles never appears to have had charge of any survey, but his skill as a senior assistant to the late Admiral Bullock, as well as at the Hydrographic office, where he acted chiefly as secretary to the Hydrographer of the Admiralty, were well-known and appreciated.

LIEUT. W. MOONEY, R.N.

1837-47.

William Mooney joined the Navy in May, 1830, in the *Pelican*. From July, 1834, to 1837, he served as Midshipman of the *Talbot*. He passed his examination 22nd Oct., 1836; and served from 1837 on the North America and West India station, as Mate and Lieutenant of the *Thunder* surveying vessel, Capt. Edw. Barnett. He was made a Lieutenant in August,

1844, and continued to serve in the West Indies as an Assistant-Surveyor until that vessel was paid off.

No record appears to exist of his subsequent services, nor did he ever rise to the post of an officer entrusted with the charge of an Admiralty survey.

VICE-ADMIRAL R. B. BEECHEY.

1835-57.

Richard Brydges Beechey, born 17th May, 1808, was son of the late Sir Wm. Beechey, R.A.; brother of the late Rear-Admiral Fredk. Wm. Beechey, President of the Royal Geographical Society, and brother-in-law of Lord Grantley.

This officer entered the Royal Naval College 1st March, 1821; and embarked, in June, 1822, on board the *Espiegle*, Capt. Collier, on the Home station. He became attached next to the *Owen Glendower*, Capt. Hon. Sir Robt. Spencer, employed on particular service, and *Seringapalam*, Capt. Sam. Warren, in the West Indies; and, on the 2nd April, 1823, he rejoined Sir R. C. Spencer, as Midshipman, in the *Naiad*. In that frigate Beechey served, in 1824, at the blockade of Algiers, and, while on the coast of Barbary, took part in several boat expeditions, especially in the cutting out of a vessel laden with grain from under the forts of Bona. Returning home in the *Phaeton*, Capt. Sturt, he joined, in March, 1825, the *Blossom*, commanded by his brother, Capt. F. W. Beechey, with whom he proceeded on a voyage of discovery to the Pacific, and twice visited Behring Strait for the purpose of co-operating in the Polar expeditions of Captains Parry and Franklin. On his return to England Mr. Beechey was promoted, after passing his examination, into the *Madagascar*, on the Mediterranean station. After a short servitude in the *Ætina*, he was appointed to the *Belvidera*, in 1829, and in 1831, to the *Curacoa*, from which vessel forming part of an experimental squadron he was invalided. Joining, in 1835, the survey of the coast of Ireland, he continued to be employed on that coast until advanced to Captain's rank in January, 1857. Captain Beechey was famous for his powers as a water-colour artist of marine subjects. The *Erebus* and *Terror* in the ice of the Antarctic, the burning of H.M.S. *Bombay*, &c., resulting from his brush.

The following charts emanated from the surveys of Captain R. B. Beechey:—

Teelin Head to Downpatrick Head, including
Donegal Bay.
Sligo and Killala Bays.
Downpatrick Head to Achill Head.
Broadhaven Bay.
Blacksod Bay.
Achill Head to Slyne Head.

Achill Head to Roonagh Head.
Newport Bay.
Westport Bay.
Corrib and Mask Loughs.
Kerry Head to Ballinskellig Bay.
Tralee and Brandon Bays.
Belfast Lough.

The above officer became a Retired Rear-Admiral in 1875, and Vice-Admiral in June, 1879.

VICE-ADMIRAL P. F. SHORTLAND.

1843-1867.

Peter Frederick Shortland entered the Navy Jan., 1827; passed his examination Dec., 1834; was promoted (from the *Excellent*, gunnery-ship at Portsmouth), to the rank of Lieutenant 1st April, 1842; and, from 11th May following until advanced to the rank of Commander 20th Jan., 1848, was employed on surveying service in North America in the *Columbia* steamer, commanded during that period by Lieuts. Kortright and Harding, by Capt. W. Fitzwilliam Owen, and for some years by himself.

He continued on the North American station in charge of the Admiralty surveys, chiefly of the Bay of Fundy, the coasts of which were most elaborately mapped on a large scale under his direction. On the completion of this work he was re-called to England in 1865, and subsequently commanded H.M.S. *Hydra* in the Mediterranean, on the coast of Sicily.

This vessel was afterwards employed, under the same Captain, in obtaining deep sea soundings in the Atlantic and Indian Oceans, after the successful accomplishment of which, she returned to England and was paid off.

In September, 1876, Captain Shortland became a retired Rear-Admiral on the Active List, and in January, 1881, a Vice-Admiral. As a Lieutenant he spent a sufficient period at Cambridge University to enable him to become eleventh wrangler of his year; for some time in consequence he became a fellow of his college, Peterhouse.

Besides contributing able papers to various scientific magazines, amongst which may be mentioned that known as Naval Science, when edited by Sir E. J. Reed, the former chief constructor of the Navy, the following emanated from his pen:—

Sailing Directions for the Bay of Fundy.
Practical Observations on Surveying.
Sounding Voyage of H.M.S. *Hydra*.

The following Admiralty charts are from Admiral Shortland's surveys:—

Nova Scotia.

Cape Sable to Sambro Island.
Baccaro Point to Ram Island.
Ram Island to Port Metway.
Metway Port to Lunenburg.
Lunenburg to Mars Head.
Mars Head to Shut-in Island.
Sable Island.

Sicily.

Augusta Port.
Girgenti and Catania.
Palma to Catania.

Bay of Fundy.

Baccaro Point to Pubnico Harbour.
Pubnico Harbour to Yarmouth.
Yarmouth to Petit Passage.
Bryer Island to Gulliver Hole, including St. Mary Bay.
Gulliver Hole to St. Croix Bay.
Grand Manan Island.
Digby Gut to the Head of Navigation.
Petitcoudiac River and Cumberland Basin.

COMMANDER C. B. YULE, R.N.

1842-1864.

Charles Bampffield Yule entered the Navy May, 1830, and from October, 1833, to November, 1838, served as Midshipman and Mate of the *Etna*, engaged surveying on the W. coast of Africa, under Coms. Skyring, Arlett, and Captain Vidal, for a part of which period he joined the *Raven*, under Lieut. G. A. Bedford.

From April, 1839, to Jan., 1842; he acted as Mate and Assistant Surveyor to Captain F. Bullock, in the *Boxer* and *Fearless*, on the English coast.

Promoted to Lieut. in April, 1842, from that time to December, 1845, he served in Torres Strait, Australia, and New Guinea, as Lieutenant Commanding and Assistant Surveyor of the *Bramble*, tender to the *Fly*, under Captain Blackwood.

On the departure of the *Fly*, or from December, 1845, to August, 1847, he succeeded to the charge of the survey of the south coast of New Guinea in the *Bramble*, with the *Castle-reagh* as tender.

From August, 1847, to March, 1850, he served in the same part of the world, in a similar capacity (commanding the *Bramble*) as tender to the *Rattlesnake*, under Captain Owen Stanley. He was engaged in the Hydrographic Department of the Admiralty from November, 1850, to March, 1851, completing Australian charts.

From 1855, his date as a Commander, he was employed by the Hydrographer in compiling the 2nd and 3rd volumes of the Australian Directory; and subsequently in preparing a new edition of the 2nd volume.

The *Bramble* may yet be recognised in the present light vessel, on the dangerous bank known as the "Sow and Pigs," at the entrance of Sydney Harbour, of New South Wales, and it is still remembered that in her, when under Yule, was once performed, the feat of beating against the S.E. trade wind from Cape York to Sydney.

Commander Yule is credited with having taken a leading part in the surveys from which the following Admiralty charts were constructed :—

New Guinea. Sheet 3. Bampton Island to
Aird River, including Bramble Cay.
Aird River to Freshwater Bay.
Freshwater Bay to Round Head.

Round Head to Orangerie Bay.
Orangerie Bay to Bramble Haven.
Bramble Haven to Rossel Islands.
Torres Strait, N.E., and E. entrances.

LIEUT. W. LORD, R.N.

1835-56.

William Lord, born in 1804, entered the Navy in January, 1823, under Captain Martin White in H.M.S. *Shamrock*, and at that time engaged in surveying the English Channel. After a brief servitude on the east coast of England, under Mr. L. Fitzmaurice, R.N., in the *Congo*, he was transferred in October, 1825, to the *Investigator*, commanded by Mr. George Thomas, R.N., as Mate and Assistant Surveyor for the survey of a part of the North Sea and Shetland Islands.

He passed his examination in 1829, and obtained his Lieutenant's commission in August, 1835, or at the age of 31 years, when he left the *Investigator*.

For many years, Lieutenant Lord (who remained on half pay) held the post of Inspector of the River Mersey; for the correct charting and buoying of which river, he was held responsible.

Lieut. Lord was the author of a telegraphic vocabulary adapted for the line of Semaphoric telegraphs from Liverpool to Holyhead, published in 8vo. in 1845.

The printed tide tables for the Port of Liverpool were enlarged and improved by his agency.

COMMANDER J. BURDWOOD, R.N.

1847-1863.

John Burdwood entered the Navy, March, 1825, on board the *Camelion*, in which vessel he served as Master's Assistant, until January, 1830. He continued in the Mediterranean for a further period of two years, latterly as Acting Second Master, in the *Asia* and *Britannia* 120, flagships, and was employed, from Jan., 1832, until Feb., 1835, as Second Master, on board the *Ceylon* and *Jupiter* troop-ships. For the next five years he acted as Master of the *Lyra*, engaged in carrying mails to Brazil, the West Indies, and Lisbon. He then, in Feb., 1840, became Acting-Master of the *Persian*, to which vessel, attached to the squadron on the west coast of Africa, he was confirmed Aug., 1841. The *Persian* was paid off in Sept., 1843. From July, 1844, until March, 1846, Mr. Burdwood served as Master of the *Eurydice*, in the West Indies. He was then employed at the Admiralty from April, 1847, as Naval Assistant to Sir Francis Beaufort, Admiral Washington, and Sir George Richards.

He retired from his post in the Hydrographic Department of the Admiralty about the year 1869.

Alluding to his services in common with those of Commander Dunsterville, Sir Roderick Murchison, in his yearly address of 1870 to the R.G. Society, remarked, "It is due to these old and valued public servants to record, and it is believed it can be done with strict truth, that in the management of their respective important departments, there has never been a default through their lengthened term of office, and to replace them will not be an easy task."

Whilst employed as a Naval Assistant to the hydrographers at the Admiralty, Commander Burdwood wrote the following highly useful works. His azimuth tables were afterwards collated and added to by Captain J. E. Davis, of the same Department:—

Tables of the Sun's Bearings from March to September, at intervals of 20 minutes, between the parallels of 70° and 81° north; computed for Arctic Travellers. Admiralty, 1852.

Tables of the Bearings of the Sun between the parallels of 14° and 20° south, at intervals of 20 minutes, from April to August. 8vo. Admiralty, 1858.

Tables of the Sun's True Bearing or Azimuth for the parallels of 49° and 50° north. 8vo. Admiralty, 1862.

Tables of the Sun's True Bearing or Azimuth for the parallels of 51° and 52° north. 8vo. Admiralty, 1862.

Tables of the Sun's True Bearing or Azimuth for the parallels of 48° to 56° north. 4to. Admiralty, 1864.

Sun's True Bearing or Azimuth Tables, computed for intervals of four minutes between the parallels of Latitude 30° and 60° inclusive. 8vo. Admiralty, 1866.

Diagram to facilitate obtaining a Ship's Position by Sumner's method. 1862.

Australia Directory, vol. 1, from Cape Leeuwin to Port Stephens, including Bass Strait and Tasmania. 8vo. Admiralty, 1855.

Method of finding the Latitude by the simultaneous Altitudes of Two Stars, and also their True Bearings or Azimuths at that time. 8vo. Admiralty, 1865.

Directions for reducing Tidal Observations. 8vo. Admiralty, 1858.

Another edition. 8vo. 1865.

Tide Tables (Daily) for 24 British and French Ports, with Constants for 230 other places of the United Kingdom and Coast of Europe. Published annually. 8vo. Admiralty.

CAPTAIN J. DAYMAN, R.N.

1846-58.

Joseph Dayman entered the Navy in October, 1831, passing his examination for a Lieutenant in 1838.

He was employed as a Mate in the *Erebus* under Sir James Ross, during the voyage of discovery in the Antarctic regions made under that officer in the years 1839-1843.

In October, 1843, Dayman was promoted to the rank of Lieutenant, and was then employed on surveying service on the coast of Ireland in the steamer *Tartarus*, under Captain James Wolfe.

From 1846 until 1850 he served in the *Rattlesnake* as Second and eventually as First Lieutenant, under Captain Owen Stanley, during the earlier part of the commission, or until that officer's death at Sydney. The *Rattlesnake* was engaged chiefly in Torres Strait and on the south coast of New Guinea.

From 1852 to 1856, Lieut. Dayman served at the Cape of Good Hope as additional Surveyor of the *Hydra*, and subsequently with his name on the books of the Commodore's ship for surveying service in the Cape Colony.

From April until September, 1857, he commanded the *Cyclops*, in which vessel he was engaged in obtaining deep sea soundings.

On the 1st of January, 1858, he was made a Commander, and appointed in the course of the same year to the *Gorgon* for deep sea sounding in the North Atlantic, and assisting to lay the Atlantic telegraph cable.

From May until November, 1859, he commanded the *Firebrand*.

For his services in the *Gorgon*, as colleague of Captain Otter, Captain Dayman received from the Mayor of New York a gold watch, and an address on parchment handsomely mounted.

The following Admiralty charts of South Africa were published from the surveys of Commander Dayman:—

Cape Hauglip to Dyer Island.
Dyer Island to Struys Bay.
Algoa Bay.

Port Elizabeth.
Natal Port.

In 1858, an octavo pamphlet descriptive of the Deep Sea Soundings obtained in the North Atlantic Ocean between Ireland and Newfoundland, in H.M.S. *Cyclops*, during the months of June and July, 1857.

This pamphlet includes a report by Professor Huxley on the examination of the specimens of the bottom brought up by the machine.

In 1859, a similar work containing an abstract of Deep Sea Soundings in the North Atlantic Ocean, between Newfoundland, the Azores, and England, made in H.M.S. *Gorgon* by Commander Dayman in September and October, 1858.

VICE-ADMIRAL BYRON DRURY.

1848-56.

Byron Drury, whose father and grandfather, Dr. Drury, were masters for about seventy years of Harrow School, first joined the *Etna* as College Volunteer, under Commander (afterwards Sir) Edward Belcher, August 13th, 1830. After only a week's service, however, he removed as a Midshipman to the *Rainbow*, Captain Sir John Franklin, in which vessel he served until January 8th, 1834, on the Mediterranean Station.

He then joined the *Racehorse*, Commander Sir Edward Home (Bart.) under whose command as a Mate he surveyed the River Paria, making numerous astronomical and magnetical observations. The *Racehorse* paid off in July, 1837, and in October of that year Drury joined the *Alligator*, Captain Sir Gordon Bremer. While in this vessel he surveyed Port Essington, and Port Bremer in Australia, and was also constantly employed with Captain Owen Stanley in the *Britomart*, surveying amongst the islands north of New Holland.

During the last two years of the *Alligator's* commission, or between the years 1839 and 1841, Captain A. L. Kuper assumed the command, with whom, in July of the latter year, having been promoted, Lieutenant Drury removed to the *Calliope*, and was for some time engaged on the coast of China. He now volunteered in to the *Starling* and *Plover*, under Captain (afterwards Sir) Henry Kellett, for surveying service in the River Yang-tse-kiang.

Sir William Parker, the Commander-in-Chief, in a certificate given on board the *Cornwallis* at Hong Kong, remarks "that during the months of July, August, and September, 1842, when the *Calliope* was attached to the expeditionary force in the Yang-tse-kiang, that Lieutenant Drury volunteered his services, and rendered valuable assistance in surveying and sounding the channels in that river for the ascent of the fleet to Nankin. With unwearied zeal he further volunteered to continue in the surveying service, when the *Calliope* was ordered to England, although he had been absent about five years from home; but the order for his discharge from the *Calliope* was not received in time to retain him."

Sir William Parker adds, "I am also aware that Lieutenant Drury's assiduity in sounding and surveying was found very serviceable to the squadron in China, before I took the command, and I consider him an officer of superior requirements and high promise in his profession, which entitles him to every favourable consideration."

As Lieutenant in 1843, and Assistant Surveyor in September, 1844, Drury was appointed to the *Shearwater*, under Commander C. G. Robinson, engaged on surveying duties on the west coast of Scotland, with whom he remained until February, 1845. Next joining the *Herald*, at that time fitting for surveying service in the Pacific, under Captain Kellett, for a period of three months only, he left, on promotion to Commander's rank, in May, 1845. Returning to the *Shearwater* in February, 1846, he remained engaged in the west coast of Scotland survey during the greater part of the years 1848 and, we believe, 1849.

In December, 1850, he was selected as Commander and Surveyor for the *Pandora* to relieve Captain Stokes in the *Acheron*, on the survey of the coasts of New Zealand.

For five years and six months, or until 13th June, 1856, Commander Drury continued in the command of the *Pandora*, following up the good work commenced in the *Acheron* by

HYDROGRAPHY.

71

Captain Stokes and his able assistants with energy and success, often under trying and difficult circumstances, the *Pandora* being a sailing brig of only about 400 tons.*

In the *Pandora*, under Captain Drury, the brothers, Thomas and James Kerr, Blakeney, George Stanley and Ellis, subsequently known amongst more modern naval surveying officers, received their early training. In the anniversary Geographical address of 1856 the President of the R.G. Society remarked, "That the various Admiralty surveys, which have been carried on in New Zealand since 1848, have been brought to a close by the return to England of the *Pandora*, Commander Drury, who brings away with him gratifying testimonials from the colony as to the value of his services in those regions; increased by the promptitude with which he made them available to the navigator, by furnishing accurate accounts of the results of his surveys through the medium of the New Zealand Gazette."

Captain Drury received post rank in August, 1857.

His dates on the retired list are as Rear-Admiral 20th April, 1875, Vice-Admiral 2nd August, 1879.

He was the author of the following:—

Revised Sailing Directions for the northern part of the colony of New Zealand. 12mo. Auckland, 1854.

A Pamphlet on the Meteorology of New Zealand. 4to.

The following charts were published from the surveys of Captain Byron Drury, some few being common to both Captains Stokes and Drury:—

North Island.

New Zealand, general chart.
" North Coast from Hokianga to
Tutukaka (sheet 1).
Rangaounou or Awanui River.
Hokianga River.
" (upper part).
Sheet 2. Monganui Bluff to Manukau, and
from Tutukaka to Mayor Island.
Kaipara Harbour.
Manukau Harbour.
Auckland Harbour, entrances.
Waitemata River.
Mercury Bay.
Mayor Island to Poverty Bay (sheet 3).
Tauranga Harbour.
Poverty Bay to Cape Palliser (sheet 4).

South or Stewart Island.

Sheet 11. Foveaux Strait and Stewart Island.
Ahuriri Road, Port Napier and Long Point
Anchorage.
Cook Strait and Coast to Cape Egmont (sheet 5).
Manukau Harbour to Cape Egmont (sheet 6).
Kawhia Harbour.
Whaingaroa Harbour.

Middle Island.

Cook Strait Anchorages (sheet 1), D'Urville
Island to the entrance of Queen Charlotte
Sound.
Sheet 2. Croiselles Harbour, Pelorous Sound
Gove and Underwood Ports, Queen Charlotte
Sound, and Tory Channel.
Current Basin and French Pass.

SIR JOHN BARROW, BART., F.R.S.

1807-1845.

Sir John Barrow, one of the original founders of the Royal Geographical Society, and for many years one of the most active and zealous promoters of hydrography, was born in June, 1764, at Dragleybeck, near Ulverstone, in North Lancashire, and showed early in life a taste for mathematics.

* The stormy coasts of New Zealand were often a source of no small peril to those engaged in this survey on board the *Pandora*. On one occasion an earthquake having taken place at night, accompanied by a heavy storm with thunder, lightning, and much rain, the vessel twisting and wrenching violently at her anchors, the word was passed, probably without authority, to call the boats away. Some even thought that the end of the world was at hand. These proceedings were, however, checked by an old Quarter-Master remarking, "That if so be the end of the world had come, why, where were the boats to pull to?" Which argument, it is believed, proving unanswerable, effectually prevented the idea of lowering the boats being followed up. In another instance the *Pandora* was blown high and dry on the coast, and for some time remained in imminent peril of becoming a total wreck.

His love of travel was evidenced in his youth by his quitting his employment as clerk in an iron foundry for a voyage to Greenland in a whaler. Soon after his return he received the appointment of Comptroller of the Household, in Lord Macartney's suite on the occasion of his Embassy to China. Here, Mr. Barrow soon made himself acquainted with the language, literature, and science of China.

Mr. Barrow afterwards accompanied Lord Macartney, in 1797, as Private Secretary, on his important mission to settle the Government of the Cape of Good Hope; and when Lord Macartney returned to England, was left by him Auditor-General of Public Accounts, Civil and Military. The state of public affairs compelled him to return to England in 1803, when he published the results of his observations, under the title of "Travels in South Africa."

In 1804, he published a second volume of travels, and in the same year was appointed by Lord Melville, second secretary to the Admiralty, a post for which he was well fitted by his peculiar turn of mind, and the interest he had taken in our colonial and transmarine negotiations.

The change of administration in 1806 led to his removal, but his claims to a pension were recognised by his political opponents; in 1807, on the dissolution of the Grenville Ministry, he was restored to the Admiralty by Lord Mulgrave. He has himself stated that from the 8th April, 1807, to the 28th January, 1845, he had continued without interruption Second Secretary to the Admiralty, under twelve or thirteen Administrations,

In 1855, he was created a Baronet, and retired from public life in 1845, at the age of 81.

He ever took a peculiar interest in those expeditions undertaken with the view of finding a north-west passage, and urged the prosecution of voyages of discovery in the Arctic regions.

He died in 1849, aged 85 years. He published:—

A considerable number of Articles in the
Quarterly Review.

Ten or twelve Articles in the Encyclopædia
Britannica.

A Review of the Life of Lord St. Vincent.

A Life of Lord Macartney, in 2 vols. 4to.

Travels in Southern Africa. 2 vols. 4to.

Travels in China. 2 vols. 4to.

Voyage to Cochin China. 1 vol. 4to.

Life of Lord Anson. 1 vol. 8vo.

Life of Lord Howe. 1 vol. 8vo.

Life of Peter the Great.

An Account of the Mutiny of the *Bounty*.

A Chronological History of Arctic Voyages.
1 vol. 8vo.

Voyages of Discovery and Research within the
Arctic Regions. 1 vol. 8vo.

LIEUTENANT CHRISTOPHER, I.N.

1835-48.

This officer was born in 1814; after entering the Indian Navy, he was employed for five years in the surveys of the coasts and islands of the Red Sea, and for the next five years in the surveys of the Maldiv Islands, the Gulf of Manar and Chagos Archipelago, under Captain Moresby.

He subsequently surveyed part of the east coast of Africa, in command of the *Tigris*, brig of war.

It was then, that, having made a journey into the interior he discovered a large stream, which he named the Haines River, an account of which, with a chart, was published in the 14th volume of the Royal Geographical Society's Journal, page 76. After this he was employed in the Indus flotilla, under Captain Powell, chiefly in Scinde, and afterwards in ascertaining by surveys how far up the Rivers Indus, Sutlej, Chenab, and Ravee, were navigable by steam. In July, 1848, he joined the force under Lieut. Edwardes, operating before Mooltan, and received his death wound while pointing out the way to a detachment of troops, advancing to support the force already in the trenches, at the age of 34 years.

LIEUTENANT JOHN WOOD, I.N.

1834-43.

John Wood was born in 1812, educated at Perth Academy, and joined the Bombay Marine when very young.

In 1834, he left Bombay in the *Coote*, visiting the Laccadive Islands, of which he made some valuable hydrographical notes.

He commenced surveying work in the Indus, about the year 1835, in command of the first steam vessel that floated on the river, when he examined its course from the sea to Haidarabad, and remained in the country to observe its periodical rise and fall.

In 1836, Lieutenant Wood accompanied Alexander Burnes in his mission to Cabul, and afterwards performed one of the most remarkable journeys that has ever been undertaken in Central Asia. Wood made a survey of the Indus from its mouth to Attock. At Kalabagh, the point where the mighty stream escapes from the Salt Range, he found it impossible to stem the current. Undaunted by the difficulty, Wood landed and went by forced marches to Attock, thence descending the river, and completing his survey amidst the falls and rapids.

After reaching Cabul, he crossed the mountains to Kunduz, and was eventually the first European except Marco Polo, who ever reached the "Bam-i-Dunya" or roof of the world. Thus, in 1838, Wood discovered the source of the Oxus, and for this splendid achievement, he received the gold medal of the Royal Geographical Society in 1842.

He retired in 1842, and after visiting many of the colonies, finally became managing Superintendent of the Indus Flotilla, and lived for many years in Sind. He was of an extremely retiring disposition, but his great worth as a valuable public servant was fully recognised, and his loss much felt in Western India. He died in London, November the 13th, 1871, aged 59 years.

There remain several manuscript maps by Lieutenant Wood, it is believed, in the Geographical Department of the India Office, viz. :—

A series of sheets of the Indus and a chart of the Indus from Mittun to Attock in 1838; four sheets, on a scale of two inches to the mile, not coloured.

A map of the upper valley of the Oxus from Kunduz to its source, showing the new ground explored by Lieutenant Wood, 1837-38.

A survey of routes from Peshawur to Bamiau, with sketches and sections of the Khaibar and Hindu Kush Passes.

The route of Burnes's Mission to Cabul, in three sheets.

Nine sheets of Burnes's route from Cabul to Bokhara, and thence through Persia to Bushire (drawn by Lieut. Wood).

Seven sheets of route surveys in Turkistan.

A survey of the Khawk Pass, the most easterly from Cabul to Balkh in Turkistan.

Also, the following works and papers were written by Lieutenant Wood :—

Extract from Lieut. Wood's Journal regarding the Laccadive Islands. (R.G.S. Journal for 1836, p. 29).

Memoranda on the River Indus. (Bombay G.S. Journal, vol. 1).

Report on the source of the Oxus. (R.G.S. Journal for 1840, p. 520).

Personal Narrative of a Journey to the source of the River Oxus, by the route of the Indus, Cabul, and Badakshan. 1845.

A second edition with an essay on the valley of the Oxus, by Colonel H. Yule, C.B., was published by Mr. Murray in 1872.

COMMANDER J. HARDING, R.N.

1842-46.

Having entered the Navy in 1805, this officer served as a Midshipman on the coast of Spain and Brazilian stations.

Having returned to England he joined the *Dædalus* frigate, in which he was wrecked off Ceylon, in July, 1813. He then joined the *Minden* until 1814, when he became an Acting Lieutenant of the *Hecate*.

In 1815, having been confirmed in a Lieutenant's rank, he joined the *Sphinx*, and in the absence of the Commander discharged the duties of captain of that vessel.

In 1824 and 1825, he became Supernumerary Lieutenant of the *Ramillies* and *Hyperion*, employed on the Coast Blockade.

Failing to obtain further employment he proceeded to Singapore in command of a merchant brig, and made several sketches in the vicinity of that port. On his return to England in 1831 these were forwarded to Captain Beaufort at the Admiralty, and eventually led to the appointment of Lieut. Harding to the Irish, and afterwards the west coast of England survey, in which he remained until 1835.

In 1842, after seven years of half-pay, he was appointed to the command of the *Columbia* paddle steam brig, in which he was engaged in surveying on the North American station until the close of 1844.

In 1845, he was attached as additional Lieutenant to the *Cyclops* and subsequently to the *Crocodile*, on the south-east coast of America, in which latter he continued until promoted to the rank of Commander, in November, 1846. Commander Harding does not appear to have been afterwards actively engaged afloat.

The Admiralty plan of the entrance to St. John Harbour, Bay of Fundy, is by Commander Harding.

LIEUT. A. KORTRIGHT, R.N.

1842-47.

This officer joined the Navy in 1822, and first served in the *Investigator*, under Master Commander George Thomas, at that time engaged in a survey of the Firth of Forth.

In 1823, he joined the *Fly*, and in 1825 the *Doterel*, obtaining his commission as a Lieutenant in 1828; in 1831, we find him in the *Etna*, under Captain Belcher, on the survey of the coast of Africa, from whence he returned invalided in 1832.

Lieutenant Kortright then joined the survey of the north-east coast of England, under Commander Michael Slater, who, in November, 1841, certified that "he was capable of taking charge of any of the home surveys."

In May, 1842, he was made Lieutenant Commander of the *Columbia*, surveying vessel on the North American Station, but was superseded in October of the same year.

In November, 1844, Captain W. F. W. Owen, in charge of the surveying operations in North America, certified that Lieutenant Kortright was "a very expert, accurate and neat draughtsman, and had conducted the survey of the Port of St. Andrew's to his satisfaction."

He continued to serve in the Bay of Fundy survey until 1847, when returning to England, he petitioned for promotion in 1848, but apparently without success.

Surveys of St. Andrew Port and L'Etang Harbour, in the Bay of Fundy, are by Lieut. Kortright.

CAPTAIN E. J. JOHNSON, R.N., F.R.S.

1842-54.

Edward John Johnson entered the Navy May, 1807, on board the *Nassau*, Capt. Campbell. In that ship he attended the expedition to Copenhagen, and (on her subsequent extrication from a mass of ice in which she had been blocked up during the whole winter) was present, March, 1808, in company with the *Stately*, at the capture and destruction, on the coast of Zealand, of the Danish ship, *Prinds Christian Frederic*, after a running fight of great length and obstinacy. He was next, until June, 1815, employed as Midshipman and Acting-Lieutenant in the *Solebay*, Capt. Proby; *Malacca*, Capt. Butterfield; *Ethalion*, Capt. Heywood; *Endymion*, Capt. Hope; *St. Domingo*, *Asia* and *Tonnant*, flag-ships of Sir John

Borlase Warren and Sir Alex. Cochrane; and *Dragon*, Capt. Barrie, on the Home, Baltic and North American stations. While in the *Ethalion*, Mr. Johnson served in various cutting-out affairs, and on more than one occasion was sent into port as prize-master; and, when in the *Tonnant*, co-operated on shore in the attacks upon Washington and Baltimore, and was employed in the boats during the expedition against New Orleans. Being presented, on leaving the *Dragon*, with a commission dated Feb., 1815, he obtained, in May, 1818, an appointment to the *Shamrock* surveying-vessel, Capt. Martin White, with whom he did duty in the channel and off the coast of Ireland until Feb., 1820. In March, 1829, shortly after he had joined the *William and Mary* yacht, he was promoted to the command of the *Brilomart*, in which vessel he remained, chiefly on the Lisbon station, until paid off in 1831. He was then ordered by the Admiralty to complete the survey of the Faerøe Islands—a service he had commenced at his own expense when last on half-pay. His advancement to the rank of Captain took place 27th Dec., 1838.

Capt. Johnson, in Oct., 1835, was appointed by the Admiralty to conduct certain magnetic experiments on iron steam-vessels in the River Shannon; and in May, 1836, he was elected a Fellow of the Royal Society. He was nominated a member of the Magnetic Compass Committee of the Admiralty in 1838; and was made, in March, 1842, the first superintendent of the Compass department of the Royal Navy.

The following works emanated from Captain Johnson:—

- Sailing Directions from Sunderland Point to Berwick, including the Farne Islands. 8vo. 1836.
- Report of Magnetic Experiments tried on board an iron steam vessel. 4to. 1836.
- Description of the Magnetic Disperser. 8vo.
- Practical Illustrations of the necessity for ascertaining the Deviations of the Compass. 4to. 1847.
- Another Edition. 8vo. 1852.
- On placing Compasses on board iron ships. 4to. 1842.
- Deviation Tables of different classes of H.M. ships with diagrams, &c. Folio. 1851.
- His survey of the Færøe Islands has been superseded by a more recent Danish survey.

Captain Johnson was succeeded in his post of Superintendent of the Admiralty Compass Department about the year 1855, by Captain (now Sir) F. J. Evans.

CAPTAIN A. DU PETIT THOUARS (French Navy.

1836-39.

This voyage was made in connection with the French whale fishing interest in the Pacific. The *Venus* left Brest December, 1836, arrived at Valparaiso in April, thence to Rio, Callao, Oahu of the Sandwich group, where H.M.S. *Sulphur*, under Captain Belcher, R.N., was met with; from Honolulu to Awatska Bay, thence to Monterey, the crew suffering severely from scurvy. Quitting Monterey the voyage was continued to Guadaloupe, which was examined, and Los Alijos rocks fixed. Touching at Cape St. Lucas, she reached Mazatlan, San Blas, and Acapulco, describing each of those places, and thence to Valparaiso, March, 1838. St. Ambrose and St. Felix islands, called by the Spaniards the Unfortunate islands, were next visited, and then Callao, surveying the Hormigas rocks and touching at the Galapagos. The Marquesas islands were then surveyed, the north part of the Low Archipelago traversed, and Papeite anchored at, where a convention was drawn up promising protection to French ships. Passing thence to New Zealand, several islands, including the Kermadec group, were examined on the way, and the Bay of Islands reached in October. Sydney was the next port touched at, thence to France, Brest being arrived at June, 1839. Under the direction of M. U. de Tassau many additions to the hydrography of the Pacific were made, chief amongst which was the chart of the Marquesas islands. The scientific portion of the voyage was carefully attended to, and many branches of natural history enriched. In the third volume of the narrative of the voyage the principal object is set forth in the report to the Minister of Marine, viz., "On the Whale Fishery in the Pacific Ocean."

See Voyage autour du Monde sur la Frégate *la Venus*, pendant les années, 1836-39. Nine vols. 8vo., and folio. Atlas. Paris, 1842-49.

MEMOIRS OF

LIEUT. G. B. LAWRENCE, R.N.

1843-53.

This officer entered the Navy in June, 1829, as a volunteer of the first class, on board the *Sparrowhawk*, in the West Indies, in which vessel he continued until August, 1832, when he was transferred to the surveying vessel *Blossom*, for a passage to England.

From the 30th December, 1831, to 4th August, 1832, Lawrence had been lent to the *Blossom*, and performed duty on shore at Jamaica during the slave insurrection of 1831.

In April, 1833, he was appointed as Midshipman to the *Thunder*, again in the West Indies, and continued as a Mate and Assistant-Surveyor in that vessel until April, 1841, when he obtained the acting command of the surveying schooner *Lark*.

During his service in the *Thunder*, Lawrence was placed in charge of an exploring party across Central America. He then surveyed the Lake of Nicaragua, and determined chronometrically, the geographical positions of the principal towns, forts, &c., between San Juan de Nicaragua on the Atlantic, and the port of San Juan on the Pacific.

In February, 1843, he was confirmed in the rank of Lieutenant, and continued in command of the *Lark* until August, 1848.

The Bahama Legislature presented Lieutenant Lawrence with a vote of thanks in April, 1845, for making a survey of the Port of Nassau and framing a report thereon.

On the return to England of Captain Barnett from the West Indies, Lieut. Lawrence was appointed his successor in charge of the surveys of that part of the world, and continued among the Antilles and in the Caribbean Sea in 1849 and 1850.

Continuing his surveying duties amongst the Virgin Islands in H.M.S. *Scorpion*, Lieutenant Lawrence at last fell a victim to the West Indian climate, after nearly 24 years servitude therein. He died of fever, in 1853, at Santa Cruz, at the age of 38 years, and was succeeded in the charge of the survey by his Assistant, Mr. (now Staff-Captain) John Parsons, R.N.

Of the charts published from the surveys of Lawrence, were the following, besides large contributions to the more general sheets :—

San Domingo Island to Dominica Island.
Alfred Sound, Inagua Island.
Mathew Town Road.
Anguilla to Puerto Rico (Virgin Islands).
Virgin Islands, in three sheets.
Gorda Sound (Virgin Gorda).
Road Harbour, Tortola.

St. Thomas Harbour.
Culebra or Passage Island.
Bocas de Drago and Port of Spain (Windward Islands).
Campeche Bay (Mexico Gulf).
Laguna de Terminos, Puerto real entrance.
" " " Western entrance.

ADMIRAL GUSTAF KLINT (Swedish Navy).

1832-41.

The hydrographic labours of the above officer were chiefly confined to the survey of the coasts of his own country, Sweden. These, however, have been generally known and appreciated by geographers of all countries.

The gulf of Bothnia, Klint's principal undertaking, was surveyed under his direction in the years 1832-36, and published in a series of seven charts by the Royal Marine Department, at Stockholm, in 1849.

The sailing directions were subsequently translated from the original manuscript by Mr. C. Bernard Costa, of the Swedish Consulate in London, and revised in passing through the press by Mr. H. W. Crowe, Swedish Interpreter to the Baltic fleet, in 1854-55. They were then adapted to the published English charts of the Gulf of Bothnia, which were engraved from those of Sweden. Admiral Klint died at Stockholm, at an advanced age, about the year 1839.

Besides other works, extending as far back as 1816, the following were published from Admiral Klint's compilation :—

Sailing Directions for the Baltic Sea and the Gulf of Finland. 8vo. 1854.
Sailing Directions for the Gulf of Bothnia. 8vo. 1855.
E. G. Lårobok i Navigations Vetenskapen. Stockholm, 1842.
Nautiska och Logarithmiska Tabeller. 8vo. Stockholm, 1842.

REAR-ADMIRAL W. SMYTH, R.N.

1835-43.

This officer, who entered the Navy in 1813, made his first entry into the surveying service on board the *Blossom*, under Captain Beechey, in that vessel's voyage to the Pacific in 1825-28.

Obtaining his commission as a Lieutenant in 1827, in 1831 he applied for further employment in the surveying service, but apparently without success.

From June, 1831, to 1835, he served as a Lieutenant of the *Samarang*, on the coast of South America. In 1835, he undertook the journey from Lima to Para, thus alluded to in Vol. VI. of the R. G. S. Journal for 1836.

"An extremely interesting voyage was also made last year by Lieutenant Smyth, of the Royal Navy, down a portion of the Huallaga and Ucayali rivers to the Amazons, and down the latter to the sea. Lieutenant Smyth was serving in the *Samarang*, on the coast of Peru, when the proposal was made to him by the merchants of Lima to undertake this service; and although, in some degree, he was unsuccessful in the principal object proposed, viz., an attempt to descend the Pachetea to the Ucayali, and thus determine the quality of the upper navigation of this river, yet, by the observations which he was enabled to make of the general character of the country, and the hearsay information concerning it which he was otherwise enabled to procure, he left little, or it may be said no doubt, of the general fact that from Pozuzu, on the Pachetea, 80 miles from Huanuco, 120 from Cerro di Pasco, and 300 from Lima, an easy navigable passage exists to the Atlantic, were the banks of the rivers cleared of the barbarous tribes which infest some parts of them; a fact which may prove at no distant period of great importance—Upper Peru and Bolivia apparently abounding in marketable commodities, and requiring only the habit of trade with Europe to have their resources developed.

The accessions to geography made by Lieutenant Smyth consisted otherwise in the determination, in many cases astronomically, of a number of points along the rivers above-mentioned; of the rectification, accordingly, of their course, as previously laid down; of some detailed statements regarding the Rio Negro, resting on the authority of a Portuguese priest residing at Barra, which are contained in the paper addressed by Lieutenant Smyth to the Royal Geographical Society, and in the views given by him of the state of the native Indians."

From May, 1836, to November, 1837, Smyth served as senior Lieutenant of the *Terror*, under Captain (afterwards Sir) George Back. Promoted to Commander's rank in 1837, he obtained command, in September, 1838, of H.M. brig *Grecian*, on the South America and Cape of Good Hope station.

He was made a Post Captain in December, 1843, did not again serve actively afloat, and died a Rear-Admiral in 1877.

Assisted by Lieutenant F. Lowe, R.N., he produced,

Narrative of a journey from Lima to Para, across the Andes, and down the River Amazon, in 1834.
8vo. 1856.

COMMANDER EDWARD DUNSTERVILLE, R.N.

1842-1870.

No description of the Naval Surveying Service, nor of the officers who have been employed therein, could be complete, without a brief record of the services of the above-named officer, who, if not a nautical surveyor himself, contributed in a vast degree to the circulation of the surveys of others.

Commander Dunsterville entered the Navy in July, 1812, as first-class volunteer on board the *Brisk*, Capt. Mounsher, employed on the north coast of Spain, where he co-operated with the Army, and was present at the unsuccessful night attack made in 1812 on the

fortress of San Sebastian. Made a Midshipman in 1814, he served until February, 1815, in that capacity under Commanders Bamber and Prickett, in the *Pelican*, the latter officer disrating him to the rate of A.B. (as was possible in those days) in order to rate a follower in his stead. In consequence of this, the Commander-in-Chief at the Cove of Cork (now Queenstown) ordered Mr. Dunsterville to be discharged in February, 1815, to the *Ethalion*, Captain Dobbie, where he remained until August of the same year, about which time the ship was ordered to be paid off.

He then joined the *Trent*, bearing Vice-Admiral Sir H. Sawyer's flag, and was finally discharged from His Majesty's service, in consequence of the reduction of the fleet to a peace establishment on shore in November, 1815. Nothing daunted, Dunsterville joined the merchant service, and served as Second and Chief Mate for nearly three years, first in the ship *Harriette*, of Cork, and afterwards in two others, of London and Liverpool. In September, 1824, he successfully passed an examination at the Trinity House, for a Master in the Royal Navy, and was appointed in the same month Second Master of the *Valorous*, Captain the Earl of Huntingdon, afterwards being promoted in 1825 as Acting Master into the *Carnation*, Commander Rawdon Maclean. He next joined the *Bustard*, Commander W. Sandom in July, 1825, stationed in the West Indies, in which ship he paid off in September, 1828.

We next find him in the *Ranger*, under Captain William Walpole, again in the West Indies, where he remained until May, 1832, when he was made Master of the *Thunder*, surveying vessel, under Commander Richard Owen, employed surveying the Mosquito coast. In March, 1833, the subject of this sketch was invalidated at Bermuda for repeated attacks of dyspepsia, occasioned by a servitude of fifteen years on the West India Station. He then joined the *Howe* at Sheerness, and afterwards the *Cambridge*, which was stationed in the Mediterranean, under Captain Edward Barnard, and took an active part in the operations of 1840 on the coast of Syria, and assisted in blockading the Egyptian fleet at Alexandria.

In 1842, he was appointed one of the Naval Assistants to the Hydrographer (Sir Francis Beaufort), in succession to Mr. Osborne of the same department.

In November, 1855, upon Mr. Dunsterville being permitted to retire with the rank of Commander, the late Hydrographer (Sir Francis Beaufort), who had retired in the early part of the same year, wrote him the following warm-hearted letter:—

Dear Dunsterville,—There has been much said lately about the folly of putting square bolts into triangular holes, and *vice versa*, but I think that all who know you will agree that their Lordships, in giving you just rank, have for once succeeded in dropping the right pin into the right place, at all events, it gives me great satisfaction. I am glad to find from your note, that, after so many years hard work, it will assist in making you more comfortable.

From Burdwood I hear that many changes have taken place in the Admiralty; but there is one thing which I am sure will never change—your indefatigable zeal.

Yours very truly,

F. BEAUFORT (*late Hydrographer*).

To Commander Dunsterville it was left how best to solve the problem of—given a large number of vessels of war constantly on the move, and of a large quantity of charts constantly being cancelled and corrected, how to keep the first invariably supplied up to the latest date with the last. This, in addition to nautical notices, correcting catalogues, and lists of lights, ordering and issuing charts, and making up new folios for the stores at the home ports, and at the Hydrographic Office. For 28 years Commander Dunsterville, almost unaided, accomplished this task, without a mistake, earning the eulogism of three successive hydrographers.

At length, in 1870, having passed his seventy-third year, he retired upon a well-earned civil pension, in addition to his pension gained by naval service.

Sir George Richards, in a farewell letter, remarked, "he carried with him his sincere wishes for the long enjoyment of the retirement he had earned, by a devotion to the public service, which he believed had never been surpassed."

Sir Roderick Murchison, in his yearly address as President to the fellows of the Royal Geographical Society in 1870, alluding to the retirement of Commanders Dunsterville and Burdwood from the Hydrographical Department, says, "It is due to those old and valued public servants to record, and it is believed it can be done with strict truth, that in the management of their respective important departments, there has never been a default throughout their lengthened term of office, and to replace them will not be an easy task."

Commander Dunsterville wore the Syrian medals, and during his leisure hours edited the later and revised editions of Horsburgh's celebrated East India Directory. After his retirement, he wrote an autobiography, from which much of the above has been taken. He died in 1876, aged 79 years.

COMMANDER H. L. COX, R.N.

1853-65.

Henry Laird Cox, born July, 1809, entered the Navy, Jan., 1824, on board the *Hasty*, Master-Commander Lewis Fitzmaurice, in which vessel and as Midshipman, in the *Shamrock*, Capt. Martin White, he was employed in surveying the English Channel until October, 1828.

From Nov., 1828, until Oct., 1830, his name was borne on the books of various guardships at Plymouth. During that period Cox was often absent on detached service, in the course of which he made one trip to the West Indies and another to the Mediterranean.

In 1830-1 he was employed under Capt. Belcher, as Mate in the *Ætna*, in surveying the rivers, &c., on the north-west coast of Africa; in 1831-2, he was attached to the *Fairy* surveying vessel, Capt. Wm. Hewett; and from May, 1833, until Dec., 1836, he was engaged in the *Britomart*, in the suppression of the slave trade on the coast of Africa, where he was frequently sent away in charge of the boats to examine rivers between Cape de Verde and the Equator, and where while thus occupied he made three prizes. He was subsequently stationed in the Mediterranean, on board the *Harlequin*, and at Plymouth, on board the *Impregnable*; and on 23rd March, 1840, he was promoted to the rank of Lieutenant and nominated Additional of the *Stag*, bearing the broad pendant of Commodore Thomas Ball Sullivan on the coast of South America. In the following July, he there joined the *Chio*. He had temporary command, in 1841-2, of the *Sparrow* ketch, on the same station.

From Dec., 1842, to April, 1845, he assisted in the *Slyx*, Capt. Vidal, in surveying Madeira and the Azores; and from the latter period until May, 1853, he was employed in surveying the south coast of England as Assistant-Surveyor, under Capt. Sheringham. His surveying promotion to the rank of Commander took place Jan., 1857.

From May, 1853, to August, 1860, Commander Cox had charge of the survey of part of the west coast of England, Isle of Man, &c., carried out chiefly in hired boats.

On the formation of the Australian colonial surveys in 1860, Commander Cox accepted the charge of that of Victoria, in which he continued for about six years. He was succeeded by Commander G. R. Wilkinson, about the year 1866.

The most prominent of Commander Cox's surveys were:—

England.
Start Point to Portland.
Dartmouth Harbour.
Dodman Point to Start Point.
Salcombe River.
Plymouth Sound and Hamoaze.

Australia.
Bass Strait, 2 sheets.
Port Phillip, 2 sheets.
" " Entrance.
Hobson Bay and Yarra River.
Geelong Harbour.
Port Western.

MEMOIRS OF

CAPTAIN F. W. L. THOMAS, R.N.

1845-64.

This officer, the son of George Thomas, Esq., the Master commanding the *Investigator* and *Mastiff*, for so many years engaged surveying amongst the Shetland and Orkney Islands, and alluded to at page 50 of Part I. of this work, entered the Navy in January, 1827, on board his father's command, the *Investigator*.

He passed his examination in 1835, and continued to serve in the *Investigator* and *Mastiff* as Mate and Assistant-Surveyor until August, 1841, when he was made a Lieutenant in consequence apparently, of his father's application to the hydrographer. Thus:—

CAPT. BEAUFORT R.N., F.R.S., &c., HYDROGRAPHICAL OFFICE, ADMIRALTY.

Hr. Ms. Surveying Vessel "Mastiff,"
Woolwich, 22nd January, 1840.

Sir,—I beg leave to communicate to you that having served *thirty years* as Maritime Surveyor under the Hydrographical Department, during which period my services have been called into requisition on several important occasions, led me to apply to my Lords Commissioners of the Admiralty for promotion, considering that the arduous duties performed, and my long services entitled me to a claim upon them; but it appearing by their Lordships letter of the 27th of December, 1837, that the door of promotion is for ever shut against me, and that I must remain the remainder of my life the Junior Officer of my class as far as pay is concerned; I most humbly implore you to urge my claims in favour of my son, Mr. Fred. Wm. Leopd. Thomas; he has served thirteen years in the *Investigator* and *Mastiff* under my command, the latter four years as Assistant-Surveyor, and has passed examination for a Lieutenant in Her Majesty's Navy five years.

I have the honour to be, Sir,
Your very humble Servant,
GEO. THOMAS, Master Commanding.

In April, 1845, he obtained the command of the *Woodlark*, tender to the *Mastiff*, for the survey of the Orkney Islands, and from October, 1848, to the close of his surveying career on the coast of Scotland, more especially in the Firth of Forth.

Receiving the surveying promotion to Commander's rank January, 1860, Captain Thomas retired with the latter rank in April, 1864, and still survives.

Captain Thomas wrote:—

Sailing Directions for the Orkneys; in North Sea Pilot, Part I. 8vo. 1857.
Sailing Directions for the Firth of Forth; in North Sea Pilot, Part II. 8vo. 1857.
Notice of Beehive houses in Harris and Lewis; and traditions of the Each-Usige, or Waterhorse, connected therewith. 4to. 1860.

The following charts are from his surveys:—

Eyemouth to the Tay, including Firth of Forth.	Queensferry to Stirling.
St. Abbs Head to Edinburgh.	The Orkneys.
Fisherrow to Queensferry.	Pierowall Road.

CAPTAIN SIR GEORGE BIDDLECOMBE, R.N., KNT.

1845-60.

George Biddlecombe was born in Nov., 1807, and first went to sea in the merchant service. In 1824 he joined the *Vigilant* cutter, Lieut. Colthurst; and, in 1825, the *Boadicea*, in the East Indies. He left the Navy soon afterwards, and, becoming second officer of an East India transport, took part in the war in Ava. He passed for Second-Master, on board the *Victory*, in 1828, and, in 1831, received an appointment to the *Ætina*, surveying vessel, Capt. Edw. Belcher and Wm. Geo. Skyring. Joining in Nov., 1833, the *Blonde*, Commodore Mason, in the West Indies, he thence proceeded to the Pacific. In April, 1835, he was promoted to the rank of Master. He was employed—from Jan., 1836, until March, 1838, in the *Actæon*, Capt. Lord Edw. Russell, on the south-east coast of America and in the Pacific—from March, 1838, until April, 1842, in the *Talbot*, Capt. H. J. Codrington

and R. F. Stopford, in the Mediterranean—from Aug., 1842, until Jan., 1845, in the *Imaum*, receiving-ship at Jamaica—from April until July, 1846, in the *Trafalgar*, Capt. J. N. Nott, stationed at the Nore as flagship, and attached next to an experimental squadron—from July, 1846, until April, 1849, in the *St. Vincent*, in which ship he cruised under the broad pendant of Sir F. A. Collier, served at Portsmouth under the flag of Sir Chas. Ogle—from April, 1849, until Dec., 1850, in the *Victoria and Albert* yacht, Commodore Lord Adolphus FitzClarence—from Feb., 1851, until Feb., 1854, in the *St. George*, bearing the broad pendants of Commodores Lord John Hay and Michl. Seymour, at Devonport—from Feb. until March, 1854, in the *Royal William*, also bearing the broad pendant of Commodore Seymour, at Devonport—and, from March until Dec. in the same year, in the *Duke of Wellington*, as Master of the Baltic Fleet, under Sir Charles Napier. In the *Actæon*, in which he served, Mr. Biddlecombe surveyed a group of islands discovered by her in the Pacific. While attached to the *Talbot* he surveyed numerous anchorages on the Ionian station, in the Archipelago, and up the Dardanelles and Bosphorus; examined the south shore of the Black Sea as far as Trebizond, as well as the port of Varna; and prepared a survey, published by the Admiralty, of the bay and banks of Acre, previous to the bombardment of that place, at which he was present. The skill and diligence he displayed also in surveying the Skerki shoals, where he discovered many unknown patches, procured him the approval of their Lordships. For these services he received a gratifying certificate from Sir Fras. Beaufort, the Hydrographer of the Admiralty. At Jamaica, where he was Master of the *Imaum*, he constructed a chart of the entrances to Port Royal and Kingston. For his surveying performances he received the thanks of the Common Council of Kingston; also an address, signed by the principal merchants of that place, accompanied by a chronometer, “as a token of their gratitude;” and from the Admiralty the sum of £40. He surveyed the coast in the vicinity of Morant Point light-house, and completing a drawing thereof, which was lithographed. His survey of Port Royal and Kingston Harbours, with directions, were forwarded to the Admiralty; he also submitted a code of pilot-laws for the consideration of the legislature of Jamaica, portions of which were adopted. On proceeding to Lisbon, he was employed in effecting a survey of the Tagus. As Master of the Baltic Fleet, Mr. Biddlecombe reconnoitred the southern parts of the Aland Islands, Hango Bay, Baro Sund, and the anchorage of Sweaborg, preparatory to taking the fleet to those places. The remarks he drew up were forwarded to the Admiralty, as was a survey which he made of Baro Sund. He proceeded with the allied fleets to Cronstadt, the outer anchorage of which he reconnoitred in H.M.S. *Driver*; and taking charge, in Led Sund, of the *Prince* st. with upwards of 2,000 French troops on board, he carried that ship to Bomarsund. There he joined the *Bulldog*, and was employed with several Masters in sounding and buoying the shoals near the fortress. He subsequently made a survey of Led Sund, which was forwarded to the Admiralty.

After holding the post of Queen’s Harbour Master, Assistant-Master Attendant, and Master Attendant at the Home Ports, Captain Biddlecombe retired with that rank from the Staff Captain’s list, and somewhat late in life received the honour of Knighthood. He died rather suddenly about the year 1879.

Besides the undermentioned works he published “An Autobiography of his life and services.”

Art of Rigging with Tables of the relative strength of chain and hemp cables. 8vo. 1848.

Directions for making and entering the Tagus. 8vo. 1848.

Concise Remarks on the English Channel. 1860.

Naval Tactics and Trials of Sailing with the established plan of Lights for Steam Vessels, and

Regulations to avoid Collision. 4to. 1850.

Steam Fleet Tactics. Trials of Sailing with Diagrams of the several Evolutions. 4to. 1857.

Practical Remarks on Steam Vessels. 4to.

Changes in the Royal Navy during the last half century. 8vo. 1872.

The present Admiralty Chart of Keith Reef, Skerki Patches, and Talbot Shoal is from Biddlecombe’s survey of 1841.

LIEUTENANT DAVID M. GORDON, R.N.

1845-48.

The above officer, after serving seven years as midshipman and mate, left England in 1842, in H.M.S. *Wolf*, to join the *Agincourt* as gunnery lieutenant, under the flag of Rear-Admiral Sir Thomas Cochrane, by whom he was appointed Assistant-Surveyor to Captain Collinson, in H.M. brig *Plover*, and with the latter officer employed surveying on the coast of China, northward of Hong Kong. In 1845, he was made a Lieutenant, and on the departure of the *Plover* for England, the command of the surveying schooner *Young Hebe* having been declined by Lieutenant Bate, Gordon was recommended and appointed, and afterwards fully engaged in making surveys of the islands and channels, in the neighbourhood of Hong Kong. He was then appointed to the *Royalist*, in which vessel he surveyed the west coast of Formosa, during the north-east monsoon, in the course of which survey the *Royalist* was battered down for six weeks. He then continued for those unfinished portions of the north and west coasts of Borneo, which had been omitted by Sir Edward Belcher, in the *Samarang*. In completing the surveys of the rivers from Sambas to Labuan, his health suffered considerably. The *Royalist* was ordered to Singapore to recruit her crew, and on her way, was dismasted, and narrowly escaped destruction. Reaching Labuan under jury masts, she was towed to Singapore by the colonial steam vessel *Auckland*. Here, remittent fever seized Lieutenant Gordon, and in a few days prostrated its victim; he died December 2nd, 1848, aged 29. Gordon was noted for possessing a kind, amiable, upright disposition. The governor and civil and military authorities, with the greater portion of the mercantile community, followed his remains to the grave.

The *Nautical Magazine* of this period thus alludes to the death of Lieutenant Gordon:—
 "In the death of Lieutenant Gordon the Hydrographical department has lost an energetic, persevering and talented officer, who fell a victim to over-attention to the duties of his situation, and engaging in toils, far in excess of his physical strength; toils, which undermined a naturally robust constitution, and hurried to the grave one whose mind was so engrossed in completing the surveys he had undertaken as to forget the demands of health and the relaxation indispensable to the human frame under a tropical sun."

After Lieutenant Gordon's death, Commander Thornton Bate was appointed from England to the command of the *Royalist*, and continuation of the China Sea survey.

The Admiralty charts published from Lieutenant Gordon's surveys were—

Tamsui Harbour.
 South Natuna Islands.
 Royalist Haven.
 Cape Sirik to Tatan Point.

Tatan Point to Barram Point.
 Barram Point to Nosong Point.
 Nosong Point to Ambong Bay.

COMMANDER BIRD ALLEN, R.N.

1841.

This officer spent the greater part of his career in the surveying service in the West Indies, where for some years he held the position of First Lieutenant of the *Thunder*.

Volume X. of the Journal of the Royal Geographical Society contains a paper compiled by Bird Allen, from notes of Captain Richard Owen and the officers of the *Thunder* and *Lark*, on the eastern coast of Central America.

"The survey was prosecuted from Cape Catoche, the north-east point of Yucatan, in latitude 21° 31' N., in a southerly direction along the eastern shore of that peninsula, including the shores of Spanish Yucatan, and the British settlement of Honduras, then in an easterly direction 350 miles to Cape Gracia à Dios, comprising part of the coast of Guatemala and Mosquito.

"Again to the south, the survey extended for 250 miles, to latitude $10^{\circ} 47' N.$, longitude $83^{\circ} 37' W.$, being the remainder of the coast of Mosquito, and 45 miles of the coast of Nicaragua."

Commander Bird Allen observes, "The most remarkable geographical feature of this coast is the chain of coral reefs and small islets at an average distance of 15 miles from the main land of Belize, with a clear navigable passage within them, from four to eight miles wide. Within this natural breakwater, ships and boats navigate in all weathers, night and day. Its sea border is a perpendicular coral wall of great depth."

In 1840, Commander Bird Allen was chosen for the command of one of the three vessels (the *Soudan*) forming the ill-fated Niger expedition, under Captain Trotter. He fell a victim to the climate during that expedition in the year 1841.

J. G. C. CURTIS (GODSMAN).

1845-61.

John George Cockburn Curtis, afterwards known as Godsmán, was born on April 6th, 1817. When five years old he accompanied his father, an officer in the Royal Navy, on a voyage to India. He remained about two years at Madras, and then returned to England, and was educated at the Royal Naval School at Greenwich.

At the age of thirteen he entered the Royal Navy as a volunteer of the first class, and sailed to Mauritius in H.M.S. *Talbot*, whence he returned in about three years. At the age of seventeen, having applied for a surveying vessel, he was appointed to H.M.S. *Sulphur* as Midshipman, and the principal part of the ten subsequent years was spent by him at sea.

Upon his return to England, having quitted the Royal Navy, he was, in conjunction with Captain Wolfe and Lieutenant Beechy, directed by the Admiralty to make a survey of the Cove of Cork. Upon the completion of this survey he entered the Hydrographer's office. In 1845, he was selected by the Admiralty for the discharge of important duties in connection with the Tidal Harbours Commission.

From 1846 to 1849, he was employed by the local authorities as well as by the Admiralty to conduct investigations upon the tidal phenomena of the Mersey, Nene, and Dee. In May, 1849, he surveyed the lower portion of the river Nene, in connection with the Admiralty inquiry into the Norfolk Estuary Bill of that year; and in April, 1850, he reported to the Admiralty on the proposed Hartlepool West Harbour and Docks.

In 1852 he was at New York engaged in the Croton Aqueduct department. He then went to Spain, and for a considerable time worked under the Spanish Government in the irrigation of the "Patrimonia Reale." In 1861, as Admiralty Inspector, he held an inquiry on the proposed Nene Valley Drainage and Navigation Works.

In 1864, he went to Turkey, and was employed on the Smyrna and Casaba Railway. His last work was in 1868, when he was requested to report upon the utilisation of the fresh-water supply of the Thorney river, a tributary to the Nene.

In 1877 he had a slight attack of paralysis, from which, however, he quickly recovered. On December 4th, 1879, he was stricken with apoplexy in Westminster, and died on the following day.

As a member of the Institute of Civil Engineers, he was known for the greater part of his life as Mr. John George Cockburn Curtis, the name of Godsmán having been assumed by him only in recent years.

The following works were by the above surveyor:—

Tables for correcting Lunar Distances; with Rules for finding the Errors and Rates of Chronometers.
8vo. 1836.

Report on the Norwich and Yarmouth Navigation. 4to. 1846.

CAPTAIN A. G. EDYE, R.N.

1845-63.

This officer entered the Navy 29th May, 1829, under the auspices of Vice-Admiral Sir Pulteney Malcolm, as First Class Volunteer on board the *Wellesley*, Captain Maitland, one of the squadron stationed off the Dardanelles, during the temporary misunderstanding between England and Russia.

Towards the close of the same year, several of his sketches having attracted the attention of Sir Pulteney, he was appointed to the *Mastiff*, under Captain Richard Copeland, and was for six years employed in that vessel, and as midshipman in the *Meteor* or *Beacon*, in surveying the Grecian Archipelago.

The task of surveying the Spalmadore Islands, at the entrance to the gulf of Smyrna, and the island of Mityleni were entrusted to him. During this servitude, he assisted in the destruction of seven piratical vessels at Thasos Island.

On his return to England in the spring of 1836, having passed his examination in June, 1835, he was appointed Flag-Mate to the *Britannia* 120, flag-ship of Sir William Durham at Portsmouth.

In July, 1837, on the invitation of Captain Beechey, he was appointed Chief Surveying Assistant to that officer, in the important survey of the Irish channel. On this survey Mr. Ede continued to be employed in the *African* and *Lucifer* steamers until 4th November, 1843.

In December, 1844, he joined the *Caledonia* at Plymouth, and was sent to fill a temporary vacancy on board the *Flying Fish*, one of an experimental squadron of brigs cruising in the channel.

In April, 1845, he was appointed to the *Tartarus* steamer, Captain James Wolfe, for the survey of the west coast of Ireland.

Until April, 1857, Commander Ede, who was made a Commander 1st January, 1856, conducted that work in conjunction with Captain R. B. Beechey. He then, in consequence of that officer's promotion, took charge of the survey of the coast of Kerry.

He became a retired Captain 30th March, 1863, and is still alive.

Commander Ede is the inventor of a clinometer, for registering the transverse and longitudinal motions of a vessel, for which he received the silver medal of the Society of Arts, and for improvements in the same instrument, that of the Mechanics' Institute of Devonport.

Apart from the surveys carried on conjointly with Captain Beechey, the following charts are from Captain Ede's surveys:—

Blasket Sound and Islands, with plan of Smerwick Harbour.

CAPTAIN F. ROBINSON, R.N.

Frederick Robinson joined the Navy in the year 1824, and from December, 1827, to 1829, served as a Midshipman of the *Chanticleer*, under Commander Henry Foster, which vessel was specially commissioned for pendulum and other scientific observations on the coast of South America. (See Part I., page 122).

From the *Chanticleer*, bearing with him an excellent certificate from the Commander, Robinson was transferred to the *Eden*, under Capt. W. F. W. Owen, by whom he was recommended to Captain Beaufort for further employment in the surveying service.

In October, 1831, he was appointed to the *Etna*, under Commander Belcher, with whom he sailed on surveying duty to the east coast of Africa, Portugal, &c.

After leaving the *Etna*, and having had a short training in the *Excellent*, Robinson next joined the *Charybdis*, under Lieutenant Mercer; this was in December, 1833. He continued

in this vessel until 1835, when he was appointed to the *Comet*, Captain G. A. Frazer, engaged in the survey of the coast of Ireland.

His next appointments were to the *Penelope*, on the west coast of Africa, and then to the *Bonetta*, Commander T. S. Brock, in the Mediterranean.

He returned to England as First Lieutenant of the *Bonetta*, and subsequently served in the *Investigator*, discovery ship, under Captain E. J. Bird, in the Arctic Regions.

STAFF-COMMANDER T. BOURCHIER, R.N.

1849-64.

This officer entered the surveying service of the Royal Navy in April, 1842, under Captain Washington, with whom he continued until 1845. He then proceeded in the *Herald*, commanded by Captain Henry Kellett, to the west coast of North America.

From July, 1849, to June, 1852, he served under Captain Thomas Moore in the Arctic Regions, and again from the 3rd of January, 1853, to the 24th December, 1856, he was employed as Acting Master of the *Rattlesnake*, Captain Henry Trollope, on particular service, chiefly connected with the Arctic.

In May, 1856, the Admiralty appointed him to the west coast of Scotland survey, where, in the *Speedwell*, under Commander E. J. Bedford, he served until August, 1860.

On the formation of the Australian colonial surveys he was selected to accompany Commander H. L. Cox as Chief Assistant for the coasts of Victoria, and continued in that capacity until about the year 1866.

VICE-ADMIRAL JOHN ORLEBAR.

1845-64.

Born in 1810, this officer entered the Navy March, 1824; passed his examination in 1831; obtained his first commission Sept., 1832; and from May, 1833, until the close of 1835, was employed in North America and the West Indies on board the *Larne* and *Forle*.

He was promoted to the rank of Lieutenant in September, 1835, and became an Assistant Surveyor, under Captain Bayfield, on the survey of the Gulf and River St. Lawrence in 1836. Obtaining his Commander's commission in February, 1845, Commander Orlebar continued as an Assistant Surveyor on the same station until January 1st, 1857, when he assumed charge of the Newfoundland survey.

His date as a Post-Captain is 1st January, 1861, and as a Rear-Admiral on the retired list August, 1877, and Vice-Admiral May, 1882.

In 1864, Captain Orlebar retired from active surveying service, after 30 years continuous employment.

In 1860, at Charlotte Town, Nova Scotia, Captain Orlebar gave a lecture on "The late Royal Visit, and its probable consequences upon the future of the British North American colonies," afterwards published in *12mo*.

The following Admiralty charts are published from his surveys:—

Newfoundland.

Cape Bonavista to Bay Bulls.
Catalina Harbour.
Trinity Harbour and Bays to English Head.
Heart's Content, and New and Old Pelican Harbours.
St. John's Harbour.
Bay Bulls to Placentia.
Broyle Harbour to Renewse Harbour.
Barin and St. Lawrence Harbours.

Knife Bay to Cape Anguille.

La Poile Bay.

Duck Island to Ship Rock Shoal, including Port Basque.

St. George Harbour and Codroy Road.

Nova Scotia.

Sambro Island to Cape Canso.

Beaver Harbour.

Nicomtau Bay.

COMMANDER S. MERCER, R.N.

1838.

Samuel Mercer entered the Navy Jan., 1822, as Midshipman, on board the *Leven*, Capt. Wm. Fitzwilliam Owen, in which vessel, until Sept., 1826, he was employed in surveying the east and west coasts of Africa.

In Feb., 1827, after he had been for about two months attached to the *Challenger*, on the Home station, he again joined Capt. Owen on board the *Eden*. Continuing with him until June, 1830, he was in consequence afforded an opportunity of assisting in the colonization of Fernando Po, and had the satisfaction during the period of being awarded a Lieutenant's commission, dated 12th Jan., 1829.

His next appointments were—June, 1831, to the *Blossom*, Capt. Rich. Owen, employed on surveying service in the West Indies, where he remained, part of the time in command of the *Monkey* tender, until Oct., 1832—and 11th Jan., 1834, to the command of the *Charybdis* brig. While in that vessel, which he paid off in Sept., 1837, Lieut. Mercer was again stationed on the African coast, and succeeded in capturing fourteen slave vessels. Attaining Commander's rank June, 1838, he officiated, from Aug., 1841, until Aug., 1846, as Superintendent of the Packet Service at Dover, with his name on the books of the *Ocean* guard-ship at Sheerness.

Commander Mercer did not again serve in the surveying service.

LIEUTENANT H. G. VEITCH, R.N.

1847-57.

Henry Gordon Veitch entered the Navy Aug., 1828; passed his examination Dec., 1834.

From April, 1842, to February, 1844, he served as Mate of the *Slyx*, Captain Vidal employed in surveying the Azores or Western Islands.

In February, 1844, having been made a Lieutenant, he was re-appointed to the *Slyx*, and eventually paid off in that vessel in January, 1845.

From January to May, 1845, he was employed at the Hydrographic Office completing the charts of the Azores; and from the latter date to November he was attached to the *Shearwater*, Captain C. G. Robinson, employed on the survey of the Clyde and west coast of Scotland.

We next find him from June, 1847, to February, 1848, under Captain Sheringham, on the south coast of England, and subsequently under Commander Church, surveying the south-west coast of Ireland.

He continued on the books of H.M.S. *Fisgard* in 1857, for surveying service on the coasts of the United Kingdom, but does not appear to have attained a higher rank than that of Lieutenant.

CAPTAIN G. M. ALLDRIDGE, R.N.

1850-64.

George Manley Alldridge entered the Navy July, 1829, as Second Class Volunteer, on board the *Hyperion*, Capt. Mingaye. From May, 1830, he was continuously employed in the surveying department of the Navy; from that date until 1832 as First Class Volunteer in the *Meteor*, Capt. Copeland; from 1832 until Dec., 1840, as Midshipman and Mate in the *Beacon*, Capt. Copeland and Graves; from Dec., 1840, until Oct., 1849, as Mate and Assistant-Surveyor, and Lieutenant and Assistant-Surveyor in the *Lucifer*, *Firefly*, *Cambria*, *Water-*

sprite and *Jasper* steamers, all commanded by Capt. F. W. Beechey; and, from Oct., 1849, to 1864, as "Additional" Lieutenant and Commander of the *Fisgard*. During the period he belonged to the *Meteor*, Mr. Alldridge was employed in the survey of the Negropont. When in the *Beacon* he was engaged on the survey of the coasts of Thessaly and Roumelia. He was present at the *Beacon's* capture of seven piratical vessels and several Albanian pirates off the island of Thasos; he assisted in surveying the coast of Asia Minor, the coast of Caria, and the Island of Rhodes. In the *Lucifer* Alldridge was engaged in the "deep sea" survey of the Irish Channel, and in surveying Belfast Lough.

In command of a hired tender of 47 tons, he was sent to survey the banks off the Isle of Man, and to make tidal observations at various stations in the Irish Sea. He was subsequently employed in sounding and examining the nature of the bottom in Holyhead Bay for a harbour of refuge, under Mr. Rendal, C.E.

He also made plans, for law purposes, of Pennar Creek, quarries, &c. He discovered a dangerous rock off Thorn Island, Milford Haven; and in charge of a hired pilot-boat of 50 tons he surveyed the Aust Passage, Bristol Channel, with reference to a contemplated bridge across the River Severn.

Although with his name on the books of the *Fisgard*, Commander Alldridge, from May, 1850, commanded the *Asp* steamer, in which vessel he performed various important services.

He had charge of the survey of the River Dee and the approaches to Liverpool, and drew up a report on the weirs and waters of Appledore. He laid down the submarine telegraph between Holyhead and Dublin—the first communication of the kind between Great Britain and Ireland.

He conducted the survey of Milford Haven—of the port of Bridgewater and its approaches—of the coast of Wales, from St. Ann's Head to Stackpole Head—of the Cleddy, or Haverfordwest River—and of Barnstaple Bay, and the rivers Taw and Torridge. Commander Alldridge succeeded in rescuing, when on shore in Freshwater Bay, the *Owen Glendower*, a steamer, the owners of which presented him with a piece of plate and a purse of sovereigns. For his services to the Irish Electric Telegraph Company, he received the gift of 100 shares; and for saving the *Ocean Queen*, 635 tons, when in a sinking state, and towing her over the bar into Bideford; and for saving the *Louise*, of 442 tons, when on the rocks, under Braunton Lighthouse, and towing her likewise into Bideford, he was presented with £100 from Lloyds', and with a piece of plate from the owners. Commander Alldridge continued in charge of the Bristol Channel Survey until 1864.

In 1858, he surveyed Swansea Bay and coast westward, following this up by the survey in 1859, from Neath to Porthcawl and Scareweather Sands.

Porthcawl to Breaksea Point and other parts of the coast of Wales, including sounding off Holyhead in search of the Ethel Rock, the River Dee, Carmarthen Bar, and the rivers Taf and Towy were the latter day works of Captain Alldridge, who retired with that rank in April, 1864.

Since his retirement, Captain Alldridge has, we believe, re-sounded some of the mouths of the rivers formerly surveyed by him.

He served ten years on foreign and twenty-three years on Home Surveying Service.

The following were the principal charts published from the surveys of Captain Alldridge:—

Barnstaple and Bideford.
Bridgewater Port.
Kenfig River to Nash Point.
Swansea and Neath.
Pyl-du Head to Worms Head and Helwick Shoals.

Burry Inlet.
Tenby and Caldy Roads.
Milford Haven.
Cleddau River, from Pembroke Dockyard to Haverfordwest.

CAPTAIN SIR J. H. GLOVER, R.N., G.C.M.G.

1855-62.

This officer, the present governor of Newfoundland, received his early training in the surveying service of the Royal Navy.

He joined the Navy in December, 1841, and when belonging to the *Queen*, in the Mediterranean, Glover, with some six other volunteers of the first-class, was appointed to H.M. surveying vessel *Beacon*, Captain Thomas Graves; this was in May, 1842.

Promoted to Lieutenant's rank in October, 1851, he commanded the *Offer* paddle-wheel steam vessel, on the coast of England, from March, 1855, to about the year 1858.

His date as a Commander is 24th November, 1862, and as a retired Captain 24th November, 1877.

The Admiralty charts of the Kwara river, on the west coast of Africa, in nine sheets, are from a survey made by Lieut. Glover in 1859.

Of his more recent and important services in the Ashantee War, and on the Gold Coast, this is hardly the place for any description; but no doubt Sir John Glover would admit that he owes no small amount of his success in life to the early training received in H.M. Naval Surveying Service, under Captain Graves in the *Beacon*.

CAPTAIN FELIX JONES (late I.N.)

1843-54.

This well-known Indian surveyor appears to have first seen service as a Midshipman of the *Palinurus*, engaged in the northern portion of the Red Sea survey, under Commander Robert Moresby, which vessel sailed from Bombay on the 11th September, 1829. The charts of this north part of the Red Sea survey were executed by Felix Jones, then an Acting Lieutenant.

In a letter to the Hydrographer of the Admiralty, dated July 13th, 1870, Captain Jones states that "the Red Sea survey was carried on by a system of triangulation down either shore. The work was verified by frequent bases, by almost daily azimuths, by latitudes by the sun and stars observed on shore by artificial horizons, and by chronometric differences."

On the return of the *Palinurus* to Bombay, it was resolved by the Indian authorities that the south coast of Arabia should also be surveyed, the charge being entrusted to Commander Haines.

Felix Jones was next engaged in the Maldivé Islands, and in Ceylon, where he visited and fixed Adam's peak, and the Horton plains, descending the Kaltura river, of which he made a survey in company with Major-General Adams. These two pushed their way over the higher ranges by the elephant paths, there being then no constructed roads.

Subsequently, he was employed surveying in the gulf of Manar, and, in 1839, reported upon the harbour of Grane, or el-Kuweit.

In May, 1840, he joined Lieutenant C. D. Campbell in the Mesopotamian survey, commanding the *Nitocris*.

In September, 1841, leaving his vessel at Beles, Lieutenant Jones was sent across the Syrian Desert by Lieutenant Campbell, to Beyrout, where he communicated with the British fleet, whence he obtained stores. Having connected the river Euphrates and Mediterranean by chronometric measurements for longitude, Lieutenant Jones returned to Beles by another route through Northern Syria.* The measurements were made between the light station

* In October, 1841, Captain Lynch, after the time of Colonel Chesney, commenced the survey of the Euphrates river, in the steamers *Nitocris*, *Nimrod*, and *Assyria*. Captain Lynch retired from the survey in 1843, and was succeeded by Lieutenant Felix Jones. (Markham's memoir of the Indian Surveys, page 30).

below Beles with the Mediterranean at Sawediah and Alexandretta, and with the cities of Antioch and Aleppo. The chart shows the river at its lowest state, and is constructed on trigonometrical *data*, from a base line measured on the level plain between Beles and Jiaber.*

In April, 1842, Lieutenant Jones conducted the *Nilocris* down the river to the Persian Gulf, and in June, 1842, on the return of the various officers to Bombay, he remained in that vessel to protect British interests at Bagdad, and continue the survey of the country between the Tigris and Euphrates.

"The chief result of the Mesopotamian expedition was, that the Tigris was proved to be navigable all the year round as far as Bagdad, and during the freshes as far as Mosul for steamers of very light draught; but that the Euphrates was not navigable throughout its course at all periods of the year by vessels of the draught of these steamers."

From 1842 until 1846, Lieutenant Felix Jones remained in command on the river Tigris, and, as opportunities offered for travelling in the disturbed districts around, was engaged in collecting materials for a map comprising the territories and rivers between the Mediterranean, Kurdistan, Persia, and the Persian Gulf. This map he constructed in Bombay when employed on special duty in 1846-47.

In 1844, Lieutenant Jones, accompanied Sir Henry Rawlinson on a journey to collect information respecting the boundary between Persia and Turkey. The results were a memoir and map of a country but little known.†

The Tigris, from Bagdad to Samarra, was ascended by him in the *Nilocris* in 1846.

In May, 1847, Felix Jones returned to Mesopotamia as Surveyor, and with extended powers on obtaining his commission as Commander, on the 13th of September, 1847. In 1848, he undertook a journey to determine the course of the ancient Nêhrwân Canal, and to survey the once fertile region which it irrigated, now a desolate and almost impassable waste. His interesting memoir on the canal gives the history of the work from the days of its construction in the time of the Sassanian dynasty, and minutely describes its vast brick-work dams and sluices.

In April and September, 1850, Commander Jones surveyed the old bed of the Tigris, discovered the site of the ancient Opis, and made researches in the vicinity of the Median wall and Phycus of Xenophon. In 1852, he made a trigonometrical survey of the country between the Tigris and the Upper Zab, including the ruins of Nineveh. The results of this work are recorded in the beautiful maps of the "Assyrian Vestiges," in four sheets, and in a valuable memoir.

In 1853, Captain Felix Jones, assisted by a midshipman (now Lieut.) Collingwood, completed a map of Bagdad on a large scale, with a memoir on the province, and in 1854 he brought home his maps of Babylonia. They consisted of three sheets with a detailed memoir, and included the country from Museyb, north of Hillah, down to the north-west end of the Sea of Nejj.‡

In 1853, after twenty-five years service, he quitted Turkish Arabia on sick leave, traversing Asia Minor to Constantinople, whence he proceeded to London. About this time, Persia exhibiting hostile intentions towards Turkey and England, Captain Jones returned to Bagdad, where he was appointed Acting Political Agent and Consul General in Turkish Arabia.

In October, 1855, he succeeded Capt. Kemball as Political Agent in the Persian Gulf, and furnished Government with plans and itineraries for the invasion of a country but little known. For these he received a letter of thanks from Lord Canning. On the outbreak of war, twelve months later, Captain Jones was named Political Agent to the Persian expeditionary force.

* History of the Indian Navy, Vol. II., page 49.

† See Narrative of a Journey through parts of Persia and Kurdistan, undertaken by Commander J. F. Jones, I.N., in company with Major Rawlinson, Political Agent in Turkish Arabia.

‡ See page 31 of Markham's memoir of the Indian Surveys. Unfortunately the Babylonian maps were lost in the India House.

During the Indian Mutiny he again earned the repeated approval of Government for the manner in which he held in check the disposition of Persia and the Arab Maritime tribes of the Persian Gulf, the exposure necessitated in carrying out which service brought on fever, and he returned to England in June, 1862, on sick leave. Shortly afterwards he assisted in the necessary preliminaries respecting the Indo-European line of telegraph laid *viâ* the Persian Gulf. At the end of February, 1863, he visited Bombay, and offered his services to the Governor; but having completed 35 years service, the rules were against his retention in civil employment.

Captain Jones devoted the last years of his life in the cause of geography, and to the service of Government, and as recently as 1875 completed a map of Mesopotamia, in which his knowledge of that country and beautiful draughtsmanship are displayed.* He died the 3rd September, 1878, in Upper Norwood.

The memoirs and maps by Captain Felix Jones will be found in the Journal of the R.G. Society, Vol. XVIII., p. 1, and in Bombay Selections, No. 43 (new Series).

Also, he published "The Direct Highway to the East, considered as the perfection of Great Britain's Duties towards British India." 8vo. 1872.

LIEUT. H. H. WHITELOCK, I.N.

1837.

The first record of Lieutenant Whitelock's services is when he joined the *Discovery*, 268 tons, under Captain Guy, and subsequently Captain Brucks, for the Persian Gulf survey in 1820. This survey occupied from 1820 to 1830, and the charts produced were chiefly constructed by Lieutenant Houghton.

Lieutenant Whitelock wrote three papers in connection with this work. One a description of the islands at the entrance of the Persian Gulf, another an account of the Arabs on the pirate coast, and the third a narrative of a journey in 'Omân. The latter account is published in the Journal of the Royal Geographical Society, Vol. VIII., page 170.

In 1833, Lieutenant Whitelock, assisted by Mr. Felix Jones, commenced the survey of the west coast of Kattywar, which he completed as far as Diu Island, including Beyt harbour, when on the 26th October, 1836, he expired on board the *Discovery* surveying ship.

His survey of the western coast of Kattywar was afterwards taken up by Lieutenant Ethersey, who also completed the Gulf of Cambay.

The following charts were published from Lieut. Whitelock's survey:—

Coast of Kattywar, from Diu to Dwarka.
Diu Harbour.

CAPTAIN C. W. MONTRIOU, I.N.

1844-1856.

Captain Montriou, who served with distinction in the first Burmese War under Commodore Hayes, and as Indian Navy draughtsman for many years, died of cholera at Bombay on the 29th of April, 1856, only sixteen days after his promotion to the rank of Captain, on the retirement of Captain Lynch. "A man of extraordinary talents and abilities, beloved and admired by every one who knew him, he had served continuously for thirty-two years in the service of Government in India, and was considered a very superior officer. He had served in the first Rangoon War, and took a prominent part in many of the maritime surveys in the bay of Bengal. In 1839, he was sent to Bombay, and commanded the receiving ship *Hastings*, and was acting draughtsman as well for some years. In this position he became a great favourite with the late Sir Robert Oliver, and he was in such good favour with seamen that he had often from

* The map which remains in MS., consists of 4 sheets, 25 inches by 39 inches. The Directors of the Crystal Palace liberally placing an apartment in their edifice at his disposal for this work.

three to four hundred sailors in his ship, and by this means he made up the war complements of the ships and steamers equipped for the China War. He planned and wrote out the whole of the ordnance equipment required for the vessels of the Indian Navy, and was a general referee from the highest official quarters respecting professional matters afloat; but, strange to say, though he had a most wonderful memory, was highly read, and well informed upon almost every subject, yet he could never be induced to become an author. His love of reading and writing was great, and there were few men, however learned, that he could not cope with in scientific acquirements. His manner was retiring and unassuming, but at the same time he had a high and noble spirit, and was most warm-hearted and generous."

In March, 1844, Lieutenant Montriou* was appointed to the command of the *Taptee*, I.N. brig, "for the purpose of surveying the Rajapoor Creek and other inlets on the coast of the South Konkan." We find him transferred from the 10th of June following, to the temporary charge of the Indian Navy Draughtsman's office at Bombay, in place of Commander Boulderson, but he soon after returned to the Malabar coast. Again he was Acting Draughtsman from the 25th of July, 1845, when Commander Boulderson temporarily held the office of Assistant-Superintendent, during Sir Robert Oliver's absence, but, on the 22nd of October following, he again sailed in the *Taptee*, his Assistant-Surveyor being Midshipman A. D. Taylor, with the object, as appears in his instructions, "of prosecuting the survey of the west coast as far south as the Beypore River, and particularly to ascertain the capability of the different rivers and creeks to be used as harbours of refuge for ships in distress or in time of war." This latter eventuality had reference to an apprehended outbreak of hostilities with the United States, the Company's steam frigates being armed with additional heavy guns. Lieutenant Montriou finally returned to Bombay on the 28th May, 1846, with several surveys and an extensive series of topographical, meteorological, and tidal observations. He was assisted in his work by Midshipmen Whish, Nixon, Lamb, and Dickson; but found his chief helper in Midshipman Taylor, who gave early promise of becoming one of the most accomplished surveyors produced by the Indian Navy. On his return to Bombay, Lieut Montriou resumed charge of the Draughtman's Office, which had been temporarily held by Lieutenant H. H. Hewett, on his return from China, in the *Medusa*, early in the year.

From 1847 to 1851, Commander Montriou was in charge of the Observatory, and subsequently Government appointed him Senior Naval Officer at Aden. Here he, on several occasions, distinguished himself in the boat attacks on the Arabs, and in co-operating with the Resident for the welfare of the port; he was constantly consulted by the Resident in political matters, on account of his tact, learning, and experience.

"But at Aden, private misfortunes and family bereavements told heavily upon his constitution, and, after a long and distressing illness, he was burnt out of house and home, and he and his wife and child were left utterly destitute of everything, except the clothes they had on when rescued from the flames. On this occasion he lost property to the amount of 26,000 rupees. He therefore had to begin life anew, and, on his return to Bombay, was given the command of the *Queen*† and then of the *Punjaub*, and in 1855 was nominated Master Attendant and Captain of the port. His losses so embarrassed his affairs that he was unable to visit England for the recovery of his health. His whole career had been one of usefulness and honourable distinction, and we believe he also drew up the Report for the Committee of the House of Commons, respecting the surveys of the East India Company."

* Low's History of the Indian Navy, pages 215 and 313.

† The following instance of the devotion to duty which distinguished Captain Montriou, is given by Lieut. Carew, at this time one of the officers of the *Queen*. He says—"We were steaming down the river Hooghly, bound to Bombay, when we struck on that most dangerous bank, the James and Mary. The tide was rapidly falling, and no time was lost in laying a bower anchor out in mid-stream, and shifting all the guns to windward, where they were well secured; meantime the boats were lowered. Our vessel, whose keel adhered to the mud of the steep bank, was heeling over fast, when Captain Montriou, in answer to something said by the pilot, replied, 'No, the ship may leave us, as *that* we cannot help, but we won't leave her while she floats, so we will go to quarters.' We remained at quarters watching the vessel gradually healing over till the guns hung from their breechings and side-tackles, when she suddenly cut her keel out of the mud, and started off into deep water until her anchor brought her up. The pilot said it was the first vessel he had known to be saved when once in the position we were. It was the heavy guns shifted to windward that saved her."

Sir Henry Leeke, the Commander-in-Chief of the Indian Navy, paid the following tribute to the deceased officer:—"It is with sincere and very deep regret the Commander-in-Chief has to announce to the Service the demise of Commander Charles William Montrieu, Master-Attendant, whose melancholy death took place this morning at ten o'clock, at his residence in Colaba. In making this sad event known, the Commander-in-Chief cannot resist expressing the mournful gratification he feels at being able to bear testimony to the truly upright and honourable career of Commander Montrieu, during the many years he has served in the Indian Navy. In all his duties he was strictly correct, and ever anxious to perform them with a degree of integrity and zeal seldom surpassed, and his loss will be felt by all who have had the pleasure of serving with or knowing him. The Commander-in-Chief desires that Captains and Commanding Officers will cause as many of the officers and seamen of the ships in port as can be spared, and all officers of the dockyard establishment, to attend at the Colaba Church, at a quarter-past five o'clock this evening, to follow his remains to the grave, and pay the last melancholy tribute to one who was so justly esteemed and beloved in the Service."

Captain Montrieu made a series of valuable tidal observations at Bombay during the years 1846-47-48, and he then remarked that the law of those tides had been found to differ materially from that which had at that time been determined relative to the tides in Europe. For some time Lieut. Dundas Taylor served as Montrieu's assistant.

The following charts were published from the surveys of Captain Montrieu:—

Soonmieanee Harbour.
Sketch of Anchorage, Rutnaghiri.
Bay and Entrance to Rajapoor River.

Viziadroog Harbour.
Dewghur Harbour.
Calicut Roads and Entrance to Beypore River.



REAR-ADMIRAL JOHN WASHINGTON.

Hydrographer, 1855 to 1863.

CHAPTER II.

Smith, Sanders, Selby, Grieve, E. K. Calver, Pullen, Aird, Hoskyn, Jeffery, Richards, Sidney, Skead, Usborne, Scott Taylor, Burstal, Cudlip, A. D. Taylor, Constable, Creyke, Ward, Heathcote, Stanton, Bewsher, Sweny, Fell.

John Washington, born in 1800, entered the Navy as a First Class Volunteer in 1812, on board the frigate *Juno*, of 46 guns, employed on the North American station, and took part in numerous operations in the River Chesapeake, assisting in making prizes of several of the enemies vessels; that vessel amongst other services completely discomfiting fifteen gunboats which had been despatched for the express purpose of her capture. As a Midshipman, Washington then sailed in the *Sybil*, which, with the *Princess Caroline*, made a fruitless search for the American Commodore, Rodgers. In this voyage he acquired much scientific knowledge under the Master of the vessel (afterwards Sir W. Bain), in making astronomical and magnetical observations. Returning to England, and having passed through the Royal Naval College, where he obtained the prize gold medal in 1816, he again left for the North American station in the *Forth*; continuing in which vessel to the Pacific, he nearly lost his life by a man falling from aloft, and knocking him into the sea, from which he was only rescued by extraordinary efforts.

In 1819 and 1820, as a passed Midshipman, we find him in the *Vengeur* and *Superb*, in the South American station, where he was made a Lieutenant January 1st, 1821. On promotion, obtaining permission to return to England by his own route, he disembarked at Valparaiso, crossed the Andes to Mendoza, riding across the Pampas to Buenos Ayres.

He was then employed in 1823, as First Lieutenant of the *Parthan*, in the West Indies, and on particular service. After about two years spent upon half-pay, during which he travelled in France, Spain, and Italy, improving his powers as a linguist, he sailed, in 1827, as First Lieutenant of the brig *Weazle*, for the Mediterranean, where he was transferred to the frigate *Dartmouth*; and while on this service, in company with Consul-General Drummond Hay, explored the interior of Marocco, making astronomical observations on his route, and fixing the true position of places hitherto undetermined. A paper containing these observations was published in the first volume of the Journal of the Royal Geographical Society. Appointed as Flag Lieutenant to the *Royal George*, bearing the Commander-in-Chief's flag at the Nore, 6th August, 1830, he continued under Sir John Beresford in a like capacity in the *Ocean*, until promoted to Commander's rank in 1833.

In 1836, Commander Washington succeeded Commander Maconochie as Secretary of the Royal Geographical Society, editing the various publications of the society, assisted only by a single clerk, for a period of five years.

In March, 1841, he received his first surveying appointment to the *Shearwater*, succeeding Captain Hewitt, of the *Fairy*, which had been lost in the North Sea survey. He became a Post Captain in 1842, out of compliment, it was said, to the King of Prussia, whom he conveyed to England in the *Black Eagle*.

In 1843, he obtained command of the steam vessel *Blazer*, and in her was continuously employed in surveying the east coast of England, and parts of the North Sea, until 1847.

Having rendered himself eminent in the interesting branch of the service he had now adopted, by Sir Francis Beaufort's nomination, he, in 1845, was appointed a Commissioner for inquiring into the state of the rivers, shores, and harbours, of the United Kingdom. He was afterwards for a short time employed in what was entitled the Railway and Harbour Department of the Admiralty, and prior to the outbreak of war with Russia, in 1853, was specially instructed by Sir James Graham, through Sir Francis Beaufort, to take advantage of a visit he was about to make to Denmark, Sweden, and Russia, relative to the establishment of an improved form of lifeboat, to obtain all possible information respecting the Baltic fleet, and the then state and condition of the defences at Kronstadt, Revel, and Bomarsund.

Such duties in these days would be assigned to a Naval Attaché, but fortunately in Capt. Washington the Navy possessed an energetic Nautical Surveyor, as well as a linguist and keen observer, quite equal to whatever military might be required of him. His report was exhaustively complete, and the following may be taken as a specimen of its thoroughness:—

"On my voyage home I had the good fortune to meet the Revel division of the Baltic fleet at sea. They were sailing in two lines abreast, in close order, at about two cables length apart; it consisted of one three-decker (the *Russia*, 120 guns), six two-deckers, and three large frigates. We passed close to them, and had a good sight of all the ships; they appeared to sail very unequally; the three-decker had all sail set before a fine fresh westerly wind, while some of the two-deckers had their topsails on the cap. They appeared to be running for Revel. I have thus seen every ship in the Baltic fleet, and been enabled to count every gun that can be brought to bear on an enemies ship, at Kronstadt, Sweaborg, Revel, or Bomarsund."

Owing in a measure to this report, and the health of Sir Francis Beaufort failing, the Board decided, war with Russia having broken out, to offer the Hydrographership to Captain John Washington.

Under Sir Francis Beaufort the Hydrographic Department had grown to an enormous extent. Sir Francis Beaufort had been hydrographer for twenty-six years, and was nearly eighty years of age. Somewhat reluctantly, therefore, he was induced to resign in Captain Washington's favour, who had been assisting him in his manifold duties since the commencement of the Russian war. It was said that Sir Francis had always the highest opinion of his successor's powers, and had stated that, in the numerous reports and inquiries on which Captain Washington had been employed, he was inclined, if anything, to overmuch trouble and minuteness of detail.

The year 1854 found Captain Washington full of enthusiasm and energy, possessed of the goodwill of all around him, the occupant of Sir Francis Beaufort's chair. His powers of perseverance and personal industry found ample scope at the Admiralty, and in his own department especially, he was considered highly successful. He pushed forward for publication all information that had accumulated, and thereby greatly increased the circulation of British Admiralty charts. Amongst some of the leading officers in charge of surveys abroad, however, Captain Washington's appointment did not earn quite so much popularity as might have been expected. A few of these out of loyalty to Sir Francis Beaufort clung to the belief that no other could ever approach him as the head of what, from insignificance, had now become a flourishing and weighty department of the Admiralty.

He was induced to take a sincere interest in the Navigating officers, at that time known as Masters, R.N. He endeavoured to assist those who had assisted him in his labours afloat, and who were now, in the majority of instances, similarly assisting him as Hydrographer, at the Admiralty, on shore. He made a great effort in the teeth of what some considered his own interests, to abolish the Masters as a separate class, and place them on a *par* with those of their standing upon the executive lists. This recommendation, which he endeavoured to create into a reality, as member of a committee which sat upon the subject in February, 1862, though intended in the best interests of the surveying service, made Captain Washington's name far from popular with the more conservative members of that committee. Taking failure to heart, he importuned, and at times harrassed concerning other seeming anomalies, respecting the Hydrographic Department; not contenting himself with representation in the form of written submissions, but by personal interviews, oftentimes considered inconvenient.

The strong hand of Sir Francis Beaufort, with surveyors afloat, in some instances was missed. He who in his capacity as Hydrographer could afford to write thus, to so eminent a naval surveying personage as Sir Edward Belcher, when that officer had slightly exceeded his instructions by intermixing diplomacy with the surveying work for which he was appointed :

"Your last letter of 1845, is really all Hebrew to me, ransoms and dollars—queens—treaties and negotiations. What have I to do with these awful things? they far transcend my limited chart-making faculties, however well-suited they may be to Admiralty Lords, to Commanders-in-Chief, to Governors of Colonies, and to *you*; and with them, my good friend, you must arrange your diplomatic enterprises, and to them you must look for applause. Fortunately the Board have not asked for opinions, which I beg leave to reserve for affairs of soundings, angles, and other humble things of that kind. That you may have been doing good service to the country I will not deny, but the harvest I look for at your hands does not stretch beyond the reach of a deep sea line; and all the credit I crave for you, and through you, for myself, must be won in the kingdoms of science, and reaped in hydrographic fields."

It has been said, that Captains and Commanders entrusted with the charge of surveys, on arrival in England, found matters Hydrographic carried out on more cosmopolitan lines than heretofore. The presence of the Hydrographer was not so easily gained as in Sir Francis Beaufort's day. Small hired vessels and crews came more than ever into use for surveys at home and for colonial surveys; economy being urged as the cause, and this not without reason.

So matters continued, until in 1863, occurred the loss of H.M.S. *Orpheus*, under Commodore Burnett, on the bar of the Manukau river, New Zealand. Indirect blame for the ill-advised course pursued in the navigation of the *Orpheus*, for a time appeared to attach itself to the Hydrographic Department of the Admiralty.

The question hinged upon whether or not certain Hydrographic information warning mariners as to the change in the bar at the entrance to the Manukau river had been duly supplied to the ill-fated *Orpheus*. Questions were asked in Parliament. Captain Washington sifted and enquired into the matter to the satisfaction of all unprejudiced minds, and it was found that the *Orpheus* had been officially supplied with the notification usually given on such occasions to the effect, "that the marks on the chart were not to be relied on," and that those entrusted with the navigation of the *Orpheus*, had the best information that could be officially given.

Thus the matter was thought to have ended. In December, 1847, when the steam vessel *Avenger* was lost with all hands but four, on the Sorelli rocks, near Tunis, on the north-coast of Africa, a similar charge was laid to the door of the Hydrographic Department of the Admiralty. The *Avenger* should have been supplied at Gibraltar with certain information. Did she receive it? The members of the court which tried Lieutenant Rooke and the three surviving men for the loss of that ship, held at Malta in January, 1848, stated that they had considerable doubt if the vessel had the Admiralty charts of the Mediterranean on board. Fortunately for the Hydrographic Office, the receipt given by Captain Napier, to the Captain in charge at Gibraltar, for the charts in question, was forthcoming.

The idea of the *Orpheus* catastrophe being caused, or even aided in the slightest degree by the alleged short-comings of his Department, worked upon Admiral Washington's already over-wrought nervous disposition. He became seriously ill and left England for Havre, where the return of his second son from the China station re-animated him for a time; but on the sudden appointment of that son to the Pacific station, Admiral Washington hastened to London to endeavour to intercede with the authorities, and get the appointment cancelled; failing in this, his despondency and ill-health increased, and after a short visit to Switzerland, he returned to Havre to die in the sixty-third year of his age. High honours were paid to his remains by all the authorities, and the inhabitants of Havre, on the occasion of his interment.

Thus, in 1863, died Rear-Admiral Washington, in a great measure the victim of over-work and self-inflicted mental strain and torture, so often with the conscientious official the wages of high place. Admiral Washington was one of those men of highly nervous temperaments and feeling hearts, who inevitably fall victims to their zeal and sensibility. He was a Fellow of the Royal Society, and of many scientific and philanthropic establishments. The important anonymous suggestion signed A. Z. (afterwards traced to him), addressed to the President and Council of the Royal Geographical Society, suggesting the Antarctic Expedition of Sir James Ross, was recorded in the bulletin of the French Geographical Society. His knowledge and acquirements made a deep impression in the mind of Baron Alexander von Humboldt, the chief adviser to the King of Russia, on the occasion of his visit to England. In 1850, he published an Esquimaux and English vocabulary for the use of those employed in an Arctic expedition. Thanks to his energy, Livingstone was furnished with a steam vessel for the ascent of the Zambesi, and he was untiring in support of Lady Franklin, through all her efforts on behalf of her missing husband.

Admiral Washington revised and enlarged the chapter devoted to Hydrography, in the Admiralty Manual of Scientific Inquiry for the second and third editions of that work; the original having been edited by Rear-Admiral Beechey.

The following were published from his pen:—

- Geographical Notice of the Empire of Morocco. *Royal Geo. Jour.* i. 123. 1831.
- Sketch of the Progress of Geography, and of the Labours of the Royal Geographical Society during the year 1836-7. *Royal Geo. Jour.* vii. 172. 1837.
- Report on the State of the Harbours and Rivers in Scotland: in Appendix C. to 2nd Report of Tidal Harbours Commission. 1846.
- Report on the Loss of Life, and Damage caused to Fishing Boats on the East Coast of Scotland, in the Gale of 19th August, 1848. 1849.
- On the Progress of Naval Architecture as indicating the necessity for Scientific Education, and for the classification of Ships and of Steam Engines: also on Life-Boats. 8vo. 1852.
- Labrador-Eskimo and English Vocabulary. 12mo. 1850.
- Greenland-Eskimo and English Vocabulary. 12mo. 1853.

"A state of war had always proved to be the opportunity of the British Hydrographic Department," writes an eminent naval authority of this period.

That this was the case had been amply illustrated during hostilities in China, with Russia, in the Parana, and in other small affairs, when the Department on shore, as well as the surveying service afloat, had the opportunity of showing out, and proving of what necessity

HYDROGRAPHY.

97

they both were to the country. The same authority has stated that "Captain Washington's term of office was distinguished by marked progress—he brought high interests and influences to bear with him from the outside. Possessed of wide and enlightened views, and of great industry, the Department under his control fully sustained the high character it had attained under his predecessor."

When the celebrated Menai bridge across the strait of that name was constructed, one of the conditions insisted upon by the Admiralty, was that all parts of its lower surface should be 100 feet above the level of high water. The various arguments and circumstances connected with this, led to a special branch in the Hydrographic Office being formed, termed the Harbour Branch, to which an officer of the Royal Engineers was appointed under the Hydrographer. In 1857 it consisted as follows:—

HARBOUR BRANCH.

Conservator Captain Vetch, R.E., F.R.S.
Clerks G. Eveniss and B. J. Drage, Esqrs.
Draughtsman W. Lowrie, Esq.

This branch was shortly afterwards turned over to the Board of Trade.

The list of names of officers employed on surveying service was not published at this time; it appears to have only received official recognition in the Navy List some years later.

In January, 1857, the war with Russia being over, and when surveying matters were falling back, into the state they would have probably been in, had no such war taken place, the following was the condition of the surveying service:—

SURVEYS.	OFFICER IN CHARGE.	SHIP OR OTHER MEANS.
China and Tartary	Captain William T. Bate	H.M.S. <i>Actæon</i> (Dove tender)
North Coast of Ireland	Lieut. C. J. Bullock	H.M. cutter <i>Sylvia</i> and hired crew.
Bay of Fundy	Captain G. A. Bedford	H.M.S. <i>Columbia</i> (paddle steamer).
Fiji Islands	Commander P. F. Shortland . .	" <i>Herald</i> .
Mediterranean	Captain H. M. Denham	" <i>Medina</i> (paddle steamer).
Commissioned for Vancouver Is- land	Captain T. A. B. Spratt	" <i>Plumper</i> (screw steamer).
West Coast of Scotland	Captain G. H. Richards	" <i>Porcupine</i> (paddle steamer).
West Indies	Captain H. C. Otter	" <i>Scorpion</i> .
Mediterranean	Master-in-Com. J. Parsons . .	" <i>Tartarus</i> (paddle steamer).
	Commander A. L. Mansell . .	" <i>Shamrock</i> .
Inverness-shire	Commander James Wood	Boats and hired crew.
Bristol Channel	Commander G. M. Alldridge . .	H.M.S. <i>Asp</i> and hired crew.
River Thames	Commander E. Burstal	Boats and hired crew.
Plymouth Sound	Lieutenant H. L. Cox	Boats and hired crew.
Coast of Ireland	Master-in-Com. Richard Hoskyn	Boats and hired crew.
West Coast of England	Master-in-Com. E. K. Calver . .	H.M. cutter <i>Seaflower</i> and hired crew.
Inverness-shire	Master-in-Com. J. Jeffery . . .	Hired boats.
West Coast of Scotland	Master-in-Com. E. J. Bedford . .	Boats and hired crew.
River Plate	Commander F. W. Sidney . . .	" <i>Indian</i> " and hired crew.
S.W. Coast of Ireland	Commander A. G. Edye	H.M.G.B. <i>Shamrock</i> and hired crew.
E. Coast Nova Scotia	Commander J. Orlebar	Hired vessel.
China Sea	Master-in-Com. J. Richards . .	H.M.S. <i>Saracen</i> .
Coast of England	Captain George Williams . . .	Boats and hired crew.

The Hydrographic Department had a recognised place given to it among the Civil Department of the Official Navy List, for the first time since its origin in 1795, in 1857.*

This would appear to have been Captain Washington's bringing about, the first Lord

* Before 1856, the Hydrographer's name and appointment was the only one given publicity to.

of the Admiralty at this time was *The Right Hon. Sir Charles Wood, Bart.*, G.C.B., and Captain (now *Admiral Sir*) Alexander Milne, was Junior Sea Lord. In 1857, it has a separate position, and names are stated in full; it then consisted as follows:—

<i>Hydrographer</i>	Captain Washington, R.N., F.R.S. (succeeded Hydrographer Sir Francis Beaufort, in 1855).
<i>Naval Assistants</i>	Captain A. B. Becher, Commanders W. Barrie and E. Dunsterville, Masters J. Burdwood and J. W. K. King, Esqrs., R.N.
<i>Superintendent of Compasses</i>	F. J. O. Evans, Esq., R.N.
<i>Chief Draughtsman</i>	Michael Walker, Esq.
<i>Draughtsmen</i>	Messrs. T. Walker, T. Bermingham, S. Horsfield, and E. J. Powell.

In addition to the extraordinary demands of the period, Captain Washington's views led him to endeavour to make up suddenly for the only failing—if failing it could be considered—of Sir Francis Beaufort's *régimé*, by the immediate publication of all information, whether charts or other documents, which had accumulated.

Nor were the surveying operations afloat curtailed; the China sea surveys were increased, Japan was commenced, an extensive examination of our colonies in the North Pacific undertaken, and surveying parties dispatched by the recommendation and arrangement of Captain Sir Henry Denham (of the *Herald*) to the shores of each of the Australian colonies; those colonies entering into an agreement with the Imperial Government to bear in each case, one half of the working expenses of the various surveys.

At the same time, the surveys of the coasts of the United Kingdom were energetically pushed forward. Captain Washington's efforts were also successfully directed to the greater circulation of the Admiralty charts among the Mercantile Marine of this country; they had already become largely adopted by the Government and foreign navies of most other countries.

Nor was this all, Captain Washington took a personal interest in each and every individual's welfare in the Hydrographic Department, as well as in the surveying service.

To sustain the efforts he had been making, and maintain the enormous amount of extra machinery he had set in motion, told seriously upon his nervous temperament.

It has been said, too, that he perceived, that in his zeal, he had undertaken too much. The ball of surveying publications of all kinds having been set rolling, continued to increase, while his small staff remained almost at a stand-still as to numbers, slightly retrograding perhaps in energy, as time went on, and the age of individuals increased.

The powerful spurt caused by the Russian war was not calculated to be sustained by them for ever after, and Captain Washington was at no pains to conceal his vexation on this score.

For the emergency of the Russian war, no better Hydrographer could have been selected; but, had no Russian war occurred, and the surveying service afloat as well as the Hydrographic Department on shore been pursuing the even tenor of its ways, it seems doubtful whether Captain Washington would have ever accepted the post.

Immediately before the death of Admiral Washington, the Hydrographic Department at Whitehall consisted as follows:—

<i>Hydrographer</i>	Rear-Admiral John Washington.
<i>Chief Naval Assistant</i>	Captain A. B. Becher, R.N., F.R.A.S.
<i>Naval Assistants</i>	Captain William V. Read, Commander E. Dunsterville, Staff Commanders J. Burdwood, J. W. King, and James Penn, R.N.
<i>Superintendent of Compasses</i>	Staff Commander F. J. O. Evans, R.N., F.R.S.
<i>Superintendent of Charts</i>	Captain George A. Bedford, R.N.
<i>Draughtsmen</i>	{ <i>First Class</i> —T. Walker, Esq.
	{ <i>Second Class</i> —T. Bermingham, and E. J. Powell, Esqrs.
	{ <i>Third Class</i> —R. Carrington, Esq.

HARBOUR BRANCH.—Transferred to the Board of Trade.

Progress of Marine Surveys, 1854 to 1863, under Rear-Admiral John Washington.

In 1854, the Admiralty surveys on the coasts of Great Britain were ten in number, and of Foreign and Colonial surveys, supported by the Admiralty, there were also ten.

War with Russia gave an impulse to hydrography, by causing the surveys which had been executed by Denmark, Sweden, Russia, and Prussia, to be made better known, and more accessible.

On the coast of England, part of Dorset, the harbour of Lyme Regis, and river Dart to Totnes, were surveyed; also, the Manacles, Helford river, and Coverack harbour. On the west coast of England the Cledden river, from Haverfordwest to Milford Haven, was mapped, and the rivers Taw and Torridge commenced. On the coast of Scotland part of Argyllshire, with Lochs Dinch, Long, and Ailsh, in Ross-shire, were surveyed.

In Ireland, part of Londonderry, including Port Rush and the river Bann leading to Coleraine, had been charted; on the north west coast, part of the shore of the County Donegal, the north shore of Mayo, from Killala bay to Broadhaven; and on the south west coast, in County Kerry, the shore from Ballinskelligs bay to Sneem in the Kenmare estuary.

The *Merlin* and *Porcupine*, under Captains Sullivan and Otter, accompanied the fleet in the Baltic. Led sound, the Aland islands, and channel to the fortress of Bomarsund, had been surveyed by these officers, and the anchorage of Barö sound, sounded out.

Captain Spratt, in the *Spitfire*, in the Black Sea, surveyed Bourghaz bay, Varna, Kustenhjeh, the Sulina mouth of the Danube, Koslu, where good coal was discovered, Balaklava, Eupatoria, Kazach and Kamiesh bays in the Crimea; and made a plan of the Khersonese peninsula, showing the position of the allied camps and batteries, as well as a plan of the battle field of Alma. Commander Nolloth, in the *Frolic*, made a plan of the anchorage of the mouth of the Orange river, near the Cape Colony, where copper ore was discovered. Lieutenant Dayman, in the *Hydra*, found a dangerous bank some 9 miles seaward of Cape Recife.

In China, Mr. Richards, in the *Saracen*, completed the river Min to Fu-chau-fu.

The Macdonald Islands in the South Indian ocean were discovered, and named after the officer of the Mercantile Marine, who, in 1854, chanced upon them; four other vessels also sighted and reported these islands during the same year, viz., on the 1st, 2nd, 3rd and 4th December.

Seven sheets of the N.E. part of Australia were issued by the Hydrographic Office, and a new chart of St. Vincent and Spencer Gulfs in South Australia.

The surveying party under Commander Byron Drury in the *Pandora*, in New Zealand, were engaged in Current Basin, French Pass, Sumner Bar, and Waimea river. They also added to the soundings off the east coast of Middle island, and examined the rocks called the Traps and Snares off the south extreme of Stewart's island.

Capt. Denham, in the *Herald*, fixed the position of Raoul island and of the North and South Minerva reefs; he also had made plans of the islands of Moala, Angau and Ovalau in the Fiji group.

Captain Bayfield and staff continued employed near Halifax Harbour, and Commander Shortland in the Bay of Fundy.

Mr. Parsons, in charge of the West Indian survey, completed Caledonia harbour and Port Escoces, and examined the Guincho and Lobos Cays, and the southern part of the old Bahama channel bordering on Cuba.

Of India, a survey of the mouths of the Indus, Coast of Scinde and Kutch, Gulf of Kutch, Bate harbour, Bombay bank of soundings, eastern part of Palk strait, coast of Pegu and gulf of Martaban had been published; as well as new surveys of the strait of Malacca and the north coast of Sumatra.

A chart of the Arabian sea showing the winds and currents during the S.W. monsoon, compiled by Lieut. A. D. Taylor, I.N., was published.

A set of charts, in 36 sheets, showing the winds and currents for each month of the year in the Indian, China and Red seas, and Persian gulf, were sent to England.

Some few remarks on the Bonin Islands by Commodore Perry the head of the United States Expedition to Yeddo, in 1853-54, reached England this year; the narrative descriptive of this voyage was not published by Congress at Washington, however, until 1856, when it took the shape of four quarto volumes, with a fifth added, containing the Sailing Directions and Nautical Remarks of the Officers of the Expedition.

In 1855, Lieutenant Cox and Mr. Usborne mapped the English coast from Portland to Golden Head, including Abbotsbury and Chesil Bank, and made a plan of Bridport.

In Cornwall, Captain G. Williams and Mr. Wells completed the coast between Fowey and Falmouth, with plans of Pentuan and Mevagissey.

In the Bristol Channel, Commander Alldridge and Mr. D. Hall planned the rivers Taw and Torridge, Milford Haven, with Pembroke Reach, having been published at the Admiralty.

The entrance of Solway Firth was re-examined, and charts corrected for the changes, which had occurred during the twenty years since this Firth was originally surveyed.

Part I. of the Channel Pilot was compiled by Mr. J. W. King, R.N., and published at the Admiralty; Part II., which, containing the north-coast of France, from Grisnez to Ushant, was well advanced.

Commanders Bedford and Creyke were employed in Argyleshire, and parts of Jura, mapping Loch Spelve in Mull, and Loch Feochan.

Commander Wood, and Messrs. Jeffery and Taylor, examined its northern coast of Skye, from Loch Sligachan to Kyle Akin and Kyle Rhea.

Captain Otter was engaged in the Hebrides.

The Orkneys and Shetland were re-visited by Mr. E. K. Calver, in order to revise the sailing directions of those intricate groups. This work was satisfactorily executed.

In the Firth of Forth, Lieutenant Thomas and his assistants examined the coast of Fife as far as Fifeness, and filled in the soundings to the eastward of the Isle of May.

Messrs. Hoskyn, Aird and Yule, mapped the Irish coast from Carrick-a-Rede southwards to Garron Point; they also connected Rathlin island with the main.

Captain Bedford and Lieutenant Horner completed a plan of Lough Swilly.

In Kerry, Commanders Beechey and Edye, with Mr. W. B. Calver, made a plan of Castlemaine harbour and bay.

Commander Church and Lieutenant Veitch mapped the shore of Kerry from Ballinskelligs bay to Port Magee, and obtained soundings around the Skelligs.

In the Baltic, Captains Sullivan and Otter, and their assistants, Commanders Cudlip, Creyke, and Burstal, and Lieutenant Ward, R.N., made plans of Led Sound in the Aland isles, and the approaches to Bomarsund; of Barö and Häst Sounds, with the south access to Sweaborg; of Wormsö sound, on the south side of the Gulf of Finland.

In the Black Sea, Captain Spratt, R.N., C.B., and Lieutenants Mansell, Wilkinson, and Brooker, discovered rocks near the Strait of Kertch, and off Anápa, on the Circassian coast, which had escaped former examinations. They also sounded around Kinburn Spit, and the estuary of the Dnieper and Bug, leading to the towns of Khersón and Nicolaief. A plan of the Khersonese peninsula, including Kazach and Kamiesh bays, showing the position of the Allied camps and batteries, was completed by Lieutenant Wilkinson.

Captain Spratt's reconnaissance of the country between Kustenji and the Danube at Chernavoda, had been published, as also his chart of the Narrows of the Dardanelles.

On the coast of Egypt, Commander Mansell, in the *Tartarus*, commenced the north shore, from the Damietta mouth of the Nile eastwards, with a view to ascertain whether it afforded a suitable site for the entrance of the Suez Canal.

Lieutenants Dayman and Simpson mapped the coast from Hanglip to Cape Agulhas, and surveyed Algoa bay and Port Natal.

Messrs. Richards and Inskip, on the China station, had been despatched to Siam.

In the Gulf of Tartary, not visited by any ship of war since Broughton, in 1797, English cruisers partially traced the western shore of the island of Saghalin, examined Castries bay on the mainland, and traced a channel, carrying three fathoms, towards the mouth of the Amúr.

The chart of Paláwan and its off-lying reefs, the result of the survey of Commander Bate, in the *Royalist*, in the years 1851-5, was published, with sailing directions.

The surveys of Captains Stokes and Drury, were published at the Admiralty, with plans of Cook Strait and Port Nicholson, accompanied by sailing directions, compiled by Captain George Richards and Mr. F. J. Evans, R.N. (both assistants on the survey).

Captain Denham, in the Western Pacific, surveyed Norfolk island. He determined the position of Conway reef. On his route to the Fiji islands, Captain Denham obtained soundings in a depth of 1,020 fathoms, Levuka harbour and Mbau waters in the Fiji group completing his work for 1855.

Halifax harbour and coast to the eastward as far as Shut-in island, resulting from the surveys of Captain Bayfield, was published at the Admiralty during 1854, and Cape Canso westward to Country harbour surveyed by the same officer.

Commander Shortland completed the survey of the Grand Manan islands at the entrance of the Bay of Fundy, and a portion of the south-western coast of Nova Scotia.

A plan of Port Escocés and Caledonia harbour, surveyed by Messrs. Parsons and Dillon, was published by the Admiralty during the year 1854, and these officers had been engaged at the islands of Santa Cruz and St. Lucia.

Lieutenant Sidney, with slight means, re-examined the approach to the river Paraná, and re-sounded the shoals in the vicinity of Martin Garcia.

The maritime surveyors of France conducted their surveys along the coasts of Italy and of the Strait of Gibraltar. M. Darondeau completed the survey of Western Liguria, and was occupied in conducting operations in the Neapolitan dominions, in connecting the islands of the Ponza group, with his triangulation of the continent.

The hydrographic expedition dispatched by the French Government to survey the Strait of Gibraltar and the adjoining coasts, completed its task, thanks to Captain Kerhallet, well known by his works on the currents of the Atlantic and Pacific oceans, and of M. Vincendon Dumoulin, of the corps of Ingénieurs Hydrographes of France.

The Spanish Government caused a survey of that kingdom to be commenced upon an uniform system, and a part of the triangulation had been completed. A series of triangles, in a meridional direction, being carried on from Pico, E. of Malaga, on the coast of the Mediterranean, to Santander, on the Bay of Biscay, and in the direction of the parallels from the Portuguese frontier to Aragon, where it had been connected with the operations of M. M. Biot and Arago, for the measurement of the arc of the meridian between Dunkirk and Formentera.

During the year 1856, twenty different surveying parties were on active service, one-half employed on our own coasts, the remainder in the colonies, the Mediterranean, the river Plate, the south-western Pacific, and coast of China.

Commanders Burstal and Cudlip, in August, began a survey of the Thames from London Bridge upwards to Putney.

On the east coast of England, Mr. E. K. Calver revised and inserted the changes that had taken place during the preceding 10 years, in the anchorages of Yarmouth and Lowestoft Roads. He also prepared the Sailing Directions for this coast, and for the opposite shore of Belgium, Holland, and Jutland, up to the Skaw, forming parts III. and IV. of the "North Sea Pilot."

On the south coast of England, Commander Cox, and Messrs. Usborne and Davis completed Plymouth Sound.

In Cornwall, Captain Williams and Mr. Wells completed Fowey river from Lostwithiel to the sea, and the coast from Fowey to the Dodman.

In the Bristol Channel, Commander Alldridge and Mr. Hall surveyed Caldy and Tenby roads, where they mapped several rocks and shoals not before pointed out.

In the Frith of Forth, Lieut. Thomas and Mr. Sutton surveyed the coast of Haddington by Dunbar, and St. Abb's Head to Coldingham, and completed the outer soundings to the eastward of the Isle of May.

The Sailing Directions for the Orkneys and Shetland, drawn up by the late Commander Thomas, revised and corrected by Mr. E. K. Calver, were published in 1856.

Commander Wood surveyed a small portion of Skye, while Mr. Jeffery mapped Loch Nevis.

In Argyleshire, Commanders Bedford and Creyke, and Mr. Bouchier, added to the north shores of the Isle of Mull, and re-examined Oban bay.

In the Hebrides, soundings off the Isle of Lewis were obtained by Captain Otter in the *Porcupine*.

On the north-eastern shore of Ireland, Messrs. Hoskyn, Aird, and Yule completed the examination of Belfast harbour. They also mapped a portion of the coast of Antrim, from Garrow Point to Ballygally Head, the harbour of Lough Larne, and the artificial packet-station of Donaghadee.

In Wexford, Captain Frazer and Lieut. Bullock re-examined the channels and banks at the entrance of that harbour, and made a survey of the river Slaney up to Enniscarthy.

In Donegal, Captain Bedford and Lieut. Horner completed plans of Sheep Haven and Mulross Bay.

In Kerry, Commanders Beechey and Edye, with Mr. W. B. Calver, mapped a portion of Tralee and Brandon bays, while Mr. McDougall surveyed Dingle and Ventry harbours.

Lieut. Dayman, R.N., was to leave England in command of the *Cyclops*, to carry deep sea soundings across the Atlantic, from Valentia to Trinity Bay in Newfoundland. The vessel furnished with 20,000 fathoms of line, a portion being of silk, as well as an abundant supply of sounding machines.

The Delta of the Danube had been carried out by Lieut. Wilkinson, under the orders of Captain Spratt, whose report on Fidonisi, or Serpent island, had been communicated to the Admiralty.

Captain Spratt had obtained a line of deep sea soundings between Malta and Candia, in which the greatest depth was 2,170 fathoms.

On the coast of Egypt, Commander Mansell, in the *Tartarus*, with Lieut. Brooker and Mr. Skead, completed a survey of the coast from Damietta eastward to El Araish, a plan of the port of Alexandria, and a survey of the bay of Suez. Captain Mansell also ran a line of soundings between Alexandria and the island of Rhodes. In October, 1856, Messrs. Delamanche and Ploix, Ingénieurs Hydrographes of the French Imperial Marine, carried a line of soundings across the Mediterranean between Port Vendris, in France, to Algiers, in which the greatest depth was about 1,600 fathoms.

In the Cape Colony, Mr. Francis Skead surveyed Port Natal, begun by Lieut. Dayman, R.N., in 1855.

The *Actæon*, accompanied by the *Dove*, under Lieut. Bullock, sailed for China, and Capt. Bate was to resume the survey of such parts of the coast as most required it. Messrs. Richards and Inskip, in the *Saracen*, were to proceed to make a survey of the Pratas, with a view to the construction of a lighthouse upon that reef.

The Gulf of Siam had been materially improved during the year 1856, Messrs. Richards and Inskip having visited Bangkok, and rectified the positions of several islands, headlands, and capes on the shores of the gulf.

On the coast of Tartary, the officers of the *Barracouta* examined a harbour, named after that ship, in which the Russian frigate *Pallas* had formerly taken refuge, about 130 miles south of Castries bay.

In the Admiralty chart, the course of the Amúr had been laid down from the observations made by Peschurof, in 1855.

Captain Denham, in the *Herald*, surveyed several islands of the Fiji group, as Angau, Matuka, Mbatiki, Moala. Assistant-Surgeon Macdonald, of the *Herald*, made a journey into the interior of Viti Levu, which, with a track chart of the route, were communicated to the R.G. Society by the Admiralty.

Captain George Richards, R.N., known as a fellow-labourer with Captain Stokes in the survey of New Zealand, sailed for Vancouver island, to determine, in conjunction with the United States Commissioners, the boundary, as laid down by treaty, between the British and American possessions.

In the Rio de la Plata, Lieut. Sidney fixed the position of the north edge of the English Bank, and completed a plan of the outer roadstead of Buenos Ayres; also, partially examined the lower course of the Uruguay.

On the coast of Brazil, Lieut. Parish, R.N., furnished plans of several small harbours and otherwise improved our charts, while a more complete sailing directory, founded on the labours of Baron Roussin, was commenced by Rear-Admiral FitzRoy.

In the West Indies, a survey of the island of Santa Cruz, and the harbour of Christianstadt, had been made by Messrs. Parsons and Dillon; and a re-examination of the harbour of Grey Town by Mr. Scott, master of the *Impérieuse*.

In the Bay of Fundy, Commander Shortland, with Lieut. Scott and Mr. Scarnell, completed the soundings in the vicinity of the Grand Manan islands at the entrance of the bay, and mapped a further portion of the south-western coast of Nova Scotia.

Rear-Admiral Bayfield, succeeding to his flag, retired from the command of the survey of the Gulf and River St. Lawrence, on which work he had been engaged upwards of a quarter of a century.

Commander Orlebar, former chief assistant, succeeded to the charge of the survey, which was to be continued along the eastern shores of Nova Scotia.

In the season 1857, a re-examination of the Thames between Putney and Woolwich was made by Commanders Burstal and Cudlip.

Commander Cox, with Messrs. Osborne and Davis, were still engaged on the examination of Plymouth Sound.

In Cornwall, Captain Williams and Mr. Wells Master, surveyed the coast between St. Germain beacon and Fowey.

Commander Alldridge and Mr. Daniel Hall were employed in the British Channel, in the passage of Jack Sound.

Mr. E. K. Calver sounded Holyhead harbour, and Portpatrick.

Commanders Bedford, Creyke and Mr. Bouchier were employed on the coasts of Argyleshire.

Commander J. Wood and Mr. Forbes surveyed 15 miles of the coast of the Isle of Skye, and sounded over 83 square miles; while Mr. Jeffery examined 40 miles of coast between Malag and Ru Arisaig, including the shores of Loch na Gaul.

Captain Otter, in H.M.S. *Porcupine*, in the Hebrides, with her tender, the *Seagull*, assisted by Lieutenant Dent, and Messrs. Stanton, G. Stanley, and Cramer, examined the shores and islets of Harris sound; while Lieutenant Thomas and Mr. Clifton surveyed East Loch Tarbert.

Messrs. Hoskyn, Aird, and Yule, completed in Ireland the survey of Lough Carlingford, and the river up to the town of Newry.

Captain Bedford, with Lieutenants Sidney and Horner, mapped 50 miles of the coastline between Loughs Swilly and Foyle.

Commander Edye, with Messrs. Macdougall and W. B. Calver, examined 26 miles of the coast of Kerry.

Commander Dayman, in the *Cyclops*, sounded across the Atlantic from Valentia to Newfoundland, and was about to proceed in the *Gorgon*, to accompany the *Niagara*, with the western portion of the cable, to her destination.

Captain Spratt had continued, assisted by Lieutenant Wilkinson, the delta of the Danube in the Black Sea.

Commander Mansell, in the *Tartarus*, with Lieutenant Brooker and Mr. Skead, mapped the coast of Egypt from Alexandria to Damietta.

Mr. Francis Skead, in South Africa, surveyed the entrance of St. John river, and commenced Table bay.

Captain Pullen had been despatched in the *Cyclops* for the purpose of obtaining deep soundings in the Red Sea, soundings being taken on the way out in the vicinity of some of the *Vigias* of the Atlantic and Indian oceans.

Captain Bate had lost his life before Canton in 1857; but Lieutenant Bullock had set to work, and trigonometrically surveyed Canton.

Messrs. Richards, Inskip, and Reed, in the *Saracen*, completed a plan of Bangkok and of the river Menam.

Captain Denham, in the *Herald*, completed the survey of Port Jackson.

Capt. Richards, in the *Plumper*, seconded by Messrs. Mayne, Bull, Pender, and Bedwell, continued in the strait of Juan de Fuca, and Lieut. Mayne had fixed the position of the gold mines some 50 miles up the Frazer river.

Lieutenant Sidney completed a plan of Buenos Ayres roadstead.

Messrs. Parsons and Dillon had been employed on the coast from St. Domingo eastward to Dominica, including Porto Rico.

Commander Shortland, with Messrs. Scott, Pike, Scarnell, and Mourilyan, surveyed the coast of New Brunswick from Quaco to St. Martin Head, Chiguecto to Cape Sharpe, and Port George to Cape Split, on the Nova Scotia territory.

Commander Orlebar, with Messrs. Hancock, Des Brisay, and Carey, surveyed 50 miles of coast in the neighbourhood of Great Bras d'Or.

In 1857, the Austrian frigate *Novara*, 30 guns, left Trieste on a scientific voyage round the world. The astronomical, meteorological, and magnetical observations were made by officers of the Navy, under the command of Commodore Wullerstorff. Dr. Hochstetter, from the Geological Institution of the Austrian Empire, was occupied with the geological and physical, Messrs. Frauenfell and Zelebor with zoological, Drs. Schwarz and Tellinek with botanical, and Dr. Scherzu with astrological and national-economical researches and investigations. The last of these gentlemen kept the journal of the expedition and made the reports on its progress and results to the different political and scientific authorities in

Europe. The expedition was accompanied by the Austrian artist, M. Selliny, who illustrated the most interesting points visited by the *Novara*, and made drawings for different scientific purposes.

In 1858, on the coast of England, Hartlepool bay was re-surveyed by Captain Bedford and Lieut. Horner. The first survey of the bay was made by Commander Slater in the year 1829, and repeated by Mr. E. K. Calver in 1843.

Commander Cox and Messrs. Osborne and Davis, continued the survey of Hamoaze, and completed St. John lake and St. Germans river, including 33 miles of river bank line and 13 square miles of soundings. In the Channel Islands, Commander Sidney re-examined the harbour of Braye in Alderney, and the great bank off Guernsey.

In Cornwall, Captain Williams and Mr. Wells surveyed from the Rame Head westward to St. Germans beacon, including Whitesand bay and Port Wrinkle, with plans of Boscastle and Port Isaac. They also executed a plan of the Eddystone rocks off Plymouth, showing the outline of the granite mass that forms the base for the Eddystone Lighthouse, erected by Smeaton in 1760.

Commander Alldridge and Mr. Hall, in the *Asp*, made a survey of Swansea bay.

Commanders Bedford and Creyke, and Mr. Bouchier, R.N., were employed on the coasts of Mull.

In Skye, Commander Wood and Mr. Forbes surveyed 12 miles of coast of the island from Loch Bhreatail northwards to Loch Braeadaile, including Lochs Eynort and Harport. On the coast of Inverness-shire, Mr. Jeffery completed the shore line as far as Ru Arisaig.

In the Hebrides, Captain Otter, in the *Porcupine*, with the *Seagull*, Lieut. Chimmo, aided by Lieutenants Dent and Hawes, and Messrs. Stanley and Cramer, surveyed Loch Roag, and commenced Loch Maddy on the east coast of North Uist; they also examined the Haskier.

Lieut. Thomas surveyed West Loch Tarbert, and connected it with the Eastern Loch, which he completed last season.

Messrs. Hoskyn, Aird, and Yule surveyed Dundalk bay and harbour, commenced Strangford narrows, and obtained borings on Carlingford bar.

In Donegal, Captain Bedford and Lieut. Horner completed that portion of the shore which was required to fill up the gap in the existing charts.

Commander Edye, with Messrs. MacDougall and W. B. Calver, were employed on the Blasket isles from Dingle bay to the Skerries, in the course of which they sounded over an area of several square miles. This completed the survey of the shores of Ireland, and it only remained to carry the soundings off shore to the depth of 100 fathoms.

The channel between Malta and Gozo was re-examined by Captain Spratt, and Lieut. Wilkinson, in the *Medina*, and a report was written by the former, showing how the Nile continues to bring down its deposits.

Lieut. Wilkinson made a chart, showing the delta of the Danube in the Black Sea.

Commander Mansell, with Lieut. Brooker and Mr. Frederick Skead, surveyed the gulf of Iskanderun, and made plans of Ayas on the north and Alexandretta on the south.

In the Cape Colony, Mr. Francis Skead completed the survey of Table bay. He also accompanied Dr. Livingstone to the mouth of the Zambesi, and made a sketch survey of the delta of that river, as far up as Expedition island.

Captain Pullen, in H.M.S. *Cyclops*, completed a line of soundings in the Red Sea. He also carried a line of soundings from Aden to Kurrachie.

Mr. Stanton, who succeeded Mr. Richards, in command of the *Saracen*, with Mr. Reed, was employed in the survey of Banca Strait.

Commander Ward, who succeeded Captain Bate in command of the *Actæon*, with the *Dove*, Lieutenant Bullock, and Messrs. Kerr and Blackney improved the chart of Chu Kiang, or Canton river, and Lieut. Bullock explored the western river for about 150 miles. In the Yang-tse-kiang the surveyors accompanied Lord Elgin in his voyage by Nankin to Han-Kow, and made an eye sketch of the river for 150 miles as far as Han-Kow. Captain Ward also re-surveyed the river from Wusung to Shanghae. In the gulf of Pechili, the Pei-ho was ascended as far as Tien-sin, and a survey, made by Mons. E. Ploix, Ingénieur-Hydrographe of the French Navy; this was published by the Admiralty.

Captain Denham, with Lieut. Hutchinson, and the officers of the *Herald*, made a partial survey of Shark bay, sounded the approaches to Port Jackson, carried a track through the Coral Sea, correcting the sites of the Cato and other banks. Captain Sir Edward Belcher re-examined the longitudes in the Eastern Archipelago, from Madras eastward, in order to reconcile the discrepancies which existed in that part of the globe.

In this year the transfer of the government of India from the East India Company to the Crown, caused the following summary of eastern surveys to be made by Capt. Washington:—The Red Sea, Gulf of Aden, Socotra, and the south-east coast of Arabia, had been sufficiently surveyed for the purposes of navigation, as also the coasts of Beluchistâu, Scinde and Kattiawar, as far south as Cambay. The Gulf of Persia required re-examination, which was in progress.

From Cambay, along the coast of Malabar to Cape Comorin, and thence northward by Madras to Calcutta, the peninsula of India has been triangulated. The nautical survey of the west coast, and of the east coast between Madras and Santipilly, had been completed. From the Gulf of Manaar northward to Madras, and from Santipilly to Point Palmyra, was in course of progress by the officers of the Indian Navy. The Sunderbunds or mouths of the Ganges, up to Calcutta and to Chittagong, had been completely surveyed.

In Ceylon, the west coast was surveyed, but the south and east coasts required attention. Plans of Trincomalee, Point de Galle, and Colombo, were wanting. The Maldives, Laccadives, and Chagos Archipelago had been surveyed and published by the East India Company. The coast of Chittagong and Aracan, southward to Cape Negrais, had been partially surveyed. From Isle St. Matthew south to within ten miles of Pulo Penang, the Malacca coast was all but unknown, though a survey was in progress. The same with the Andaman and Nicobar groups, of which little was known.

Captain George H. Richards, with Messrs. Bull, Pender, Mayne, and Bedwell, completed a survey of Rosario and Haro Straits, and the islets that lie between the mainland and Vancouver Island.

Commander Orlebar, with Commander Hancock, and Messrs. Des Brisay, Clifton and Carey, surveyed 46 miles of the coast of Cape Breton Island, from Cape Hinchinbroke to Port Nova, including Louisburg harbour. In Newfoundland, advantage was taken of laying the Atlantic Submarine Cable, to make a plan of Bull Arm, Trinity Bay, by Captain Otter and the officers of the *Porcupine*. In the Bay of Fundy, Captain Shortland, with Messrs. Scott, Pike, Scarnell, and Mourilyan, surveyed the coast of New Brunswick from St. Martin Head easterly to Wolf river, part of Chignecto bay and the Bay of Mines.

In the West Indies, Mr. Parsons, with Messrs. Dillon and W. B. Calver, were engaged on the island of Grenada. Commander Dayman carried a line of soundings from the Azores to England.

In 1859, Dover bay was re-sounded by Mr. E. K. Calver.

On the south coast of England, Mr. J. Scott Taylor inserted on the charts the changes that had occurred since Captain Sheringham's survey in 1848.

In the Channel islands, Commander Sidney and Messrs. Richards and Taylor corrected portions of Alderney and Guernsey; they also sounded Hurd's deep.

Commander Cox, with Messrs. Usborne and Davis, completed 12 miles of sea-coast, 32

miles of harbour coast-line, and sounded over an area of 60 square miles. Off the Land's End, and in the Scilly islands, Captain Williams and Mr. Wells filled in the soundings over a space of 650 square miles.

In the Bristol Channel, Commander Alldridge completed surveys of the eastern half of Swansea bay, including Neath river and Port Talbot. Mr. E. K. Calver, with Messrs. Inskip and Davison, revised the charts between Bristol channel and Solway Firth, and prepared for publication the Sailing Directions of the west coast.

Commander Bedford, with Commander Creyke and Mr. Bouchier, completed the survey of Mull, including the sounding of Lochs na Keal, Seriedan, and Buy; also of Loch Etive on the main, and 20 miles of Linnhe Loch leading to the Caledonian Canal. Commander Ward accomplished 37 miles of the south coast of Skye, completing the survey of the island, and Mr. Jeffery has pushed the work in Lochs na Nuagh and Ailort, having mapped 41 miles of the coast.

Captain Otter, in the *Porcupine*, with her tender, the *Seagull*, Lieut. Chimmo, Lieutenants Dent and Hawes, and Messrs. Stanley and Gray, examined a portion of the west side of the island of North Uist and the Monarch isles, and sounded over part of the Little Minch.

In Harris, Commander Thomas, Messrs. Morrison and Sharbau, surveyed Loch Resort and part of Scarpa Island.

Messrs. Hoskyn, Aird, and Yule surveyed the coast between Strangford and Belfast Loughs, and a portion of the interior of Strangford Lough and Narrows. On the north-west coast, Captain Bedford and Lieutenant Horner added some off-shore soundings to the charts, and completed this portion of the coast. Off the south-west coast, Commander Edye and Mr. McDougall sounded the approaches to a distance of 30 miles off-shore, and determined the 100 fathoms-edge of soundings.

Captain Spratt, in the *Medina*, brought to a close the survey of the Island of Candia or Crete.

Commander Mansell, in the *Firefly*, with Lieutenant Brooker, completed the Gulf of Iskanderûn, and made plans of Ayas, Latakiyah, and Beirut.

Commander Dayman, in the summer, sounded from the entrance of the channel across the Bay of Biscay, along the coasts of Spain and Portugal, and through the Strait of Gibraltar and Mediterranean Sea, to Malta.

Mr. Francis Skead corrected the general positions in False Bay (Cape of Good Hope).

A survey of Banka strait has been completed by Mr. Stanton and Mr. Reed, in the *Saracen*.

Commander Ward and Messrs. Kerr, Blackney, Farmer and Bedwell, in the *Actæon*, with Lieut. Bullock and Mr. Ellis, in the *Dove*, made a survey of the bay of St. Vladimir; in Manchuria, of Seau-wuhu bay; in Korea, Tsan-liang-hai harbour (the Chosan of Broughton in 1796); and a sound that divides the island of Tsu-sima into two parts.

Captain Denham, with Lieutenant Hutchinson, Messrs. Smith and Wilds, masters, and Messrs. Hixson and Howard, second masters, cleared away numerous reported dangers, and defined the limits of several reefs and banks in the Coral sea.

Captain George Richards, in the *Plumper*, with Messrs. Bull and Pender, masters, Lieut. Mayne and Mr. Bedwell, and Browning, surveyed Pitt and Frazer rivers, with Burrard inlet, to the site of the capital New Westminster. Also, parts of the east coast of Vancouver island, with the adjacent channels, in the course of which they examined 700 miles of coast, while Lieut. Mayne explored 500 miles of the Upper Frazer.

Commander Orlebar divided his staff into two parties; Commander Hancock, with Messrs. Des Brisay and Carey, re-examined the river St. Lawrence, between Montreal and Quebec, while Commander Orlebar, with Mr. Clifton, returned to the coast of Labrador and the Strait of Belleisle, where positions were re-determined, and soundings taken.

Captain Shortland, with Lieut. Scott, and Messrs. Pike, Scarnell, Mourilyan, and Archdeacon, examined 60 miles of open coast, and 120 miles of river and harbour shores. Captain Shortland determined the limits of Le Have bank, which lies to the south-west of Cape Sable.

A chart of the island of Grenada, had been completed by Mr. Parsons, who was at work on the Grenadines, and then would proceed to the north to the Isle of St. Vincent.

In 1860, Commander Cox and Mr. Davis sounded the bar of Portsmouth harbour. In the Channel islands, Commander Sidney and Mr. Richards completed the east coast of Guernsey and of Sark.

Captain Stokes and Mr. Usborne completed 5 miles of sea coast eastward of the Mewstone, and 20 miles of the Yealm river. Captain Williams and Mr. Wells were occupied in making and computing the triangulation of the Scilly islands. Commander Alldridge, on the coast of Glamorganshire, completed 21 miles of coast. Mr. E. K. Calver, with Messrs. Inskip and Davison, re-examined the estuary of the river Ribble, and corrected the charts of that part of the coast.

In the Clyde, Mr. Calver made a new survey from Greenock to Glasgow.

Commander Bedford, with Commander Creyke, Mr. Bouchier, and Mr. Ray, R.N., had been engaged on the survey of Loch Linnhe, leading up to the south-west entrance of the Caledonian Canal, and of the outlying rocks.

Mr. Jeffery, with Messrs. Donald Matheson and James Hannan, mapped the coast between Arasaig and Smirserei points, and Lochs Moidart and Kinhay. In the Hebrides, Captain Otter, in the *Porcupine*, with her tender the *Seagull*, Lieut. Chimmio, aided by Lieuts. Dent and Hawes, and Messrs. Stanley and Boulton, were employed on the west coast of North Uist, between that island and St. Kilda, and on the islet of Rum.

In Harris, Commander Thomas had surveyed the sound of Taransay and the East bays.

On the east coast of Ireland, Mr. Hoskyn, with Lieut. Aird and Mr. Yule, were engaged on the upper part of Lough Strangford, and on the shores of County Down, from Ballyferris Point to Donaghadee. Off the south-west and south coasts, Commander Edye and Lieut. Horner had sounded over an area of 1,450 square miles, carrying their soundings to a distance of 23 miles off-shore, and to a depth of 100 fathoms.

Captain Sir Leopold McClintock, in the *Bulldog*, assisted by Mr. W. H. Reed, and Dr. Wallich, as Naturalist, and at the same time, Captain Allen Young, with Dr. Rae, Colonel Shaffner, U.S., and Mr. J. E. Davis, R.N., were despatched in the *Fox* yacht, to examine the coasts of Iceland. The results in a geographical point of view were highly valuable.

In the course of this voyage Mr. Reed, of the *Bulldog*, and Mr. Davis, of the *Fox*, made plans of Haldervig and Thorshavn, in the Farøe isles; with the Fiords of Beru, Hval and Ígalik, on the east and west coasts of Iceland; Julianshaab and part of Godhaab, on the west coast of Greenland, and Hamilton inlet, Labrador.

In the Turkish Archipelago, Captain Spratt completed the surveys of the islands of Astropalaia, Scarpantho and Kasso, with several small harbours in Crete, and Sailing Directions for that island, the Turkish, Arabic, and Greek names of places having been carefully revised by Viscount Strangford and Mr. W. Spottiswoode. Captain Spratt also carried lines of soundings between Malta, Tripoli, Benghazi, and Alexandria.

On the coast of Syria, Commander Mansell, in the *Firefly*, completed the survey of the coast from Iskanderûn to Markab, with plans of Ruad, Tripoli, Beirut, &c. In connection with this survey, Captain Washington, R.N., Commander Mansell, Dr. Joseph Hooker, the Rev. George Washington, M.A., Mr. Hanbury and Mr. Gray, R.N., visited and fixed the Cedars of Lebanon.

Six sheets of the Kwara or Niger, by Lieut. Glover, R.N., and a plan of the port of Lagos were published. At the Cape Colony, Mr. Skead completed Table Bay; he also

re-examined the lower part of the Kongone of the Zambesi. In the Red Sea, in the Strait of Jubal, Commander Mansell and Mr. Hull re-examined the Ashraffi reef, and determined the site for a lighthouse.

In the Persian Gulf, Commander Constable and Lieut. Stiffe, of H.M. Indian Navy, completed the gaps that were left in the survey of that gulf, and revised the whole in position; while Lieut. Heathcote, I.N., prepared a new chart of the Bay of Bengal, with a memoir, showing the currents that prevail in that sea during the southern monsoon.

A survey of part of the Shat-el Arab and of the city of Busrah was made by Lieut. Collingwood, I.N.; Lieut. Williams, I.N., in the surveying brig *Euphrates*, having finished the examination of the Malabar coast, had left for the coast of Ceylon. A survey of the rivers of the Punjaub was in progress by Lieut. Whish, I.N. Two surveying brigs, under Lieuts. Sweny and Jackson, I.N., were at work in the Bay of Bengal.

In Ceylon, Captain Pullen, in the *Cyclops*, and Mr. McDougall, R.N., surveyed the Basses rocks, and examined the south-east coast of Ceylon, Galle bay, and a part of the north-east coast of the island. On his passage to England, Captain Pullen re-determined the position of the San Lazaro bank, in the Mozambique strait; he also obtained several deep-sea casts of the lead in the South Atlantic, and swept away the vigia "Devil rock" from its assigned position.

Commander Ward, in the *Actæon*, and Lieut. Bullock, in the *Dove*, surveyed Ta-lien-whan bay in the Strait of Pechili. Also, the north coast of Shantung, with Chefoo, the Miao-tau islands, including Hope Sound, completing the shores of the gulfs of Pechili and Liau-tung, from Staunton island on the south, round to Ta-lien-whan bay.

Captain Denham, in the *Herald*, after a stay of 9 years on the Australian station, arrived in England. In Queensland, Mr. Smith, R.N., examined Port Denison and the mouths of the Burdekin river. A fresh impetus was about to be given to the coast surveys of the Australian colonies, as they had offered to share the expense of Admiralty surveys, and five separate parties had been organised for the purpose. Commander Cox, with Messrs. Bouchier and Boulton, R.N., and Mr. McHugh, had commenced a survey of Geelong harbour. Lieut. Brooker and Mr. Guy were about to proceed to Tasmania.

Captain George Richards, in the *Plumper*, with Messrs. Bull and Pender, Lieut. Mayne and Messrs. Bedwell, Gowland and Browning, surveyed Johnstone Strait, Jervis inlet, and Home and Quatsimo sounds. Commander Mayne also explored the country between Jervis inlet and Port Pemberton.

Captain Orlebar, with Commander Hancock, had been employed in examining the south coast of Newfoundland, including Burin and Placentia harbours.

Captain Shortland had been employed at the upper end of the Bay of Fundy, and in the Basin of Mines.

Mr. Parsons, and Messrs. W. B. Calver and Clifton, completed a chart of the Grenadines, and were at work in the island of St. Vincent.

Mr. Michael Walker, Assistant Hydrographer and Chief Draughtsman, after 50 years of public service, retired into private life. During this period, Mr. Walker gained the entire confidence of four hydrographers, viz., Captain Hurd, Sir Edward Parry, Sir Francis Beaufort, and Admiral Washington.

In 1861, Mr. Scott Taylor re-examined the shores of the Solent, Southampton Water and Portsmouth Harbour. In the Channel Islands, Mr. Richards continued the examination. Captain Stokes completed the survey of the Yealm river and soundings in Bigbury bay. A chart of Plymouth Sound, by Commander Cox, was published. Captain Williams continued in the Scilly isles. Commander Alldridge made progress on the coast of Glamorganshire; while Mr. Calver continued the survey of the upper part of the Humber, from Hull to Goole, re-examined the Eastern Gateway leading into Yarmouth roads, and the Shingles channel at mouth of Thames.

In Scotland, Commander Bedford surveyed 14 miles of the coast of Mull, and 9 miles of Loch Linnhe, with 76 miles of the shores of Loch Awe. Captain Otter surveyed Loch Lomond, Barra Sound, in the Hebrides, and part of the isles of Benbecula and Harris and part of Rum; while Mr. Jeffery brought to a close, the survey of the coast of Inverness-shire.

Mr. Hoskyn was engaged on the upper part of Lough Strangford and on the coast of Down. On the south coast of Ireland, Commander Edye filled up the off-shore soundings over an area of 1,200 square miles. A chart of the west coast of Ireland was published by the Admiralty during the year; also, Dingle and Ventry harbours, Blasket sound, and the islet of Rockall.

Captain Spratt, R.N., in the *Medina*, besides deep-sea sounding, re-examined the north coast of Africa by Cyrenaica, and made a plan of Benghazi roadstead. The meridian distance between Malta and Alexandria was ascertained by electric cable by Commander Mansell, who also surveyed the coast of Syria between Markab and Cape Bianco.

In the Cape Colony, Mr. Skead was engaged in the neighbourhood of Hout bay, and Mr. May accompanied Livingstone in his steamer, making a hydrographic sketch of the mouths of the Zambesi river.

In the Red Sea, Dissee island and harbour, with Commander Mansell's survey of the strait of Jubal, with Ashraffi reef and islet, were engraved; while, the Viceroy of Egypt caused three lights—one on Zafarana point, one on Ashraffi reef, and a third on Dædalus reef—to be lighted.

The chart of the Persian Gulf, in two sheets, was published by the Admiralty about this time. With it was also published a memorandum on the former charts of the Gulf. A plan of Bahrein, by Lieut. Whish, I.N., was made this year.

Lieutenant Williams, I.N., completed the gap on the Malabar coast, between Thull Knob and Borin pagoda.

In Banka and Gaspar straits, Mr. Stanton, in the *Saracen*, materially corrected the charts.

In China and Japan, 120 miles of the Yang-tse-kiang, above Hankow, were explored, as far as Yo-chow-foo, at the entrance of the Tung-ting lake. In addition to this service Captain Ward in the *Actæon*, and Lieut. Bullock in the *Dove*, were employed, the former on the coast of Japan, the latter on the shores of the Shantung peninsula. The *Actæon* arrived in England early in 1862, the *Swallow* relieving her in northern China.

In Australia, an organised system of coast surveys, the suggestion of Captain Denham of H.M.S. *Herald*, were set going. Thus we find Commander Sidney in New South Wales, Cox in Victoria, Hutchison in South Australia, Brooker in Tasmania, and Jeffreys in Queensland.

Captain Richards, in the *Hecate*, surveyed the entrances of the sounds on the west coast of Vancouver Island, and sounded off the entrance to Fuca Strait. Captain Orlebar mapped 200 miles of sea and harbour coast line on the south coast of Newfoundland. Captain P. Shortland completed the survey of the Bay of Fundy, and moved to the south eastern part of Nova Scotia.

Owing to the state of political affairs and civil war, 42 sheets of the several charts and plans of the United States coast survey, with Sailing Directions that accompany them, were published.

In the West Indies, Mr. Parsons completed the survey of the Grenadines, and moved on to Santa Lucia and the Port of Castries.

Mr. Burdwood's true bearing, or azimuth tables, for the parallels of 49° and 50° N. were published, and formed the commencement of the widely known tables of a similar nature, by the same author and the late Captain Davis.

Ninety new and corrected charts were brought out under the superintendence of Captain G. A. Bedford, R.N., Assistant-Hydrographer, who succeeded Mr. Michael Walker in that

capacity. The latter, taking advantage of the leisure afforded by retirement, corrected Raper's Maritime Positions, for the 7th edition of that officer's "Practice of Navigation."

In 1862, South Devon, under Captain Stokes, was brought to a close; the re-examination of the Scilly Islands by Captain Williams, and the Channel Islands by Mr. Richards, being continued.

In South Wales, Commander Alldridge surveyed 40 miles of coast-line, with 20 miles of sward or marsh line, and 100 miles of low water feature.

Mr. Calver finished the upper Humber, and re-surveyed 120 square miles of the southern entrance of the Thames. He was also engaged in making observations of the tidal streams off Dover.

Mr. Scott Taylor continued the surveys near Portsmouth and the Isle of Wight.

Captain Otter was engaged in the islands of South Uist, Canna, and Rum. Commander Thomas continued the shores of Benbecula and Harris; while Commander Edye surveyed 62 miles of the islands of Barra, Muldoanich, Flodday, Pabbay, &c.

Captain E. J. Bedford surveyed 97 miles of Lochs Linnhe, Leven, Etive, and Iel. Messrs. Hoskyn and Davis were engaged deep sea sounding in the *Porcupine* off the west coast of Ireland.

Captain Spratt in the *Medina* obtained deep sea soundings through the Grecian Archipelago, and completed the Maltese Islands, and shores of Saloniki gulf.

Commander Mansell in the *Firefly* completed the coast of Syria, connecting his triangulation with Damascus and the valley of the Jordan; he then commenced the re-examination of the channels of Corfu.

Mr. Francis Skead in the Cape Colony surveyed Mossel bay and adjacent coast.

Along the Mekran coast of Persia Lieut. A. W. Chitty, I.N., sounded between Ras Jashk and Ras Gwadel; and Lieut. Stiffe, I.N. obtained some additional soundings in the Persian Gulf and examined portions of the coast to determine the best stations for the telegraph line to connect England with India.

Mr. J. W. Reed in the *Rifleman* having transmitted surveys of the Tambelan and St. Esprit groups, examined Charlotte bank, and searched in vain for the Capiolani shoal; the various dangers south east of Cochin China were next to engage his attention.

Mr. E. Wilds in the *Swallow* had run several meridian distances, and re-surveyed the shallows of the Wusung river. This vessel had succeeded the *Actæon* and *Dove* in northern China.

In Australia, Commander Cox at Port Phillip, Hutchison in Spencer's Gulf, Sidney in New South Wales, with Lieut. Brooker in Tasmania, and Mr. Jeffery on the coast of Queensland, all did good work.

The progress of Lieut. Brooker, after a survey of Hobart Town, was cut short in consequence of the colony being unable to share in the expenses of the survey with the Admiralty.

Captain G. H. Richards in the *Hecate* completed Vancouver Island, and was on his way to England, leaving Mr. D. Pender, the master of the *Hecate*, to complete the survey of British Columbia.

Captain Orlebar remained engaged on the shores of Newfoundland; while Captain P. Shortland followed up his former labours in Nova Scotia and the Bay of Fundy.

In the West Indies, Mr. Parsons completed 70 miles of coast line of the Grenadines, St. Lucia, and St. Vincent. Plans were made by him of Admiralty Bay in Bequia Island, and Kingston Bay in St. Vincent; also of Castries Port in Santa Lucia. Falmouth Bay of Antigua had been commenced.

(Continued under the hydrographership of Vice-Admiral Sir George Richards.)

MEMOIRS OF

CAPTAIN THOMAS SMITH, R.N.

1837-53.

Thomas Smith entered the Navy in August, 1816, as a first-class volunteer, on board the *Weymouth*, in which vessel he served until November, 1820, in the Baltic, Mediterranean, and on the Cape of Good Hope stations. When on the latter station he assisted in the survey of Algoa bay.

From March, 1821, to June, 1823, he served as midshipman of the *Snap*, on the coast of Newfoundland, during the greater part of which period he commanded the *Scrub* tender.

From June, 1823, to March, 1827, still on the coast of Newfoundland, he commanded, as a mate, the *Inspector*, tender to the *Snap*, at this time commanded by Lieutenant (afterwards Admiral) F. Bullock.

Between the months of April, 1827, and July, 1829, he served on the North Sea survey in the *Protector*, under Captain William Hewett.

He returned as a mate to the *Blossom*, Captain Richard Owen, in the West Indies, from July, 1829, to May, 1830, when he became an Acting Lieutenant, and returned to England in that capacity in September, 1832.

From March, 1833, to May, 1837, he served as Lieutenant of the *Thunder* under the same captain, still on surveying duty in the West Indies. He then returned to England, and in September, 1837, obtained command of H.M. schooner *Lark*, as tender to the *Thunder*, for surveying service on the West Indian station. The *Lark* saw a great deal of rough service, while so engaged under Lieutenant Smith. She was the only vessel on the Great Bahama bank that rode out the fearful hurricane of September 6th, 1838, in safety. Extracts from her log book on this hurricane are largely quoted in the pamphlet on *Revolving Storms*, published by the Admiralty. Lieutenant Smith retained the command of the *Lark* until April, 1841.

In August, 1842, he was appointed as a Lieutenant and Assistant-Surveyor to the east coast of Scotland survey, under Captain Otter, at that time being carried on in boats, and in March, 1844, continued in the *Sparrow*, when that vessel was utilized for the same work under Captain Otter.

In June, 1846, he was promoted to the rank of Commander, but continued as additional of that rank, on the north and west coast of Scotland surveys, in the *Sparrow*, *Avon*, and *Comet*, until about the year 1853, when Captain Otter was transferred to the command of the *Porcupine* for service in the Baltic.

It will thus be seen that Commander Smith served for nearly 30 years in the surveying branch of the Navy, almost the whole of which period was actively spent in command of small craft and tenders, chiefly on the North American and West Indian station.

In June, 1856, he became a Captain on reserved half-pay.

COMMANDER J. P. SANDERS, I.N.

1844-48.

The first account of this officer is when he acted as Master of *Palinurus*, under Commander Moeresby, for the survey of the northern portion of the Red Sea in 1829.

On the return of the *Palinurus* to Bombay early in 1833, the examination of Hadramant, or the southern coast of Arabia, was commenced, the Indian Government being desirous of establishing coal depôts at Macallah and the island of Socotra for the line of steamers between Bombay and Suez.

So little of the coast of Hadramant was known, that there was an inaccuracy of 85 miles in the latitude of Macallah, and other errors in the Kooria Moorah group.

Commander Haines had charge of the survey, and reached his ground off Ras el Jezirat or Ras Madraka, about the middle of November, 1883, in the *Palinurus*. With him, as Third Lieutenant and Assistant-Surveyor, sailed Sanders.

Having completed about a hundred miles of the coast, circumstances rendered it necessary for the *Palinurus* to visit Socotra island, which was triangulated and finished by the 14th March, 1834. The survey of the south coast of Arabia was then suspended for about thirteen months, but resumed early in 1835, when Lieutenant Sanders occupied the post in the *Palinurus* of Senior Lieutenant and Assistant-Surveyor.

The result of this survey was a chart of the south coast of Arabia, from Ras Misenat to the entrance of the Red Sea, on a scale of six miles to a degree, together with numerous plans and a valuable memoir, giving "a description of about 500 miles of the southern coast of Arabia, hitherto almost unknown, and an account of its population, government, and commerce."

Commander Sanders succeeded Captain Haines in the Arabian coast survey, and contributed a paper descriptive of the proceedings of the *Palinurus*, which was published in the Royal Geographical Society's Journal, Vol. XVI. p. 169.

In 1844, he was again sent to continue the unfinished portions of the Arabian coast, assisted by Lieutenants Fell, Constable, Ward, and Whish. The work was completed in 1845.*

Commander Sanders, whose health had suffered severely from his exertions, both in the Red Sea survey and on the coast of Arabia, died at sea, near Malta, on his way to England, in the year 1848.

The following charts were published from his surveys:—

- South-east coast of Arabia, from Misenat to Ras Saugra.
- North-east coast of Arabia, from Ras Saugra to Muscat.

COMMANDER W. B. SELBY, I.N.

1841-55.

As a midshipman, Selby sailed in the *Palinurus*, October, 1837, from Bombay, under Lieutenant Carless, which vessel was ordered to complete the survey of the African coast between Cape Guardafui and Ras el Bir, and then to make plans of Karachi and Sonmeanee. By the 28th April, 1838, the survey of the east coast of Africa had been completed from Ras Jered Hafoon (ten miles south of Cape Guardafui) as far as Ras Gulwaini. Scurvy breaking out amongst the crew, now caused operations to be suspended, the *Palinurus* proceeding to Mocha and thence to Bombay.†

In 1841, Lieutenant Selby joined the *Assyria*, in succession to Lieutenant M. Lynch, whose health had broken down, for a continuation of the survey of the Mesopotamia rivers, that vessel and the *Euphrates* being under the charge of Lieutenant Campbell.

During the absence of the latter officer at Beles, Selby explored the rivers Karoon, Dizful, Kirkbah, Hie, and Bamisheer. He fully established the practicability of the navigation of the Bamisheer, and proved the possibility of communicating by steam between the Euphrates and Tigris by the Hie.

Sir Roderick Murchison, in his address to the R.G. Society of May, 1844,‡ remarked that "Lieutenant Selby, by his courage, his perseverance, and his scientific knowledge, was

*The second survey of the Arabian coast enabled Dr. Carter to make and record those valuable geographical and geological observations, which have since, from time to time, been published. (Markham's Memoir of the Indian Surveys, p. 24).

† Chiefly abridged from Lieut. Low's History of the Indian Navy. Vol. 2.

‡ Royal Geographical Society's Journal for 1844.

admirably adapted for an expedition of this nature. He has connected by scientific observations the course of the Eulæus, the Choaspes, the Coprates, and the Pastigris, with the range of mountains forming the great chain running to the east of Shuster, and with the rivers Euphrates and Tigris. He has proved the practicability of rivers, the course of which was hitherto almost unknown."

In June, 1841, Lieutenant Selby was severely wounded in an encounter with Arabs on the western bank of the Tigris, and consequently had to invalid to England.*

In 1846, the mouths of the river Indus were surveyed by Commander Selby, in the *Tapti* brig, assisted by Midshipmen Taylor and Stroyan. He drew maps showing the "great swatchway," in which there is a sudden dip from 10 to 40 and 68 fathoms, and so on to 120.

In the *Palinurus*, with Lieutenants Ward, Sweny, May, and Bewsher, having the *Nerbudda* cutter, under Lieut. Forster, for a tender, he surveyed the coast of India between Cape Comorin and Beypoor. He also constructed a map showing the prevalence of a constant circular current prevailing between the Malabar coast and the Laccadives. In the memoir which accompanied his drawings, Commander Selby described the remarkable mud bank at Aleppy, and entered at some length on the effects of the fearful cyclone of 1848 in the Laccadive group.†

From 1848 to 1850, he was engaged in the *Tapti*, in making an important chronometric survey of the Bombay bank of soundings, assisted by Whish and Sweny, the former of whom subsequently surveyed Bombay harbour. Commander Selby also surveyed the entire approach to Bombay harbour from lat. 17° 30' N. to 19° 30' N., and connected the North Canara with the Gujrat coast, including the tail of the Malacca banks.

In 1855, Commander Selby took charge of the Mesopotamia survey in the *Comet*, having with him as assistants Lieutenants Collingwood and Bewsher. These officers made a trigonometrical survey of the region west of the Euphrates, including the sea of Nejf, and the portion of Mesopotamia from Samarra on the Euphrates to a point about 10 miles above Baghdad on the Tigris. The former portion was completed and sent home in 1861, with an elaborate memoir by Commander Selby. The maps were afterwards re-drawn by Lieutenant Collingwood.

Commander Selby, while tracing the old bed of the Euphrates and surveying the Bahr-el-Nejf, were exposed to much harassing work among the marshes. He also sent in accurate plans of the irruptions from the Tigris, and showed that, before long, if no efficient steps were taken to check the evil, that river would be as unnavigable as the Euphrates now is.

The latter portion of the survey from above Baghdad to Tel Ibrahim, and from Tel Ibrahim to Samarra on the Euphrates, was commenced in October, 1862, and at about the end of that year Commander Selby retired, the survey subsequently being carried on by Lieut. Bewsher.

Commander Selby died the 24th of May, 1876, to the extreme regret of his old brother officers, and lies buried in the Higher Cemetery, Exeter.

The following charts were published from Captain Selby's surveys:—

Chronometric survey of Bombay bank of soundings.
West coast of India, Kundari island to Arnol island.
Malabar coast, sheets 1, 2 and 3.
Various maps of parts of Mesopotamia.

At page 219 of Vol. XIV. of the R.G.S. Journal is a paper by Lieut. Selby on the Karun and Dizful rivers, and the Ab-i-gargar canal to Shuster.

* He bore to the grave many scars of this desperate encounter, as well as some slugs which were imbedded in his skull, and could only have been extracted at the cost of his life.

† Markham's Memoir of the Indian Surveys, page 25.

COMMANDER ALBANY GRIEVE, I.N.

1845-58.

The first surveying record of this officer appears to have been, when, in October, 1833, he joined the *Palinurus*, under Captain Haines, as a Lieutenant for the survey of the south-coast of Arabia. This survey was temporarily discontinued in 1837, and in that year Grieve was engaged under Lieutenants Powell and Ethersey, on the survey of a part of the gulf of Manar and Palk strait, with the Paumben channel and Ceylon coast to Colombo.

In 1838, the surveying officers were re-called from the Ceylon coast, and we next find Lieutenant Grieve engaged with Lieutenant Selby as assistants to Captain Carless on the survey of the African coast, between Ras Hafun and Ras Gulwaini.

From 1839 to 1844, surveying operations in India fell to a low ebb, owing chiefly to the officer [at that time at the head of the Indian Navy not appearing to understand their value.

In 1845, however, Lieutenant Grieve, assisted by Lieutenant Ward, was permitted to continue and complete the Arabian coast, which had been commenced by Captain Haines in 1833, and continued by Captain Sanders. He then carefully charted the islands lying to the west of Socotra. Lieutenant Grieve, in 1848, surveyed the Somali coast between Berbera and Ras Gulwaini, and the islands between Socotra and Cape Guardafui, thus completing the gulf of Aden; he also compiled a fine chart of the whole, as far as Socotra, and is said to have been a very accomplished draughtsman, and rapid surveyor.

The coast of Scinde and gulf of Kutch next appear to have been the scene of his labours; here he was again assisted, in 1848-49, by Lieutenant Ward.

In 1853-54, he completed the Katiawar coast between Purbunda and Diu head, and made an elaborate plan, assisted by Lieutenant Constable, of Karachi harbour, and he was then directed to survey the maze of creeks and channels in the delta of the Indus.

Commander Grieve had completed the surveys of the Scinde, Kutch, and Katiawar coasts, as well as that of Karachi, just before his sudden death, which took place January 17th, 1858.

When Mr. Parkes, the eminent engineer, under whose auspices the harbour improvements at Karachi and the harbour works at Madras have been carried out, surveyed the former harbour, he took Commander Grieve's chart as the general basis of his work, that officer co-operating with Mr. Parkes up to the day of his untimely end.

The following charts were published from the surveys of Commander Albany Grieve, who was reputed one of the ablest surveyors of the Indian Navy:—

Gulf of Maseera.

Islands west of Socotra.

Coast of Scinde and Kutch.

" " from Kaka river to Mandavi.

Karachi harbour.

He also assisted largely in the surveys, from which charts were published, of the

South-east coast of Arabia.

North-east coast of Arabia.

Gulf of Aden.

Paumben Pass and the N.W. coast of Ceylon.

CAPTAIN E. K. CALVER, R.N., F.R.S.

1847-72.

Edward Killwick Calver, born December, 1813. This officer entered the Navy July, 1828, as second-class Volunteer, on board the *Crocodile*, fitting for the East Indies, where he attained the rank of Master's Assistant, and where he was constantly absent in the boats in search of pirates, along the shores of the Malay peninsula. On his return to England, in the autumn of 1832, he joined the *Satellite*.

In that vessel he was at first employed in blockading the coast of Holland, and afterwards in cruising for slavers on the Brazilian station, where he assisted in making several prizes, in one of which he was detached. Both in the *Crocodile* and *Satellite*, Mr. Calver (who passed his examination for Second-Master at Valparaiso, 11th October, 1834), seized all the surveying opportunities that presented themselves; executing plans of ports in the East Indies, in Australia, and in South America, which were highly approved of by his respective Commanders-in-Chief, and by the authorities at home.

So great was the zeal he displayed in this respect that, in April, 1836, soon after his arrival home, he was appointed Assistant-Surveyor to the east coast of Scotland survey, conducted by Commander Michael Atwell Slater, to which he continued attached for upwards of four years, when he became Assistant-Surveyor to Capt. John Washington, who had been selected to complete the survey of the North Sea, left unfinished by the death of Capt. Wm. Hewett, who was lost with all hands in H.M.S. *Fairy*. On this service he was employed in the *Shearwater* and *Blazer* (his promotion to the rank of Master took place 28th January, 1842), until October, 1847.

During that period, "in addition to the offshore deep-water survey of the North Sea on which the ship was engaged," Capt. Washington reported that "Mr. Calver took advantage of the times the vessel was coaling and refitting in harbour, to complete elaborate plans of Harwich and the rivers Orwell, Stour, and Deben, besides closely watching the ever-shifting sands which line the entrance into Yarmouth and Lowestoft Roads, which were surveyed several times, during which the Stanford Channel, a new and more direct south entrance into Yarmouth Road, was discovered. During the period the Harbours of Refuge Commission was holding its inquiries at Dover, Eastbourne, and Seaford, Mr. Calver carefully sounded the roadsteads, and made the plans, &c., on which the reports of that commission were based."

From October, 1847, to March, 1872, he continued in charge of the survey of the east coast of England, but he also made surveys of numerous ports on the west coast between these dates.

His survey of the river Tyne, executed on a most elaborate scale, was exhibited at the Great Exhibition of 1851, where it received marked approval.

In 1852, Sir Francis Beaufort thus recorded his opinion of Captain Calver, after an acquaintance with him of sixteen years—"I do not believe there is an officer in the whole Navy who has more fully justified the confidence that has been reposed in him, or more entirely merited the protection and favour of their Lordships."

Between the years 1847 and 1864, Captain Calver surveyed the rivers Tyne, Tees, Humber, Ribble, Clyde, and Thames estuary, Hartlepool bay, Redcar, Spurn, Yarmouth, Lowestoft roads, and Dover bay. He also compiled Sailing Directions for the Shetland islands, Orkneys, north and east coasts of Scotland, east and west coast of England including Wales, and for the continental coast from Calais to the Elbe.

Further, he made special reports to the Secretary of the Admiralty upon a number of the above ports.

As North Sea surveyor, he was appointed in 1855, by Sir James Graham, to take pilot charge of a squadron of line-of-battle ships, and other vessels carrying an expeditionary corps of the French from Calais to the Baltic, and received the approval of the Lords of the Admiralty for the same.

He passed for a line-of-battle ship in July, 1855. In August, 1858, he was appointed to the important post of Secretary to the Harbours of Refuge Commission, but the condition of his health soon compelled him to resign.

During the latter years of his service he commanded H.M.S. *Porcupine*, a paddle steam

vessel, lately replaced by the *Triton*. He was promoted to the rank of Staff-Commander in June, 1863, to Staff-Captain in March, 1870, and retired with the rank of Captain in March, 1872, after a period of 44 years (we believe unbroken) service.

Staff-Captain J. Parsons succeeded him in command of the *Porcupine* and charge of the east coast of England survey.

Captain Calver, who is a Fellow of the Royal Society, since his retirement, was for some time engaged in executing a survey and writing a report on the River Thames, in connection with the alleged silting and fouling of that river owing to the discharge of the metropolitan sewage at Erith, for the Thames Conservancy Board.

Captain Calver made several important reports, extant in the shape of Parliamentary papers, upon questions connected with the state of the rivers and harbours on the east coast of England.

The following were also published from his pen :—

On the Conservation and Improvement of Tidal Rivers. 8vo. 1853.

Proposal for the Improvement of Southwold Harbour. 8vo. 1856.

On the best Site for a Harbour of Refuge on the east coast of England. 1857.

On the construction and principle of a Wave Screen designed for the formation of Harbours of Refuge. 8vo. 1858.

Admiralty charts as follows were published from his surveys :—

Port Patrick.

The Downs.

North Foreland to the Nore.

Harwich.

Orwell and Stour Rivers.

Pakefield Gateway to Orfordness.

Yarmouth and Lowestoft roads.

The Wash.

Scarborough.

Tees Bay.

Sunderland Port.

Tyne River.

Wick Port and vicinity.

Also, numerous additions and corrections to the general coast sheets of Great Britain, and to the former surveys of other officers.

VICE-ADMIRAL W. J. S. PULLEN.

1857-65.

This officer served for five years, or from 1836 to 1841, as First Assistant-Surveyor in the colony of South Australia, under Colonel Light. For two years he held the position of Marine Surveyor to the colony mentioned. His first appointment as an Assistant-Surveyor was made in June, 1842.

Having passed his examination in 1844, he served for five-and-a-half years on the survey of the Bay of Fundy, at that time under the direction of Captain W. F. W. Owen. He was promoted to the rank of Lieutenant in 1846. Lieutenant Pullen was then selected for service in the Arctic Regions, and commanded a boat party engaged in exploring part of the north coast of America.

In Sir Edward Belcher's Arctic expedition in search of Sir John Franklin of 1853-54, Commander Pullen commanded the *North Star* store ship. He was promoted to the rank of a Post-Captain in May, 1856.

In August, 1857, Captain Pullen was appointed to command the *Cyclops*, engaged in deep sea sounding in the Red Sea, and ascertaining the best route for the Red Sea and Indian telegraph cable. He was then employed in the same vessel surveying on the north-east and south coasts of the island of Ceylon. The *Cyclops* on the voyage out to the East Indies, as well as in returning to England, obtained several deep sea soundings. He took charge of the Bermuda islands survey in 1862, and retired from active surveying labour in 1865. He became a retired Rear-Admiral in June, 1874, and Vice-Admiral in February, 1879.

The Admiralty chart of S.E. coast of Ceylon, Kirinde to Jules Naves Point is from his survey, 1860.

CAPTAIN D. AIRD, R.N.

1849-65.

David Aird entered the Navy June, 1832, as First-Class Volunteer on board the *Mastiff*, in which vessel until Feb., 1836, and from June following until May, 1841, as Midshipman, and in the *Beacon* as Mate, under Captain Copeland and Lieut. Graves, he was employed surveying in the Mediterranean.

He was next, from Nov., 1841, until Jan., 1848, engaged on similar service on the coast of New Guinea and Torres strait, as Mate and Assistant-Surveyor in the *Fly*, Captain Francis Price Blackwood, and as Mate and Lieutenant in the *Bramble*, Lieut.-Com. Charles Bampffield Yule. He commanded the *Prince George* and *Castlereagh*, tenders to those vessels, during the arduous and dangerous survey of the Great Barrier Reef, on the east coast of Australia, and also in the survey of the south-east coast of New Guinea.

His next appointment was in 1848, to the *Dragon* steam-frigate, Capt. Wm. Hutcheon Hall, on the Irish station, from which ship he removed, in April, 1849, to the *Sparrow* surveying vessel, Capt. George Augustus Frazer.

He continued to be employed from 1849 to 1861 on the west coast of Ireland, under Captain Frazer, and subsequently with Staff-Commander R. Hoskyn.

From 1861 to 1864, he was transferred to the Hebrides, under Captain Otter, and succeeded to the charge of the survey in April, 1864.

He retired from active surveying employment on the 1st of April, 1865.

CAPTAIN R. HOSKYN, R.N.

1853-73.

Richard Hoskyn was first employed in the surveying service of the Navy, under Captain Hewitt, in the North Sea, where he served from March, 1835, to July, 1836.

He was next employed in the Mediterranean, under Captain T. Graves, between the years 1836 and 1843, on board the *Mastiff* and *Beagle*, principally employed in the Grecian Archipelago. It was not until April, 1843, however, that he was made an Assistant-Surveyor, his rank at the time being that of Master.

Between the years 1843 and 1853, Mr. Hoskyn was engaged as Assistant-Surveyor to Capt. G. A. Frazer on the north and west coasts of Ireland, and in the latter year succeeded to the charge of the survey, in which he continued until 1862.

In June, July, and August, 1862, he was appointed to the command of the *Porcupine* for the purpose of taking deep sea soundings off the west coast of Ireland, principally to ascertain whether the sudden dip of from 550 to 1,750 fathoms found by Commander Dayman in the year 1857, in the parallel of 52° 15' N., extended farther to the north or south, and to endeavour to seek out a more gradual slope into the bed of the ocean for the Atlantic Submarine Cable.

This was satisfactorily accomplished by the end of September, 1862.

In June, 1863, Mr. Hoskyn was promoted to the rank of Staff-Commander, and in April, 1864, we find him appointed as Chief draughtsman to the Hydrographic Department. He succeeded Rear-Admiral G. A. Bedford as Superintendent of Charts in that department about the year 1865.

Captain Hoskyn died somewhat suddenly, from the results of over-mental exertion, as Superintendent of Charts in the Hydrographic Department in 1873. Prior to his decease he had retired with the rank of Captain.

The late Sir Bartle Frere, in his address as President of the Royal Geographical Society, in alluding to the death of Captain Hoskyn, remarked—

"Captain Hoskyn had served long in the regular line of the Naval service, as well as on Foreign and Home surveys. With a richly-stored mind, a well-regulated temperament, and unwearied powers of application, he was, fortunately for hydrography, in 1865, selected to fill the responsible office of Superintendent of Charts. By the remarkably efficient and genial manner in which he performed his duties, the esteem and friendship of all those who were associated or came in contact with him in official life, were secured, and few men have died more regretted than Richard Hoskyn."

He compiled *Sailing Directions for the coast of Ireland, Part 1, south, east, and north coasts.* 1866.
Also, a pamphlet, entitled *Deep Sea Soundings, West of Ireland, in H.M.S. Porcupine.* 1862.

The following were amongst the Admiralty charts published from his surveys:—

Drogheda to Carlingford.	Donaghadee Harbour.
Carlingford Lough Entrance.	Lough Larne.
Carlingford Lough with Newry River.	Lough Foyle.
Lough Strangford.	Wicklow Roadstead.

CAPTAIN J. JEFFERY, R.N.

1842-1868.

James Jeffery entered the Navy in January, 1826, as a volunteer of the second-class on board the *Spartiate*, Captain Warren. On the 17th January, 1828, he became a Master's Assistant, continuing in the same vessel until the following September.

He served next as Master's Assistant of the *Pearl* for three years, or until April, 1831, on the coast of Ireland, and from June, 1831, to March, 1833, in the *Samarang*, Captain C. H. Paget, on the South American station. For a short period he held the appointment of Acting Master of the *Hornet* on the same station, and after returning to the *Samarang* was paid off 24th January, 1835.

He then joined the *Meteor*, Commander Belcher, as Acting Master, and was employed on the survey of the Irish channel in that vessel and the *Carron* until November, 1835, when the latter was paid off.

Returning to the general service, Mr. Jeffery was then employed in the West Indies as Second Master, Acting Master, and Master of the *Melville*, the *Racehorse*, the *Pilot*, and the *Winchester*, between the months of January, 1836, and March, 1842.

In July, 1842, he was appointed Assistant-Surveyor to the Scotch survey, under Captain Otter, and continued to serve under that officer in the *Sparrow*, the *Avon*, and the *Comet* for twenty years, or until April, 1862, when he was appointed to the charge of the survey of Queensland.

He was promoted to the rank of Staff-Commander in June, 1863, and remained in command of the Queensland survey until relieved in 1867 by Staff-Commander Bedwell. Captain Jeffery's date as a retired Captain is the 2nd of April, 1868.

The following charts were from Captain Jeffery's surveys:—

Loch Moidart (W. coast of Scotland).	Moreton Bay.
East coast of Australia.	Great Sandy Strait, northern portion.
Danger Point to Cape Moreton.	

CAPTAIN J. RICHARDS, R.N.

1854-1872.

John Richards was employed in H.M.S. *Sulphur* under Captain (afterwards Sir) Edward Belcher, between the years 1835 and 1842, as a Master's Assistant on the west coast of America, Pacific islands, and China. Captain Belcher remarked of him "that he had constantly served during the whole period immediately under his own eye, either in the boat or at the charts, the documents sent to office abundantly testifying to his abilities, and that he wished to keep him as a follower."

In 1842, he was for some months engaged at the Hydrographic Office of the Admiralty, finishing the *Sulphur's* charts.

Again, from 1842 to 1847, he served under Sir Edward Belcher in the *Samarang*, and not being able to obtain his commission as a Master in the surveying service, solicited and obtained an appointment in the regular service as Acting Master.

He then served as Master of the *Geyser* and *Hecate*, from September, 1847, during a period of 5 years and 9 months, on the Cape station, the West Indies, and the home stations. Whilst so employed he made and sent to the Hydrographic Office surveys of several places only known by name before, for which he received the thanks of each Commander-in-Chief, under whom he served, viz., Admiral Dacres, at the Cape, in 1848; Admiral Sir George Seymour, in the West Indies, 1853; and Commodore Martin, at Lisbon, in 1851. He also received the thanks of the Lords of the Admiralty by a letter dated 23rd December, 1851, for surveying the bar and entrance of the river Tagus.

Early in the year 1854, he was appointed to the command of H.M. brig *Saracen*, for surveying service in China and the Eastern seas. Amongst the more important surveys executed by him during this cruise, which extended for 5 years and 2 months, or until June, 1859, were the river Min, S.W. coast of Formosa, Strait of Tsugar in Japan, and about 1,000 miles of the coast of the gulf of Siam, besides numerous small surveys of ports and anchorages, as well as several track surveys.

In June, 1859, he was appointed as Assistant-Surveyor to the Channel island survey, under Commander Sidney, and succeeded that officer in the command in June, 1861. He continued in charge of this survey and that of the west coast of England until March, 1872, when he retired with the rank of Captain, having been promoted to that of Staff-Commander in June, 1863.

The following Admiralty charts are published from the surveys of Captain John Richards:—

Siam Gulf. Palo Kapas to Cape Patani.

Sheet 1, Lem Tane to Koh-ta-kut.

" 2, Koh-ta-kut to Cape Liant.

" 3, Cape Liant to Koh-kut.

" 4, Koh-kut to Bay Island.

" 5, Bay Island to Pulo Obi.

Koh Tron and Channels leading to.

Kamput Anchorages.

Menam Chau Phya or Bangkok River.

Pulo Condore Group.

Pratas Reef and Island.

Tsugar Strait.

Min River, from the entrance to Fu-chau-fu.

Channel Islands, south portion and adjacent coast of France.

Channel Islands, north portion and adjacent coast of France.

Jersey, in three sheets.

Morecambe Bay, and various additions and corrections to charts of the different Channel Islands, and parts of the west coast of England.

He also published in 1855, in 8vo., Notes on some places visited during a Surveying Expedition round the coast of Japan and Korea, in the summer of 1855.

CAPTAIN F. W. SIDNEY, R.N.

1842-1869.

Frederick William Sidney joined the Navy as a volunteer of the first-class on board the surveying vessel *Thunder*, in April, 1833. Became a midshipman in April, 1835, and a Mate in April, 1839. The *Thunder* was engaged in the West Indies during the early part of this period under Commander Owen. For four years Mr. Sidney performed the duties of an Assistant-Surveyor without remuneration, and a portion of his West Indian service was spent in the *Lark* schooner, tender to the *Thunder*, commanded by Lieutenants Barnett and T. Smith.

In January, 1839, he was lent to the *Magnificent* at Jamaica, to enable him to pass his examination for a Lieutenant, which he did in April, 1839. Having suffered from yellow fever when at Jamaica, he was recommended to return to England for the benefit of his health; his six years' service in the West Indies and constant exposure in boats having greatly debilitated his constitution.

In January, 1840, he was appointed to the *Beacon*, Lieutenant Graves in command, employed on surveying service in the Mediterranean, where he continued until August of the same year, when he was ordered by the Admiralty to return again to England for service in the Niger Expedition, then resolved upon.

In 1841, he was appointed Mate and Assistant-Surveyor, under Captain Trotter and Commander Bird Allen, in the *Soudan* and *Wilberforce* steam vessels, in which he made a survey of the Cameroons river, and of the Niger, as far as its confluence with the Chadda river. For this service he was promoted to the rank of Lieutenant in January, 1842, and having been paid off in September of the same year, was engaged for a short time preparing the charts made during the expedition, at the Admiralty.

In December, 1842, he joined the *Slyx* as Chief Assistant-Surveyor, under Captain Vidal, for the survey of Madeira and the Azores, or Western islands.

We next find him in April, 1845, appointed as Chief Assistant to the survey of the west coast of Ireland, under Commander G. A. Bedford, in which capacity he continued for about ten years.

In 1854, he was appointed to the charge of the survey of the entrance of the river Plate, including the mouths of the Parana and Uruguay, and roadsteads of Buenos Ayres and Colonia, with the English bank outside Monte Video. This survey, in which he had only a young Master's Assistant to aid him, he carried out in a small vessel fitted under his own auspices, and named the *Indian*. He re-joined the survey of the north-west coast of Ireland in 1857 for a few months, and in 1858 was appointed in charge to that of the Channel islands.

He was made a Commander on the 1st January, 1859, and continued in the Channel islands until, in June, 1861, he was appointed to the charge of the survey of New South Wales, which he carried out in a hired schooner, the *Captain Cook*.

In 1863, after the loss of H.M.S. *Orpheus*, he re-surveyed the Manukau bar, New Zealand.

Promoted to the rank of Captain in 1867, he was, in 1868, obliged to invalid on account of injury to his eyesight, and retired in April, 1869.

Sir Roderick Murchison, in his presidential address of 1869, to the Royal Geographical Society, remarked that "The seaboard of New South Wales, from Cape Howe on the south to Danger point on the north, embracing 600 miles of latitude, had been completed; and its ports and anchorages surveyed with all the accuracy necessary for ocean navigation, or indeed for any purpose. The survey was commenced by Captain Sidney in 1861, who had retired after a long and meritorious service of 34 years, during which he was constantly engaged in surveying duties in various parts of the globe."

The following charts were published from the surveys of Captain Sidney:—

Entrance to the Rio de la Plata.	Beecroft Head to Port Jackson.
Buenos Ayres Road, and adjacent coast from	Port Jackson to Port Stephens.
Quilmes to Punta Olivos.	Broken Bay.
Channel Islands, 2 sheets.	Newcastle Harbour.
Alderney and Caskets.	Port Stephens.
Alderney Harbour.	Port Stephens to Tacking Point.
Guernsey, Herm, and Serk, 3 sheets.	Tacking Point to Coffs Island.
Manukau Bar (New Zealand).	Coffs Island to Evans Head.
<i>East coast of Australia.</i>	Solitary Islands and adjacent coast.
Montagu Island to Beecroft Head and Ulladulla	Evans Head to Danger Point.
Harbour.	

NAV.-LIEUT. F. SKEAD, R.N.

1841-1865.

Francis Skead first entered the surveying service of the Navy in China, under Captain Kellett, in the year 1841, and continued to serve under that officer, Captain Collinson, and Lieutenant Thornton Bate until 1846.

He then entered the general service of the Navy, and served for some time in H.M. troopship *Sapphire*.

Re-joining the surveying service in 1849, he served for nine months on the coast of Scotland, under Captain Robinson.

From 1850 to 1855, he was employed under Captain Collinson on Arctic service, having returned from which, he was appointed as Master and Assistant-Surveyor to the Cape of Good Hope survey, under Commander Joseph Dayman, in July of the latter year.

In February, 1856, on the retirement of Captain Dayman from the Cape of Good Hope, Mr. Skead succeeded to the charge of the survey, which he continued to hold until January, 1865, when he retired from active service, and accepted the post of Port Officer at Natal.

The following charts are from Nav.-Lieut. Skead's surveys:—

Table Bay.
Cape Agulhas to Mossel Bay.
Mossel Bay to Cape St. Francis.
Mossel Bay.

Knysna Harbour.
Cape St. Francis to Waterloo Bay.
Port Elizabeth.
Zambesi River, mouths of.

He also wrote—Sailing Directions from Sunday River to Point Padrone, including the Bird Islands; also, notes upon the mouth of the river Kei, made in November, 1856. 8vo. *Cape Town*, 1857.

CAPTAIN A. B. USBORNE, R.N.

1845-1867.

Alexander Burns Usborne joined the Navy in March, 1825, as Second-Class Volunteer, on board the *Thetis*, in which vessel he continued to serve until March, 1831, latterly as a Master's Assistant.

After being attached to the *Revenge* for a few months, he was, in July, 1831, appointed to the *Beagle*, Captain Robert Fitzroy, with whom he continued until February, 1837.

In May, 1833, he was made an Assistant-Surveyor, the *Beagle* being employed on the survey of the east and west coasts of South America, and amongst the Falkland islands.

From February, 1837, to May, 1839, he was employed on the coast of Australia, under Commander Wickham, in the same vessel; but had to be invalided in consequence of being shot through the body by a musket ball, whilst engaged on surveying duty in charge of two boats.

In consequence, he was attached to the Hydrographic Office from November, 1840, to December, 1841, and then transferred to the east coast of Ireland, as an Assistant-Surveyor, in the *Comet*, under Captain G. A. Frazer. On his leaving Captain Frazer that officer certified that—

"During the time I have been in the Navy, I have never met a more correct and zealous officer than Mr. Usborne, and I am happy at having this opportunity of bearing testimony to his merits, not only as a seaman, but also as a surveyor."

From April, 1845, to March, 1847, Mr. Usborne was employed on the west coast of Ireland, under Commander G. A. Bedford, and under Commander Beechey, on the survey of the same coast, from the latter date to January, 1855.

He was then transferred to the survey of the south coast of Devonshire, under Captain Stokes and Commander Cox, from January, 1855, to March, 1863, and then to the southern islands of the Hebrides, under Captain Otter.

In June, 1863, he was promoted to the rank of Staff-Commander, and in 1864 succeeded to the command of H.M.S. *Bann*, a paddle surveying vessel, on the retirement of Captain Williams. In the *Bann* he was engaged in obtaining the deep soundings off the coast of Cornwall, necessary to complete the charts of the west coast of England.

He retired with the rank of Captain in September, 1867.

STAFF-COMMANDER J. SCOTT-TAYLOR, R.N.

1854-64.

John Scott-Taylor first entered the surveying service of the Navy in August, 1838, under Captain Sheringham, with whom he served for one season on the coast of South Wales, and the ensuing season on the coast of Cornwall.

In 1839-40, he was appointed to the survey of the river Shannon and Fergus, under Commander Wolfe.

In April, 1841, as Master and Assistant-Surveyor, he was employed at Spithead in the *Sylvia*, cutter, and steam vessels *Rocket*, *Fearless*, and *Dasher*, in which surveys were undertaken from Bognor to Christchurch, including the Isle of Wight.

From 1849 to 1853, his name was placed on the books of the *Fisgard*, for the survey of the coast of England from Christchurch to Dartmouth. The whole of the period between April, 1841, and the same month of 1853, was spent under the command of Captain Sheringham.

From April, 1854, to 1857, he was engaged, again as Assistant-Surveyor, under Commander James Wood, on the survey of the isle of Skye, in Scotland.

In April, 1858, he was placed in charge of the re-survey of Portsmouth, Southampton, and the Isle of Wight. July, 1859, finds him in command of H.M.S. *Firefly*, under Commander Sidney, on the Channel island survey for four months, and he subsequently fitted that vessel out for the Mediterranean survey, to which she was sent for the contemplated coast of Syria survey, under Commander A. L. Mansell.

In February, 1860, Mr. Scott-Taylor was instructed to survey Woolwich on a scale of 70 inches to the mile, after which he was continuously engaged for about four years, or until March, 1864, re-sounding the neighbourhood of Spithead and Portsmouth bar and harbour, and noting the changes brought about by the extensive dredging operations which had been carried on.

In 1863, he was made a Staff-Commander, and retired from active service afloat in 1865.

CAPTAIN E. BURSTAL, R.N.

1846-1858.

From December, 1832, until September, 1833, Edward Burstal was employed in nautical surveying, though not borne on any ships books, in the cutter *Sylph*, on the river Thames. From September, 1833, to October, 1835, he was, as a volunteer of the first-class, on the books of the *William and Mary*, and as midshipman of the *Howe* and *Boxer*, Capt. Fred. Bullock, from Sept., 1833, until the early part of 1840, employed in surveying both the Thames and the Medway, and part of the coast of Kent. In 1837, he was appointed an Assistant-Surveyor. In 1840, he joined the *Cambridge*, and was present as Mate in the operations on the coast of Syria.

From June, 1841, until March, 1854, he was engaged, as Mate and Lieutenant, of the *Fearless*, *Tartarus*, and *Porcupine* steamers, all commanded by Capt. Bullock, and as Additional Lieutenant of the *Fisgard* guardship at Woolwich, in surveying the coast and dangers between Yarmouth and the Downs, including the rivers on the coast of Essex; and also in surveying the Swin, Dover strait, and the English Channel.

In 1846, he had temporary command of the *Porcupine*, during the famine relief service on the coast of Ireland. In March, 1854, and Feb., 1855, Mr. Burstal was successively appointed First Lieutenant of the *Alban* and *Firefly* steamers, both commanded by Capt. Hen. Chas. Otter. In those vessels he was actively employed in the Baltic. On 21st April, 1854, being in charge at the time of the *Alban's* cutter, off the island of Læsø, he caused

the surrender of two Russian merchant vessels, the *Aina* and *Nadeschda*. He assisted to lay down buoys and other sea-marks in places from which they had been removed by the Russians; and in the month of August, in the same year, accompanied a small squadron, under the orders of Capt. Francis Scott, of the *Odin*, which, threading its way through the difficult island navigation leading to Abo, made an effective *reconnaissance* of the defences of that town, consisting of batteries, gun-boats, &c. The *Firefly* was employed in June, 1855, in reconnoitring the fortress of Cronstadt, and was subsequently taken by Capt. Otter, to within 400 yards of Brandon, the seaport of Wasa, and there performed excellent service against the enemy, an ineffectual attempt to cut her off, being made by the Russians in considerable force. The operations referred to (attended with a loss to the British of only one man and a boy hurt), embraced the capture or destruction of six vessels, besides the destruction of numerous magazines, containing coal, tar, &c. In his report of the proceedings, Capt. Otter observed, "that he could not conclude without mentioning how much he was indebted to his First Lieutenant, Mr. Edw. Burstal, who had so materially assisted in inflicting this serious blow on the enemy's property." Mr. Burstal, whose gallant conduct was recommended to the favourable notice of the Admiralty by the Commander-in-Chief, was rewarded with the rank of Commander 29th Sept., 1855.

Commander Burstal received the Syrian and Baltic medals. He assisted in laying down the telegraph cable between England and France.

In May, 1856, Commander Burstal was appointed to the books of the *Fisgard*, for the re-survey of part of the river Thames, and so continued until the year 1858, when he retired from further active surveying service. Commander Cudlip acted as his assistant in this, his last, work.

He was promoted to the rank of Captain on the retired list in September, 1870, and for several years has held the responsible post of Secretary to the Thames Conservancy Board. Captain Burstal is author of a small but useful work entitled—

Handbook for Pilots and Coasters navigating the river Thames. 8vo. 1851.

COMMANDER F. A. CUDLIP, R.N.

1846-58.

Frederick Augustus Cudlip joined the surveying service of the Navy in March, 1824, as first-class volunteer on board the *Investigator*, master in command George Thomas, Esq., at that time engaged in the survey of the Shetland Islands. In that vessel he continued until December, 1828, when he was transferred as a midshipman to the *Sulphur*, Commander Dance, employed on the west coast of Australia, where Mr. Cudlip assisted in the survey of the Swan river.

From December, 1830, to February, 1831, he became Acting Lieutenant of the *Cruiser*, and at the latter date was transferred to the *Southampton*, flag-ship of Sir Edward Owen, by whose order he carried out surveys of Pulo Pitang and Pulo Cocob in the year 1832, in the strait of Malacca.

From February, 1833, to December, 1834, he held the appointment of mate of H.M.S. *Buffalo*, master-in-command E. Sadler, on the coast of New Zealand, when he assisted in the surveys of Wangaroa and Kiahow harbours.

From March, 1835, to November, 1836, he held the post of mate and Assistant-Surveyor of the *Carron*, Commander Edward Belcher, on the survey of the coast of Ireland.

March, 1837, to October, 1846, finds him successively in the *Fairy*, *Shearwater*, and *Blazer*, under Captains W. Hewitt and John Washington, surveying in the North Sea. He was made a Lieutenant in July, 1840.

From October, 1846, until the close of 1851, he was with his name on the books of the *Fisgard*, and as an Assistant-Surveyor in charge, he conducted surveys of various harbours in Scotland.

In March, 1854, he was appointed senior Lieutenant of the *Lightning*, Captain Bartholomew James Sullivan, under whom he was employed on various surveying and other service in the Baltic, where he assisted in examining the different ports, and in the attack on Bomarsund, had charge of a rocket party.

In November, 1854, he was promoted to the rank of Commander, and in August, 1856, was appointed with Commander Burstal to the books of the *Fisgard* for surveying service on the river Thames.

Commander Cudlip died at Greenwich, 11th February, 1858.

COMMANDER A. D. TAYLOR, I.N.

1853-1882.

Alfred Dundas Taylor joined the Indian Navy in May, 1841, and was appointed as midshipman to the *Hastings* in November of that year, but transferred in the ensuing month to the *Coote*, sloop of war.

In January, 1842, he was attached to the sloop of war *Elphinstone*, in the Persian gulf, and again to the *Hastings*, receiving ship at Bombay, in July, 1843.

His first appointment in the hydrographic service of India appears to have been in February, 1844, to the surveying brig *Tapti*. From 1844 to 1847, in that vessel, as a midshipman and Assistant-Surveyor, he was engaged under Commander Montriau surveying anchorages on the west coast of India; during the monsoon months being transferred to the gunnery and receiving ship *Hastings*, at Bombay. In the *Tapti*, as a contemporary of Taylor, served Whish, afterwards the surveyor of Bombay harbour.

In September, 1847, Taylor was promoted to the rank of a Lieutenant, and was subsequently appointed to the steam frigate *Ferooz*.

In October, 1850, he was appointed to the surveying pattimar *Pownah*, for the survey of the gulf of Kutch, and afterwards of the Malabar coast; in this he was assisted by Lieut. Whish, and Messrs. Barker, Stiffe, and Macaulay, midshipmen. The cutter *Maldiva* was also employed on the same service.

From June, 1858, to June, 1859, inclusive, he commanded the *Bheema*, surveying pattimar, and with him were associated Lieutenant Sweny, and Mates May, Bewsher, Williams, and Lewis. On the conclusion of the gulf of Kutch survey, the coast south of Bombay was taken in hand by Lieutenant Taylor. It was executed on a trigonometrical basis, with bases measured on shore, and included in six sheets, the coasts of the South Konkan, Canara, and Malabar. Its execution occupied a period of six years. He also surveyed the harbour of Karwar, the anchorages at Beypoor, and Cochin; and the bay of Cocanada, on the east coast of India in 1857. Lieutenant Williams afterwards completed the west coast of India between Boria and Bombay.

From June to September, 1859, Lieutenant Taylor was as a supernumerary of the *Ajdaha*, employed in completing chart work. In October and November of the same year he acted as head pilot of the steam frigate *Ferooz* in an expedition against the Waghers at Beyt and Dwarka, and at the latter end of 1859 returned to Europe on furlough.

Lieutenant Taylor received the thanks of the Court of Directors and Government of Bombay in 1853, for a wind and current chart of the Arabian Sea drawn up by him, and the approval of the same government for his services in connection with the expedition to Beyt and Dwarka.

For the satisfactory completion of many harbour surveys and reports, he received the thanks of the Government of Madras with a honorarium of Rs. 2,000.

It has been said of Commander Taylor, "that there is no man living who is so intimately acquainted with the anchorages on the Indian coast from the mouths of the Indus to those of the Godavari, or who so completely understands their capabilities for improvement."

On the abolition of the Indian Navy in 1863, Lieutenant Taylor was retired with the rank of Commander, and awarded a pension of £ 300 a year.

Between the years 1863 and 1866, he was employed at the India Office compiling the west coast of Hindostan Pilot, for the Admiralty; for which work, when completed, he received the thanks of H.M.'s Secretary of State for India.

From 1870 to 1873, Commander Taylor was engaged in preparing the first part of a new edition of Horsburgh's Directory.

In October, 1873, he was deputed to Calcutta to advise the Government of India on the subject of Maritime Surveys, on which subject he drew up a report.

In July, 1874, Commander Taylor was appointed Superintendent of Marine Surveys to the Government of India, an appointment he held until July, 1882, when he was retired under the Indian Government rule, that fifty-five years is the limit of age in which a Government servant shall be actively employed.

On his retirement, the Marine Survey Department of India, over which he had presided for 8 years, was abolished, the power and responsibilities attached to the post, being vested, by Government order, in a Captain from the Royal Navy, termed "the Director of Indian Marine."

In commenting on his departure from official life, a leading journal in India remarked that—

"Commander A. Dundas Taylor, Superintendent of the Marine Survey of India, who retired on the 1st instant under the 55 years' rule, has been for nearly 40 years connected with the surveying operations in this country. He leaves the service with the good wishes of all who are acquainted with him, and his genial, generous and kindly disposition, as also the valuable services he has rendered, will long be remembered by the maritime community throughout India."

The following works are by Commander Taylor :—

West coast of Hindostan Pilot. 1st Edition. 1866.

Sailing Directory for India, Africa, and South America. (Part 1). 1874.

Memoir to accompany chart of Winds and Currents of the Arabian Sea. 8vo. 1867.

On the Harbours of India. 12mo. 1870.

Numerous reports on Ports and Harbours in India, including a careful and complete review of all existing charts, or materials for charts (in India or England) of the coast from Pakchan river of Tenasserim, to Sonmiani Bay on the coast of Scindh, and of the islands in the bay of Bengal, &c.

A report on the Re-organisation of the Marine Survey Department of India. 1881.

Charts, as shown beneath, were published from Commander Taylor's surveys :—

W.C. India, sheet 9, Achera River to Boria Pagoda.

" " " 8, Cape Ramus to Achera River.

" " " 7, Huddee Point to Cape Ramus.

" " " 6, Purbidree to Bindoor Head.

" " " 5, Mount Dilly to Molky.

" " " 4, Calicut to Mount Dilly.

Gulf of Kutch.

Bate Harbour.

Coast of Katiawar, from Diu to Dwarka.

Cochin River, entrance, bar, and roadstead.

Coringa, or Cocanada Bay.

Wind and current chart for the Arabian Sea.

CAPTAIN C. G. CONSTABLE,* I.N.

1850-1863.

The above talented East Indian Surveyor, born in 1821, was the second son of the celebrated artist, John Constable, R.A. At an early age he showed great artistic talent, and drew and etched beautifully. Much against his father's wish he chose the sea for his profession, and first sailed with Captain Hopkins in the *Buckinghamshire*, East Indiaman, in 1835.

For the first four years, *i.e.* from 1835 to 1839, Constable appears to have served in trading East Indiamen belonging to the Company. In 1839 he joined the Indian Navy. At first there was no opportunity for the exercise of his ability as a surveyor and draughtsman, as the surveying operations of the Indian naval service were suspended between 1839 and 1844. But he was actively employed in other duties, and before he had been long in the service he was entrusted at a critical time with the command of a schooner, the *Mahi*, in the Persian gulf.

In 1844, he was attached to the Surveying Department, and in that and the following year assisted Commander Sanders, I.N. in the survey of the coast of Arabia.

In the latter part of 1849, and early in 1850, he was selected by Sir James Outram to aid him, by making maps, in the important secret service in which the latter was engaged in Egypt, receiving the thanks of the Indian Government for the service he then rendered. The subsequent years, down to 1856, were diligently employed surveying, chiefly in the brig *Euphrates*, on the western coasts of India, during which long-continued and responsible service, he was specially complimented for his zeal and ability by his Commander-in-Chief.

A series of deep-sea soundings from Angrias bank to Cape Comorin, which he had commenced, were interrupted by the Persian war. His ship had to be employed on war service, and he proceeded to the Persian gulf.

During the war, Constable made a minute survey of the harbour of Bushire and the neighbouring country. The work had to be completed within the short time the town was in the possession of the British. He had to labour, therefore, during the hottest hours of the warm season in that burning climate, and towards the end, continued the work alone, after all his officers had been cast down by illness. But the survey was completed in time. After the war he was detained making a new survey in the Persian Gulf until 1860.

The instructions to Commander Constable were comprised in the following paragraph of a despatch, dated 24th June, 1857, from the Honourable the Court of Directors of the East India Company to the Government of Bombay:—

"It is very important that as soon as the demands of the service will admit of it, one of the Indian Navy vessels should be employed in making a circuit of the Persian Gulf, for the purpose of determining correctly the latitudes and longitudes of the principal points."

In accordance with these instructions, certain positions round the Gulf were carefully determined, at such short distances apart as would admit of the interjacent coast-line being completed from the existing charts, a vessel being thereby enabled to shape her course from one point to another with certainty. The chart is a correct skeleton of the islands, and of the principal points and towns around the Gulf, with as much of the detail of coast-line (in the vicinity of the positions fixed) correctly triangulated as the time admitted. The remainder of the coast-line, &c., was adapted from the old charts so as to complete the sheet for the use of the navigator.

The latitudes and longitudes were mostly astronomically determined by reflecting instruments of the best class. With the exception of a few observations, at shoals not dry, out of sight of land, they were made with the artificial horizon.

The new chart was completed on his return to Bombay in September of the same year.

This was the first of the Indian Navy surveys which was sent to the Admiralty in London after the abolition of the East India Company.

* From the Proceedings of the Royal Geographical Society for 1879, p. 457.

The beautifully executed chart was published in 1862, and was selected by Captain Washington, the hydrographer, for placing in the International Exhibition of 1862, as a good specimen of English chart drawing.

On the transfer of the charts of the Indian Navy to the Admiralty, consequent on the abolition of the East India Company, Constable was engaged to draw up a report on the state of the Indian Naval Survey, embracing all the coasts from East Africa to the Strait of Malacca. This proved a most useful work. He also wrote the "Persian Gulf Pilot" for the Hydrographic Department, a work of 260 pages, full of the most accurate information, which he had been twenty years collecting. Lieutenant Stiffe added a supplement to this work in 1875. Industrious, conscientious, modest and loyal, he ably and faithfully performed the work that lay before him, and won the good opinions of his various colleagues.

In 1861, he became a F.R.G.S., and died in March, 1879, aged 58 years.

The following charts were the results of the surveying labours carried out by him:—

Persian Gulf (general chart), in 2 sheets. 1862.

Persian Gulf Pilot. 8vo. 1864.

Abū Shehr, or Bushire. 1857.

Memoir relative to the Hydrography of the

Basiduh Harbour and its approaches. 1860.

Persian Gulf. 8vo. 1856.

CAPTAIN R. B. CREYKE, R.N.

1855-1862.

Richard Boynton Creyke entered the Navy in July, 1829, as first-class volunteer on board the *Atholl*, on the west coast of Africa, from which vessel, in April, 1831, he was transferred to the *Medina*, where he remained until July of the same year.

He joined the *Ocean* as a midshipman in December, 1831, the *Magpie* in November, 1832, and the *Rolla* in November, 1833. In these vessels he was employed at Sheerness, and on the North Sea and Lisbon stations. He went to the Mediterranean in April, 1834, in the *Revenge*, and as a Mate became attached to the *Bellerophon* in May, 1838.

In the *Bellerophon*, as a Mate, he took part in the operations on the coast of Syria, and was present at the bombardment of St. Jean D'Acre.

In July, 1841, he was appointed to the revenue cutter *Defence*, employed in the North Sea, and was transferred, in July, 1843, to the steam vessel *Blazer*, Captain John Washington (afterwards Hydrographer) employed on surveying service in the same neighbourhood.

He was promoted to the rank of Lieutenant in September, 1843.

From February, 1844, to October, 1845, he served on the west coast of Africa in the *Penelope*, *Alert*, and *Growler*, the former being the Commodore's vessel on that station. He commanded the boats of the *Alert* in an attack on pirates at the Arguin islands, near Cape Blanco, for which he was mentioned favourably in the despatches of the Commodore.

In January, 1846, he was appointed to the survey of the west coast of Scotland, under Captain C. G. Robinson, in the *Shearwater*, and in October of the same year was made an Assistant-Surveyor. In October, 1847, his name was transferred to the books of the *San Josef*, and subsequently to the *Impregnable* and *Fisgard*, his services throughout being continued in the survey of the west coast of Scotland.

In February, 1855, Lieutenant Creyke was appointed First Lieutenant of the *Merlin*, Captain Bartholomew J. Sullivan, attached to the Baltic fleet, in which vessel he assisted in surveying the north part of Cronstadt, as well as the vicinity of Sweaborg, previous to its bombardment, at which he was present. For his services on this occasion he was promoted to the rank of Commander in September of the same year, and in the following November again resumed his duties as an Assistant-Surveyor on the west coast of Scotland, under Captain E. J. Bedford, with whom, as Chief Assistant-Surveyor, he continued to serve until about the year 1861.

His date as a Captain on the retired list is 11th Feb., 1862.

For his war services Captain Creyke has received the Syrian and Baltic medals.

COMMANDER C. Y. WARD, I.N.

1851-59.

In 1844, this officer as a midshipman assisted Commander Sanders in the *Palinurus*, on the survey of the Arabian coast, left unfinished by Captain Haines. The work was completed in 1845-46, by Lieutenant Grieve, with Ward as an Assistant.

We believe, he accompanied, and greatly assisted Lieutenant Grieve in 1848, when that officer surveyed the Somali coast between Berbera and Ras Gulwaini, and the islands between Socotra and Cape Guardafui, thus completing the gulf of Aden.

He next appears to have served under Commander Selby, in November, 1850, in the same vessel as Assistant-Surveyor, on the survey of the west coast of India, from Cape Comorin to Beypoor.

In March, 1852, when Commander Fell proceeded to England on sick leave, Lieutenant Ward succeeded to the command of the *Krishna*. Between the years 1851-1859, Ward executed surveys of part of Malacca strait, from Pulo Penang to Singapore, Preparis channel, Rangoon river, Bassein river, Sittang river and inland waters of Pegu, Mutlah river.

Early in February, 1853, the *Krishna* and *Spy* had completed the Baragua entrance to the Irrawaddy, and reported that a good channel for ships existed with $3\frac{1}{2}$ fathoms at all seasons. The *Spy* also found a good channel into the Irrawaddy, by the China Bakir branch, or entrance.

In February, 1854, Lieutenant Ward arrived at Tonghoo, having made a detailed survey of the Sittang river, but this survey was never published.

Commander Ward ranks among the first of the race of surviving Indian Navy Surveyors. As one of those who assisted in the survey of the south-east coast of Arabia, he was employed to compile the "Gulf of Aden Pilot" for the Admiralty in 1863.

His name stood next to that of Commander A. D. Taylor, in the Indian Navy List, for 1858.

The following charts were published from the surveys of Commander Ward :—

Bassein River, 1853.	Malacca Strait, 1858, in two sheets.
Rangoon River, 1854.	North and South Sands (Malacca Strait).
Preparis, North Channel, 1855.	Cape Rachada to Mount Formosa (two sheets).
Mutlah River, 1855.*	Mount Formosa to Tanjong Bolus (three sheets).
Coast of Pegu and part of Tenasserim.	
Also, the Gulf of Aden Pilot, 1863.	
Sailing Directions for Malacca Strait, published in Horsburgh's Directory; also, Directions for the River Mutlah.	

LIEUTENANT J. A. HEATHCOTE, I.N.

1855-1862.

In 1855, Lieutenant Heathcote was appointed under Commander Rennie to survey the river Irrawaddy, and report upon its navigation during the passage of the mission under Major Phayre, to the Burmese capital. This was successfully accomplished from the frontier to Amarapoora, and a large chart constructed from the observations. Lieutenant Heathcote, in a paper which appears in Vol. V. of the Journal of the Royal United Service Institution, and which was read by the late Admiral Collinson at a meeting of that institution on the 22nd February, 1861, gives a detailed account of the manner in which this survey was conducted.

Between the years 1856 and 1862, Lieutenant Heathcote was engaged upon the surveys of the Bay of Bengal.

* The survey of the Mutlah was made in 1853.

In 1856* he made a survey of the western entrance to the Hoogly, from Kaokali to the Sand Heads. It was undertaken because the Gaspar channel, that commonly used, was considered as becoming dangerous, owing to accumulations of sand, and likely to obstruct the traffic to Calcutta. This survey, which required great exactness, was performed in the surveying vessels *Krishna* and *Spy*, and the chart drawn on a large scale showed the depth of the water to feet. It was accompanied by a report upon all the channels of the Hoogly, comparing their form in 1856 with that which they had shown upon previous surveys, and showing the accumulation that had taken place in the intervals. The work was connected with the stations of the Great Trigonometrical Survey of India. Since Captain Lloyd's time as Marine Surveyor-General (1830) there has always been a river surveyor for the Hoogly, and at the present time the Deputy Conservancy of the river approaches is undertaken by an officer lent from the Royal Navy.†

In 1857, Lieutenant Heathcote made some additions and corrections to the Arakan coast and Akyab ports. After the Sepoy Mutiny in the same year, he was deputed, in company with Dr. J. F. Mouat and Dr. G. Playfair, to select and report upon a site for a penal settlement in the Andaman islands. Dr. Mouat published an interesting account on the subject, drawn up from the joint report of the three delegates concerned. The site of the first settlement made by Lieutenant Blair, in 1796, was that selected, now, as originally known as Port Blair. The manuscript survey, on a large scale, made by Lieut. Blair, of the Great Andaman island, was in the hands of the expedition; constructed between the years 1788 and 1796, it was remarked to be beautifully accurate in all its details.

In 1861, Lieutenant Heathcote was employed by the Admiralty to compile a chart of the Bay of Bengal. He also made a chart of the currents of the south-west monsoon in the Bay of Bengal, intended as an accompaniment to Taylor's chart of the Arabian Sea for the same season. These currents were worked out from a great number of the logs of old East Indiamen.

Lieutenant Heathcote, whose name stood high amongst Indian Naval Surveyors, during the last years of his life, became manager of a Salvage Company; he died on the 3rd of January, 1877, deeply regretted by his old brother officers. (Abridged from Lieut. Low's History of the Indian Navy, Vol. II., page 400).

The following were published from Lieutenant Heathcote's pen:—

Account of a running survey of the Irawaddy, appended to a paper on the Survey of Rivers, by Admiral Collinson, Journal of Royal U.S. Institution, Vol. V.

Collisions at Sea, and their Remedy, by an Improved System of Lights. No. 40, Vol. X. of Journal of U.S. Inst.

The Currents of the Bay of Bengal during the S.W. monsoon. R.G.S. Journal for 1862.

STAFF-COMMANDER W. STANTON, R.N.

1858-1867.

The first record extant of the services (surveying) of William Stanton is dated in March, 1842, when he joined H.M.S. *Slyx*, Captain Vidal, for the survey of Madeira and the Azores or Western islands. Here he continued until 1845.

From March, 1845, to December, 1849, he was engaged on the survey of Central America, Mexico, and the N.W. coast of America, on board the *Pandora*, Lieutenant-Commanding James Wood. During this period, although doing duty as an Assistant-Surveyor, Mr. Stanton received no remuneration as such, and owing to the isolated nature of the service on which the *Pandora* was employed, provisional examinations at that time not being allowed, lost upwards of a year's pay as Second Master.

* Markham's Memoir of the Indian Surveys, p. 28-29.

† In 1884, Navigating Lieutenant E. W. Petley, R.N., held the post of Deputy Conservator of the Hoogly; in this year he re-surveyed the Mutlah River.

He was next employed in the general service, and took part in one of the Arctic expeditions. At the commencement of the Russian war, when belonging to the *Dauntless*, he made a report on the navigation of the Baltic, in which he dwelt strongly on the practicability of the fleet navigating that sea without the aid of pilots. This he proved by the *Dauntless* dispensing with the aid of a pilot, and leading the combined fleets through the difficult navigation of the Great Belt to Kiel, prior to the season for re-placing the buoys and light vessels.

Mr. Stanton also surveyed the approaches and channel leading to the Dnieper and Kinburn forts, which survey was forwarded to Lord Lyons, the Commander-in-Chief, before the attack. He also discovered a new channel leading into Kertch bay, which, in the words of Commodore Ryder, was "a great saving of land transport, as by means of it he was enabled to conduct vessels to Kertch bay, a harbour of perfect safety, instead of their being exposed to the risk and delay of anchoring in the exposed anchorage of St. Paul's."

From March, 1857, to May, 1858, as Surveyor, he commanded the *Seagull*, tender to the *Porcupine*, employed in sounding on the west side of Lewis, and in surveying the Sound of Harris, and in September, 1858, accompanied Captain Otter in the latter vessel across the Atlantic, in connection with the service of laying the Atlantic telegraph cable, and in surveying Bull's bay.

From 1859 to 1862, he commanded the *Saracen*, surveying brig, engaged in Banka strait (southern entrance). During the survey of Banka strait he discovered a new passage into that strait, which, in contrast to that formerly known, took a direction across that of the prevailing monsoons, thus affording sailing vessels a leading wind both ways, by which they were enabled to make the passage through the strait in the same number of days as they formerly took weeks. To this passage the name of Stanton channel was given by the Hydrographer.

From January, 1863, to March, 1864, he was employed surveying the south-west part of the Outer Hebrides, and from the latter date to January, 1865, in examining the bank of soundings between Ireland and Barra, to a distance of nearly 100 miles off shore in the gunboat *Shamrock*. During the *Shamrock's* examination of the space between Ireland and Barra he discovered many valuable fishing banks.

In March, 1865, he was appointed to the charge of the survey of the Cape of Good Hope, and retired from active service about the year 1870, the date of his promotion to the rank of Staff-Commander being January 21st, 1867.

The following charts were published from Staff-Commander Stanton's surveys:—

Gaspar and Banka Straits, with plans of.	Gaspar Strait.
Lucipara and Stanton Channels, Naugka Islands.	(S. coast of Africa).
Banka Strait.	Mossel Bay to C. St. Francis.
" " South Entrance.	Cape St. Francis to Waterloo Bay.
" " to Singapore.	Kowie River Entrance (Port Alfred).
(Arctic) Approaches to Holsteinborg.	

LIEUTENANT J. B. BEWSHER, I.N.

1855-1865.

When Commander A. D. Taylor (late I.N.) was appointed to the command of the pattamar *Bheemah*, in succession to the *Pownah*, for the survey of part of the west coast of India, J. B. Bewsher, then a midshipman, appears to have been one of his assistants. Previous to this he was engaged on board the *Palinurus*, under Commander Selby, which carried out the survey between Cape Comorin and Bepoor.*

But it was under Commander Selby, in Mesopotamia, that Bewsher performed the most valuable service. Here, in 1855, in the steamer *Assyria*, with Lieutenant Collingwood, he

* Markham's Memoir of the Indian Surveys, pages 25 and 32.

assisted in making a trigonometrical survey of the region west of the Euphrates, including the sea of Nejf, which is fed by that river, and embracing the classic sites of Meshed 'Ali, Birs Nimrûd, Kerbela, Kufa, and Babylon, and the portion of Mesopotamia from Samarra on the Euphrates, to a point about ten miles above Baghdad on the Tigris.

The latter portion of the survey from above Baghdad to Tel Ibrahim, and from Tel Ibrahim to Samarra on the Euphrates, was commenced in October, 1862. In the end of that year Commander Selby retired, and Lieutenant Bewsher, who then took charge of the work that had thus been commenced, completed it in 1865. The maps (seven in number) were engraved in two sheets, and Bewsher's memoir contains an interesting account of the ancient canals which can still be traced, and some details respecting the humbler modern system of irrigation.

The well-known geographical authority quoted from in this memoir goes on to remark that "The ability and learning shown in this memoir of Lieutenant Bewsher are proofs that he would have been a worthy successor of the earlier surveyors; but he died of diseases contracted during the service, and the Government abruptly put a stop to the survey, leaving it incomplete, and with much work still to be done."

Lieutenant Bewsher commanded the *Comet* during the latter part of his career in Mesopotamia.

He wrote a paper, published in Vol. XI. of the Proceedings of the Royal Geographical Society, and Vol. XXXVII. of the R.G.S. Journal, entitled "On the part of Mesopotamia contained between Sheriat el Beytha, on the Tigris, and Tel Ibrahim."

LIEUTENANT M. A. SWENY, I.N.

1856-1860.

In 1848-50, as a mate in the Indian Navy, Mr. M. A. Sweny was appointed one of the surveying force, under Lieutenant Selby, in the brig *Tapti*, with the tenders *Maldiva* and *Cardiva*, fitted out for the survey of portions of the Laccadive Archipelago and Angria's bank, and also the approaches to Bombay harbour, making a chronometric survey of the Bombay bank of soundings, and connecting the North Canara with the Guzerat coast.

He continued with Lieutenant Selby in the *Palinurus* in 1850 still as a mate—Strojan who was murdered on the Somali coast at a later date, when the companion of Speke and Burton—serving in the same capacity in that vessel. The *Palinurus* was employed on the coast survey between Cape Comorin and Beypoor, surveying also portions of the Laccadive islands and the Sesostris bank. A survey of the port of Cochin, by Sweny, was made during this cruise.

In 1853, Lieutenant Sweny was appointed as Chief Assistant to Lieutenant A. D. Taylor, in the *Pownah*, for the survey of the coasts of the South Konkan, Canara, and Malabar.

In 1856, Lieutenant Sweny was appointed as Assistant Surveyor to Lieutenant Constable, in the surveying brig *Euphrates*, attached to the Persian Expeditionary force, and did excellent work in buoying the bar and channel of the Shatt-ul-Arab or Euphrates, for the passage of the fleet to bombard Mohamra, and thus enabled the various ships to ascend its waters without casualties, which otherwise could not have been accomplished owing to the scarcity of Arab pilots.

In 1858, Lieutenant Sweny, assisted by Lieutenant H. Jackson, continued the survey of the Coromandel coast, from Point Calimere to Pulicat, and the chart and memoir were sent to the Indian Government in 1860.

When the Indian Navy was abolished in 1862, Lieutenant Sweny retired with that rank, not being one of the senior twenty-four Lieutenants who were made Commanders, simultaneously with their retirement.

COMMANDER W. FELL, I.N.

1841-51.

Captain Lloyd succeeded Captain Daniel Ross as Marine Surveyor-General in India, and James Young, William Fell, Rennie, and Montrieu, were his assistants. All were engaged in the Bay of Bengal on the coast of Arakan, and sea face of the Sunderbuns, Chittagong, and the Hoogly river.

On the retirement of Captain Lloyd in 1840, the Marine Surveyor-Generalship at Calcutta was abolished; but Captain Fell was employed, but not continuously, from 1841 to 1848, on board the brig *Krishna*, in finishing detached surveys, chiefly on the Coromandel coast, along the Pegu and Martaban shores, and on the north coast of Sumatra.*

When Captain Sanders, on the resumption of marine surveying in India in 1844, was sent in the *Palinurus* to continue the portions of the Arabian coast left unfinished by Captain Haines, his Assistant-Surveyor was Lieutenant Fell, and Constable, Ward, and Whish were midshipmen. The *Palinurus* returned to Bombay during the south-west monsoon in 1845, and Lieutenant Fell appears to have then again resumed duties on the Bengal side of India, his position as Assistant to Commander Sanders being filled by Lieutenant Albany M. Grieve.

In 1851, Commander Fell was engaged in compiling a chart in three sheets of the Coromandel coast from Pulicat to Bimlipatam.†

In March, 1852, Commander Fell returned to Europe on sick leave, and was succeeded by Lieutenant C. Y. Ward.

* In the Geographical Department of the India Office there are printed Sailing Directions by Commander Fell for the coast of Pegu and Gulf of Martaban, dated 4th March, 1852, and manuscript Sailing Directions for the north coast of Sumatra, from Acheen Head to Diamond Point.

† Charts of the Coromandel coast, in three sheets, from latitude 16° 30' to 18° 45' N., were published in 1848. Lieut. Sweny, in 1860, added to Commander Fell's work, but the whole coast was not equally well completed until 1869-70.



VICE-ADMIRAL SIR GEORGE H. RICHARDS, KNT., C.B., F.R.S.

Hydrographer, 1863 to 1874.

CHAPTER III.

Mansell, Davis, Whish, Parsons, Ward, Bullock, Brooker, Chimmo, Inskip, McDougal, Hall, Mayne, Reed, Pender, Wilkinson, Nares, Wilds, Hutchison, Hull, May, St. John, Collingwood, Howard, Bedwell, Gray.

George Henry Richards, a son of the late Captain George Spencer Richards, R.N., born in 1820, at Antony, in Cornwall, entered the Navy in 1833. After a servitude of two years in the *Rhadamanthus*, he was appointed, September, 1835, to the surveying expedition, in the *Sulphur*, under Captain Beechey, then about to sail for the Pacific. He continued as a midshipman under that officer, and under his successor, Captain (afterwards Sir) Edward Belcher, throughout the whole of the arduous proceedings attendant on the Pacific survey, and when the vessels of the expedition (*Sulphur* and *Starling*) joined the fleet in China, took an active share in the important services devolving on the naval surveying officers, in the operations against the Chinese.

He passed his examination for a Lieutenant in December, 1840, having been obliged to delay this important step from July, 1838, owing to his vessel not having previously fallen in with the Commander-in-Chief.

Having suffered very much from illness, he was obliged to invalid when at Macao, in July, 1841, and about that time returned to England for the benefit of his health.

When in command of the *Sulphur* there were few Captains more exacting or more difficult to please than Sir Edward Belcher. Yet we find him writing thus of Mr. George Henry Richards, at that time a Mate of H.M. surveying vessel *Starling*. Sir Edward remarks :—

“He has at all times borne the character of an exemplary and steady officer, and is one of the few officers of the *Sulphur* of whom I can speak with unqualified praise, not only for his assiduity in surveying, but for his gallantry during the operations at Canton, and for his exemplary conduct when the other officers of the *Sulphur* were in a state of insubordinate alienation from their Captain.”

In 1842, he was promoted to the rank of Lieutenant from the flagship of Sir David Milne at Plymouth. Shortly afterwards he sailed as Second Lieutenant and Assistant-Surveyor of the *Philomel* surveying brig, Captain (now Admiral Sir) James Sullivan, for the Falkland Isles and south-east coast of South America, and for the action of Oblegado in the river Parana, where he commanded the *Philomel's* small arm men at the storming of the forts, was promoted to the rank of Commander in November, 1845.

In 1847, when the paddle steam surveying vessel *Acheron* was commissioned by Captain (now Admiral) John Lort Stokes, for the survey of the coasts of New Zealand, Commander Richards was appointed as second captain, and remained in that capacity and that of Assistant-Surveyor throughout the whole of that arduous survey, taking a large share in the active operations connected with its prosecution, during which he was often much exposed when detached, carrying out the more detailed or laborious portion of the work, in open boats.

The New Zealand Pilot was subsequently compiled by Captains Richards and Evans, the latter having acted in the capacity of master and Assistant-Surveyor on board the *Acheron*.

In December, 1851, the *Acheron* returned to England, and we next find Commander Richards appointed in February, 1852, to the *Assistance*, under Captain Sir Edward Belcher, which vessel, with the *Resolute*, Captain Kellett; *North Star*, Commander Pullen; *Intrepid*, Commander McClintock; and *Pioneer*, Commander Sherard Osborn, formed the expedition which sailed in April of that year for the Polar regions in search of Sir John Franklin, and for the relief of the *Investigator* and *Enterprise*, commanded by Captains McClure and Collinson, which vessels had entered the Arctic Sea through Behring strait. The *Assistance* and *Pioneer* passed through Wellington channel.

During this expedition, Commander Richards made one of the most extraordinary sledging journeys on record, and in many important respects, proved himself, under trying and delicate circumstances, as possessing great tact and judgment.

In April, 1854, Sir Edward Belcher found it necessary, after mature deliberation, to abandon his ships, and in the following October, having returned to England, he was tried by court martial and acquitted for so doing. In October, 1854, Commander Richards was promoted to the rank of Captain.

In 1856, Captain Richards commissioned the steam sloop *Plumper* for the survey of Vancouver island, a survey which was followed up with extraordinary energy and almost severe zeal.

In 1859, the *Plumper* proving small and defective, the *Hecate* was sent from England to replace her, under Commander (now Rear-Admiral Sir) Anthony H. Hoskins. The *Hecate* was a fine roomy paddle sloop similar to the *Hydra* of that day, and carrying an abundance of coal, proved well adapted for the work.

In 1863, the survey of Vancouver island and part of British Columbia having been completed, the senior Assistant-Surveyor (now Captain) Pender, R.N., was left in charge for the completion of the surveys of the adjacent coast of British Columbia, and Captain Richards left in the *Hecate* for England *via* the Cape of Good Hope. Many positions were rectified in the Pacific *en route*, and after a short stay at Sydney, the *Hecate* reached her destination in 1864.

News of Admiral Washington (the Hydrographer's) death reached Captain Richards at Sydney; also, the intimation that the Lords Commissioners of the Admiralty had selected him as Admiral Washington's successor.

In January, 1864, the Hydrographic Department consisted as follows:—

<i>Hydrographer</i>	Captain George H. Richards.
<i>Chief Naval Assistant</i>	Captain A. B. Becher.
<i>Naval Assistants</i>	Captain W. V. Read, Commander E. Dunsterville, Staff Commanders J. Burdwood, J. W. King, and James Penn.
<i>Superintendent of Compasses</i> . .	Staff Commander F. J. O. Evans, F.R.S.
<i>Superintendent of Charts</i> . . .	Captain G. A. Bedford, R.N.
<i>Draughtsmen</i>	{ <i>First Class</i> —T. Walker, Esq. <i>Second Class</i> —T. Bermingham, and E. J. Powell, Esqrs. <i>Third Class</i> —R. Carrington, Esq.

In the interval which elapsed between Admiral Washington's death, and the arrival of Captain Richards in England, Captain Becher undertook the management of the Department *pro. tem.* Shortly after the period at which Captain Richards assumed the reins of office, Captain Bedford, the superintendent of charts, succeeded Sir James Sullivan as Marine Adviser to the Board of Trade. He was succeeded by Staff-Commander R. Hoskyn. About the same time, the Chief Naval Assistant, Captain Becher, who was nearly seventy years of age, retired as a Rear-Admiral, after nearly forty years' connection with the Department, which he first joined as a Lieutenant during Sir Edward Parry's hydrographer-ship. Captain Becher was the founder, first editor, and proprietor of the Nautical Magazine.

The retired Captain, who at this time acted in the capacity of Secretary to the Hydrographer, was succeeded not long afterwards by an officer of Paymaster's rank, but who had been trained and held the post of Assistant-Surveyor, under Captains Drury, Bate and Ward, and was at the time of his appointment employed in the survey of Vancouver island.

One of the first general improvements that Captain Richards brought about was the provision of an ample supply of charts, bound up in the form of atlases, to the officers of H.M. ships, in addition to those specially furnished for the navigation of the ship, which were considered almost the exclusive property of the navigating officer and the Captain, and were rarely, if ever, seen by the officers, whose knowledge of charts up to this time was generally of the vaguest description.

Another important step introduced by him was the transfer of the examination of navigating officers in pilotage from the Trinity House to the Hydrographic Department, and the substitution of an universal knowledge of pilotage, for the hitherto limited one, of the English channel.

The compilation and publication of a series of pilot charts for the different oceans, more especially the Atlantic, originated with Captain Richards, and was pushed vigorously forward and completed during his hydrographership. These charts shewing the prevailing winds and currents and other physical phenomena for each three months of the year, and bound together as Wind and Current Atlases, were also furnished to the officers of H.M. ships.

The solution of the difficult problem of the gradual amalgamation of the navigating branch with the executive, and the scheme for the general examination of all officers in the practical duties of navigation and pilotage, now on the eve of being brought about, were both measures, in the main deriving their source from, and therefore attributable to, Captain Richards.

After a few years of office, and a full consideration of the work carried on under his direction as hydrographer, Captain Richards concluded that either the productive character of the Department must return to within its normal limits, or its staff must be increased.

The reasons leading to the advisability of the latter of these alternatives being followed are recorded thus:—

- (1). The quantity of matter still remaining unutilised in the Department and urgently called for.
- (2). The rapidly increasing demands of navigation consequent on the extension of commerce in almost every part of the world.
- (3). Above all, the necessity of establishing the *nucleus* of a magnetic department, which the changed condition of ship-building rendered a subject of vital importance to the safety of the navy.

Added to this, owing to the abolition of the Indian Navy in 1862, the whole of the Hydrographic duties connected with India, hitherto performed by the Company's officers, were transferred to the Admiralty without any addition to the staff of the Hydrographic Office, and that subsequently the regulation of the pilotage of the Navy was also added to the duties of the Hydrographer.

On a clear statement then by Captain Richards, showing the necessity for the measure, it was fully approved by the Duke of Somerset's Board, and the main results were

- (1). The chief naval assistant's post was merged with that of the charge of the Magnetic Department, and £100 a year added to the salary of the incumbent of that post.
- (2). Naval Assistants were permitted to be placed on ship's books to prevent compulsory retirement and give them the benefit of the time served in full towards pension.*
- (3). A Civil Assistant from amongst the clerical staff of the Accountant-General Department was selected for duties connected with pilotage.
- (4). A naval officer was appointed as assistant to the Superintendent of Compasses, and for duty in the Magnetic Department.
- (5). An additional draughtsman was added to the drawing establishment.

These augmentations took place in the year 1866. As regards the surveying service afloat. Almost immediately on Captain Richards' accession to the hydrographership, he caused printed forms to be issued to the various surveyors, both at home and abroad, in which were to be shown the full extent of each season's work, number of miles sounded over, people employed, days incapacitated from bad weather, recommendations for the better carrying out of the respective surveys, &c., &c. Healthy emulation was thus stirred up, and a better opportunity given the hydrographer to judge of the actual means and force at the disposal of the officers in charge of the different surveys, as well as of the individual merits of the subordinates engaged under them.

In 1865, at the suggestion it is believed of Admiral Sir James Sullivan, the experiment was tried of endeavouring to combine the duties of a surveying ship with those of a man-of-war. With this end in view, two gun vessels were commissioned, the *Serpent* for China, and the *Gannet* for the West Indies. A reduced scale of surveying pay was allowed to the Commanders and certain of the officers, averaging about one-half of the remuneration generally allowed in surveying vessels proper. For various causes the experiment did not succeed, and was not again repeated.

In the year 1867, the annual surveying promotions permitted to the executive surveying officers at the hydrographer's nomination, were arranged at Captain Richards' suggestion to be divided each alternate year with the officers of the navigating line employed in the surveying service. This was certainly an act of justice, as the executive line had been falling away from hydrography for some time, and it was difficult to select deserving officers for these promotions; whereas, among the navigating officers, were many whose services

* In the case of executive officers doing duty as Naval Assistants to the Hydrographer, the time so served only counts two-thirds of full time towards pension, and a half towards promotion, or similarly to officers employed in the Coast Guard on shore.

were of a highly deserving nature. Thus did Staff-Commanders Reed and Pender, both in charge of surveys, obtain their promotion.

In 1869, conjointly with Colonel (now Major-General Sir) Andrew Clarke, R.E., at that time Director of Engineering works at the Admiralty, Captain Richards, in his capacity as hydrographer, visited the Suez Canal in H.M.S. *Newport* with a view to making an official report on that great work, then about to be opened to navigation. Soundings and sections were taken throughout the length of the canal, and a survey made of Port Said and its approach. The complete report which resulted from the inspection thus made by Captain Richards and Colonel Clarke will be found published at page 259 of Vol. XIV. of the Proceedings of the Royal Geographical Society, 1870.

In 1869, the vast naval retirement scheme of the following year was in contemplation, Mr. Childers being at that time the First Lord of the Admiralty. The patronage hitherto permitted to Commanders-in-Chief on foreign stations, of promoting to vacancies caused by death, was put a stop to. About the same time, the annual surveying promotions which had been instituted in the time of Sir Francis Beaufort were no longer allowed; although the annual promotion for gunnery was still continued.

A marked effect was consequently produced on the surveying service afloat, marked even to the present day.

There is an old German proverb which says "that to stand still is to go back." Under a weaker chief than Sir George Richards,—what with the higher standard of naval education, more difficult examinations, and advance of gunnery, making it almost impossible to obtain volunteers from the young executive officers of the Navy for the surveying service, added to the fact that several of the principal surveys had come to an end,—naval hydrography would have retrograded even more than it did, or possibly have ceased altogether.

At the close of 1872, the chief event of Sir George Richards' official career as hydrographer took place, in the sailing of the *Challenger* on a scientific voyage of three years duration. There is no doubt but that he was the prime mover in that undertaking from start to finish, not only in a scientific sense, owing to his position as one of the council of the Royal Society, but especially as regards the more practical and less pleasant portion of his official duty, in successfully overcoming any monetary objection raised against its advancement.

In a few remarks made in public, prior to the *Challenger's* departure, the hydrographer remarked, "that an expedition such as this, which had been the hope and dream of his life, was now on the eve of realization."

It is hardly necessary to add that the *Challenger's* voyage proved a complete success in every way. After ten years service as hydrographer to the Admiralty, in consequence of that service being considered civil employment, in 1874, he was placed on the retired list of Rear-Admirals; this caused him to resign the hydrographer's post.

It is believed that Admiral Richards' views were strongly in favour, if possible, of the position being held by an officer on the Active List.

The late Sir Bartle Frere, in his address as President of the Royal Geographical Society, in 1874, remarked "The loss, through retirement, of Admiral Richards—who in his position of hydrographer (extending over a period of ten years, and those years of very stirring times), had secured the respect, confidence, and grateful feelings of every member of the surveying service—cannot be over-estimated. That ready appreciation of fellow-workers, devotion to duty, and earnestness for the advancement of hydrographic science, all characteristics of the man, rendered Admiral Richards a worthy follower of preceding occupants of the office and a bright example to our rising school of naval officers. The Admiral, in retiring from the post of hydrographer, carries with him the assurance that the remembrance of his efficient services to hydrography, and kindly manner to all ranks will not be readily forgotten by his old staff, ashore and afloat." *

* See R. G. S. Journal for 1874, page 164.

In 1870, he had been made a Rear-Admiral, and in 1871, a C.B. Prior to this he had become a fellow of the Royal Society, to which he was more than once Vice-President. For some years he was member of the council of the Royal, and of the Royal Geographical Society, and is a corresponding member of the Paris Academy of Science.

In 1877, Sir George Richards received the honour of knighthood, and in the same year became a Vice-Admiral on the retired list.

He was succeeded as hydrographer by Captain (now Sir) Frederick Evans, who throughout Sir George Richards' tenure of office, had acted in the capacity of Chief Naval Assistant and in charge of the Magnetic Department.

The following were the principal charts published from the surveys, chiefly of Vancouver Island and British Columbia, made under Vice-Admiral Sir George Richards' direction, when in command of the *Plumper* and *Hecate* :—

Vancouver Island.
Esquimalt Harbour.
Constance Cove.
Esquimalt and Victoria Harbours.
Victoria Harbour.
Haro and Rosario Straits.
Inner Channels leading from Juan de Fuca Strait to Haro Strait.
Haro Strait and Middle Channel.
Roche Harbour and approaches.
Griffin Bay and adjacent anchorages.
Semiahmoo Bay and Drayton Harbour.
Fraser River and Burrard Inlet.
Georgia Strait (sheet 1) to the N.E. point of Texada Island, including Howe Sound and Jervis Inlets.
Stuart and Trincomalie Channels, Oyster and Telegraph Harbours, with Maple and Osborn Bays.
Nanaimo Harbour.
Nanaimo and Departure Bay.
Georgia Strait (sheet 2) N.E. point Texada Island to Johnstone Strait, including Bute and Loughborough Inlets.
Augusta and Graves Ports, Nanoose and Pender Harbours, and Shoal Channel.

Seymour Narrows.
Johnstone and Broughton Straits.
Harvey Port.
Neville Port.
Goletas Channel to Quatsino Sound, including Scott Islands.
Goletas Channel and Passages into Queen Charlotte Sound.
Bull, Gowlland, and Beaver Harbours, Shushartie and Alert Bays.
Quatsino Sound, with Koprino Harbour, and Hecate Cove.
Quatsino to Esperanza, including Kyuquot Sound.
Klaskino and Klaskish Inlets and Anchorages.
Nasparti and Ou-Ou-Kinsh Inlets.
Kyuquot Sound.
Esperanza and Nuchatlitz Inlets.
Esperanza to Clayoquot, including Nootka Sound.
Nootka Sound.
Sydney Inlet to Nitinat, including Clayoquot and Barclay Sounds.
Barclay Sound.
Duncan and Metlah. Catlah Bays.

Also, the New Zealand Pilot, 1864. Vancouver Island Pilot, 1864.

Report on the Maritime Canal, connecting the Mediterranean at Port Said with the Red Sea at Suez, 1870.

Admiral Richards revised the Article on Hydrography, for the fourth edition of the Admiralty Manual of Scientific Inquiry, and at page 208 of Vol. XIX. of the Proceedings of the R. G. Society is a paper by him "On the route to the North Pole."

Progress of Marine Surveys, 1863 to 1874, under Vice-Admiral Sir George Richards.

In the year 1863, in which Admiral Washington died, reductions in the surveying service took place owing to the completion of some surveys and the retirement of officers, amongst whom were Captains Spratt, Alldridge, and Thomas.

On the English coast, Staff-Commander Calver, in the *Porcupine*, re-surveyed the estuary of the Thames, and was to continue to trace the changes along the coasts of Suffolk and Norfolk.

Captain George Williams, in the *Bann*, re-surveyed and sounded the Scilly islands, and was to continue completing the deep-sea soundings between the Eddystone lighthouse and Portland.

Commander Alldridge, in the *Asp*, surveyed Carmarthen bay, with the rivers Taff and Towey; thus completing the north shore of the Bristol channel. Commander Alldridge retired with the rank of Captain, and was succeeded by Commander David Aird at the close of the season's work.

The western Hebrides, under Captain Otter, was satisfactorily completed, and Captain J. E. Bedford and Mr. Stanton were expected to complete Tyree, Skerryvore, and off-lying dangers by the end of the year, having surveyed 142 miles of the coasts of Coll and Tyree during the season.

Commander Thomas having completed the shores of Benbecula and Harris, retired with the rank of Captain after 30 years of continuous service.

The survey of the Channel islands, under Staff-Commander John Richards, made good progress.

In the Mediterranean the examination of the different banks in the Malta channel, of Tripoli, and of the island and channel of Corfu, were amongst the important works completed.

Captain Spratt, who for 12 years had conducted the Mediterranean survey, this year resigned, and was succeeded by Captain Mansell, while Lieutenant Wilkinson followed to the post vacated by Captain Mansell.

Captain Orlebar surveyed 114 miles of the east coast of Newfoundland, between Cape Race and Cape Spear, and sounded over 1,330 square miles.

Captain Shortland, in Nova Scotia, completed 125 miles of the sea and harbour shores.

In the West Indies Mr. Parsons surveyed portions of the islands of St. Vincent, Antigua, and St. Lucia, and commenced the examination of Grenada.

Captain Pullen was sent to Bermuda to re-examine some of the narrow channels leading to that important dépôt.

The survey of the northern shores of British Columbia was continued by Mr. Pender and staff, that of Vancouver island having been completed by Captain Richards, and his ship, the *Hecate*, returned to England.

Commander Hutchison, in South Australia, had completed the upper portion of Spencer Gulf, including 167 miles of coast. He was, in his small schooner of 100 tons, to leave South Australia, and passing round the eastern coast, by Torres Strait, to take up the examination of the northern shore about Cambridge Gulf, that coast having been added to the territory of South Australia.

Commander Cox, in Victoria, completed the survey of Port Phillip and its approaches.

Commander Sidney, in New South Wales, with the small schooner, *Captain Cook*, made good progress, and had made a re-survey of the Manukau bar in New Zealand, where H.M.S. *Orpheus* was lost.

Mr. Jeffery, in Queensland, surveyed part of Hervey bay and the entrance of Mary river. A small detachment of Royal Marines were sent to establish a settlement at Cape York. H.M.S. *Salamander* was also sent from England to aid in this enterprise.

The *Rifleman*, under Mr. Reed, was engaged in clearing the highways to the north from Singapore of the China Sea. Through ill-health this season, Mr. Reed resigned the charge of this survey, and was succeeded by Commander Ward.

The *Swallow*, under Mr. Wilds, was employed in Northern China, chiefly in running meridian distances, but had also surveyed part of the Korean Archipelago, Chin Chu bay, and the south coast of Shan-tung; also Amoy harbour. A re-survey of a portion of the estuary of the Yangtsze Kiang was also about to be undertaken by the *Swallow*.

In 1863, twenty new charts were published by the Admiralty. Sailing Directions were prepared for the south and east coast of Africa by Captain de Horsey, R.N.; for the Persian Gulf by Captain Constable and Lieut. Stiffe, of the late I.N.; and for the Gulf of

Aden and east coast of Arabia, by Commander Ward, late I.N. A fourth edition of the China Pilot was also issued.

In the year 1864, Staff-Commander Calver, in the *Porcupine*, examined part of the coast of Suffolk, and continued the Downs. Captain G. Williams, of the *Bann*, retired early in 1864, and was succeeded by Staff-Commander Usborne, who was employed in sounding off the coast of Cornwall.

Commander D. Aird, in the *Asp*, sounded the south shore of the Bristol Channel between Combemartin and Watchett.

Commander Brooker re-sounded the bar of Portsmouth Harbour.

Captain E. J. Bedford completed the islands of Coll and Tyree, thus closing the in-shore examination of the west coast of Scotland.

Mr. Stanton, R.N., in the *Shamrock*, sounded between Ireland and the Hebrides.

Staff-Commander J. Richards progressed with the Channel Islands.

Captain Mansell, in the *Hydra*, continued the west coast of Greece, and amongst the Ionian islands, while Commander Wilkinson, in the *Firefly*, re-surveyed part of the coast of Tunis, and western portion of the island of Sicily.

Captain Orlebar, after 30 years active service, retired, and was succeeded in Newfoundland by Mr. J. H. Kerr, Master, R.N., his former assistant. Plans of Trinity harbour and Heart's Content, and part of Trinity bay and coast between it, and Bona Vista, were completed, and Captain Orlebar had selected the *termini* for the Atlantic cable.

In Nova Scotia, Captain Shortland completed 4,000 square miles of deep sounding.

Mr. Parsons, R.N., was employed on the coasts of Tobago island.

Captain Pullen was examining the reefs of Bermuda.

In British Columbia, Mr. Pender, R.N., made progress with the examination of the northern portions of the colony, the results of which with those of Vancouver island were rapidly made public.

In Victoria, Commander Cox proceeded with the survey of the coast eastward of Port Phillip. In New South Wales, Commander Sidney completed the coast between the Solitary islands and Point Danger.

Staff-Commander Jeffery, in Queensland, finished the survey of Keppel bay and part of Sandy strait.

The survey of the coast of the Cape of Good Hope Colony was continued under Mr. Skead, R.N., and Plettenberg bay was surveyed.

In China and Japan, Commander J. Ward, in the *Rifleman*, had ascertained the positions of Vanguard, Prince of Wales, Alexander, and Granger banks. The non-existence of several reported dangers had also been proved. The *Swallow*, under the command of Mr. Wilds, R.N., with her tender, the *Dove*, under Mr. George Stanley, had completed a re-survey of the entrance to the Yang-tse-kiang river, added to the soundings off the coast between Chusan and Hong Kong, as well as in the Formosa channel, and surveyed the port of Swa-tau.

In 1865, Captain E. J. Bedford, in the *Lightning*, was employed in completing the soundings off the west coast of Scotland and Hebrides, re-examined the Sound of Mull, and commenced Cardiff Roads.

Staff-Commander E. K. Calver having completed the Downs, sounded Yarmouth and Lowestoft Roads, including the coast between Winterton and Southwold.

Commander Brooker re-surveyed part of the Medina river.

The south shore of Jersey was surveyed by Staff-Commander J. Richards, who also prepared new Sailing Directions for Jersey.

In the Mediterranean, Captain Mansell, in H.M.S. *Hydra*, surveyed the west coast of the Morea, and after 32 years spent in the Mediterranean retired, and was succeeded by Captain Shortland, late of the Bay of Fundy survey.

Commander Wilkinson, in the *Firefly*, completed the coast of Tunis from Cape Bon to the southern part of the Bay of Kables; also, the Gulf of Tunis, with plans of the anchorage off the Goletta; he likewise completed the west coast of Sicily from the Gulf of Castel-a-Mare to Cape St. Marco, searched for the Fox rock off the south coast of Sardinia, and added to the soundings in the Malta channel. The *Firefly* was this year withdrawn from the Mediterranean.

The *Swallow* and *Dove*, in China, under Mr. Wilds and Mr. Stanley, R.N., completed the Shantung Promontory, and surveyed parts of the west coast of Formosa island, adding to the soundings between Hong Kong and the Corea. The *Swallow* returned to England in 1866.

The *Rifleman*, under Commander Ward, charted some of the reefs in the main route to China, and re-surveyed Victoria harbour of Labuan.

The *Serpent*, Commander Bullock, auxiliary surveying vessel, on her voyage to China, sounded on l'Agulhas bank off the Cape of Good Hope, cleared up positions of doubtful dangers in Java sea, corrected St. Paul's island in the Indian Ocean, and made a plan of the entrance to the Bruni river in Borneo.

In Nova Scotia, Commander Scott, aided by Captain Hamilton, of H.M.S. *Sphinx*, obtained soundings at the entrance of the Bay of Fundy.

In Newfoundland, Mr. J. H. Kerr, R.N., surveyed Random and Smith's sounds, and other portions of the west side of Trinity bay.

Mr. Parsons, R.N., in the West Indies, completed the survey of Tobago island, and Commander Chimmo, in the *Gannet*, like the *Serpent*, an auxiliary surveying vessel, commenced the Gulf of Paria, with the coast of Trinidad.

In British Columbia, Mr. Pender, R.N., surveyed Knight's inlet, with channels leading into it from Queen Charlotte sound, Broughton, and Johnstone straits.

In South Africa, Mr. W. Stanton, R.N., who succeeded to the charge of this survey in March, 1865, completed the charting of the coast from Cape Infanta to Izervack Point, and from Cape St. Francis to Recife Point. Mr. D. May, R.N., the Chief Assistant, was enabled to sound a considerable portion of the coast in H.M.S. *Rapid*.

Commander Sidney, in New South Wales, completed the coast from the Solitary islands to Point Danger, and connected with the Queensland survey brought southward from Moreton Bay. He also surveyed Port Stephens, and the coast to Sugar Loaf point.

In Queensland, Staff-Commander Jeffery completed the north entrance of Great Sandy strait, and was employed between that strait and the north end of Moreton island.

Commander Nares, in H.M.S. *Salamander*, added to the hydrography of the Inner Passage to Torres strait, and coast survey of Queensland.

In Victoria, Commander Cox completed the coast between Port Phillip and Western Port.

In South Australia, Mr. Howard, R.N., reconnoitred the coast in the neighbourhood of Port Darwin and Victoria river.

Adam bay was surveyed and examinations of Melville strait, and Van Diemen's gulf, with soundings in the Gulf of Carpentaria, obtained.

The South Polar ice chart was published, as well as a Book of Sailing Directions for the west coast of Hindustan, compiled by Commander A. D. Taylor (late I.N.)

Lieut. St. John, R.N., commanding the *Opossum*, added to the hydrography of the Island of Hainan, in the Gulf of Tongking, while Mr. Tilley, R.N., commanding the missionary

yacht, *Southern Cross*, forwarded remarks as well as plans of several islands and anchorages in the Pacific.

In 1866, Captain E. J. Bedford, in the *Lightning*, completed Cardiff roads and its approaches, and corrected the chart of the upper portion of the Bristol channel in the vicinity of the Welsh grounds, where changes had taken place since the surveys of 1847-9.

Staff-Commander E. K. Calver, in the *Porcupine*, was employed on the eastern coasts of the United Kingdom, correcting the charts and revising the Sailing Directions to meet the changes occurring on these shores. Five hundred and thirty miles of coast between the north-western point of Scotland, and the river Humber, had been so examined, and the entrances of the rivers Tay, Blyth, Tees, and Humber, where very considerable changes were found to have taken place, entirely re-surveyed. During the progress of this work, a dangerous sunken ledge off Tarbet Ness, the promontory which separates the Dornoch Firth from the Bay of Cromarty was discovered and placed on the charts.

Staff-Commander J. Richards completed the coast-line of Jersey, and constructed a plan of St. Helier's bay, to enable the island authorities to extend their limited harbour accommodation.

A small party with a steam launch had been employed at Portsmouth, Spithead, and its neighbourhood, during this year. The deepening of the entrance by artificial means, and the numerous works in progress, rendered it necessary that a constant watch should be kept to detect the least changes. Commander Brooker, in conjunction with Mr. Hall, Master, R.N., which latter officer succeeded, in August, to the charge of the survey, made a minute examination of Portsmouth bar on a scale of 60 inches to the mile.

The *Hydra*, Captain Shortland, was employed in the Malta channel, and commenced a minute triangulation of the south and east coasts of Sicily, for the accurate determination of the various shoals, with elaborate soundings.

Mr. J. W. Reed, commanding the *Rifleman*, had been employed in examining the reefs and shoals in the main route to China. He had surveyed the St. Esprit shoal, between the Paracels and Hong Kong, the Fiery Cross or Investigator reef off the north-west coast of Borneo, and determined the true positions, or expunged from the chart those of other hitherto doubtful dangers.

The *Swallow* was on her way to England and was to be relieved by the *Sylvia*, under Commander Brooker, which had left England.

The *Serpent*, Commander Bullock, forwarded many valuable contributions to the hydrography of the China Seas, more especially connected with the coasts of Japan. The *Nassau*, Captain Mayne, sailed from England on this service in the fall of 1866, and had commenced her work in the straits of Magellan, with the co-operation of the Chilean Government.

The West Indian survey, carried on by a hired vessel and boats, had been in abeyance in 1866, owing to the officers who had been many years employed on it having returned to England. It was resumed in 1867, under Mr. Parsons, Master, R.N., who, with two assistants, commenced the surveys of Barbadoes and Montserrat.

Mr. Langdon, Master, R.N., was engaged in sounding the channels between the reefs of the Bermuda group.

The *Gannet*, Commander Chimmo, completed the survey of the gulf of Paria and other portions of the island of Trinidad, and made large plans of the entrance, known as the "Serpent's Mouth," and the anchorage of San Fernando.

The *Gannet* also, and gunboat *Minstrel*, under Commander Chimmo, assisted by Mr. Scarnell, Master, R.N., completed the soundings of the Bay of Fundy, and brought to a close the survey of Nova Scotia.

Mr. J. H. Kerr, in Newfoundland, rendered essential service to the expedition which laid the Atlantic cable of 1866, by buoying the course of the cable, and piloting and assisting with local knowledge, the squadron which assembled in Trinity bay.

Mr. Pender, Master, R.N., had been employed with a hired vessel, surveying the channels between the north end of Vancouver Island and the northern boundary of the British possessions, in $54^{\circ} 40'$ north latitude, and surveyed the bed and harbour at the eastern entrance of the Skiddegate channel in Queen Charlotte Island, as well as plans of several useful anchorages on the shores of the mainland. The bar at the entrance of the Frazer river was also re-surveyed, in consequence of changes which had occurred in the channel.

Staff-Commander Stanton, with the assistance of H.M.S. *Rapid*, completed the soundings between Storm river and Cape Recife of the Cape Colony.

Captain Cox retired from the charge of the Australian Victoria survey, after thirty years in the surveying branch of the profession, and was succeeded by Commander Wilkinson, who, during 1866, completed from Port Phillip westward, to within a league of Cape Otway. The Government of Victoria had placed the colonial steamer *Victoria* at Commander Wilkinson's disposal for this duty.

Captain Sidney charted the coast between Sydney and Port Stephens, a distance of 86 miles. A re-survey of the harbour of Newcastle, rendered necessary by the changes in the banks and channels, was also made, and the harbour of Port Stephens.

Staff-Commander Jeffery retired from the charge of the Queensland survey, and Mr. Bedwell, Master, R.N., succeeded, completing 60 miles of the shores of Moreton bay.

Commander Nares, of the *Salamander*, lost no opportunity of adding to our hydrographical knowledge of parts of the eastern coast of Australia, which had only been partially examined before, and surveyed the eastern coast of Hinchinbroke island, the Palm island group, and Cleveland bay.

The vessel employed on the coast of South Australia had been transferred for a considerable time to the north coast of Australia, in connection with the formation of new settlements. Latterly Mr. Howard, Master, R.N., who was in charge, had charted the coast between Cape Croker, the north-east point of Coburg Peninsula and Cape Stewart, a distance of 250 miles, as well as making plans of Mount Norris bay and Liverpool river. The vessel returned to Adelaide, and Commander Hutchison resumed work on the eastern side of Spencer Gulf, 70 miles of the coast of which, southward of Cape Elizabeth, including a plan of Port Victoria, were completed.

In 1867, H.M.S. *Lightning*, under Captain E. J. Bedford, had re-surveyed from the termination of the Cardiff Survey of 1866-7 to the upper limit of King roads. This survey completed, the *Lightning* had been laid up, and the force on the home coasts reduced to one regular surveying vessel.

Staff-Commander E. K. Calver, in the *Porcupine*, continued the examination of the eastern coast with a view to the correction and revision of the Charts and Sailing Directions. The coast and harbours from the River Humber to the North Foreland had been examined. The entrance of Harwich harbour re-surveyed, and a new survey executed of the Suffolk coast from below Lowestoft to Orfordness. A tract of 9 square miles of shingle, a short distance in the offing between Dunwich and Sizewell, of the same character as that of the beach, opaque flint, was discovered; this feature proving of interest to those who have made the origin and movement of sea-beaches the subject of their investigations.

Staff-Commander D. Hall continued at the entrance of Portsmouth as far as Spithead, and westward beyond Stokes bay; and a re-survey of the harbour had been commenced, which had become necessary in connection with the extensive Government works being carried out, and the dredging in contemplation.

Staff-Commander John Richards was employed in completing the Channel Island survey.

Captain P. F. Shortland, in H.M.S. *Hydra*, was employed in the early part of 1867 in surveying the southern and eastern shores of Sicily. Later on, he was employed in sounding the Malta channel, and in September the *Hydra* was detached deep-sea sounding between Bombay and the Red sea. She reached Bombay in January, and by March, Capt.

Shortland completed this service, having sounded at short intervals in a line from Bombay to the Kooria Moria isles, and thence to Aden.

The *Hydra* was then engaged making additional investigations in the Indian Ocean, and settling some doubtful positions *en route* to England, after 5 years' foreign service, and was to be replaced in the Mediterranean by the *Newport*, under Commander G. S. Nares.

H.M.S. *Nassau*, Captain R. C. Mayne, was employed in examining the approach to Magellan strait, including the First and Second Narrows as far as Cape Negro. Among other changes, the Sarmiento bank, off Cape Virgin, had undergone alteration in its character.

Staff-Commander J. W. Reed, in the *Rifleman*, had examined nine dangerous coral reefs in the main route of the China sea, as also the Sea-Horse bank at the north-western end of the Palawan Passage.

The position of "Holmes's Shoal," in the fairway, had been examined and found free from danger. A survey of Rhio strait had been executed, and extended to the islands of the Linga Archipelago, and the channels leading to the strait of Durian, as far south as the island of Missana. The south channel into Penang had also been re-surveyed.

Commander E. W. Brooker, in H.M.S. *Sylvia*, had been employed on the coasts of Formosa. He also had searched for, and pronounced not to exist, Harp island and Alceste rock, and settled the position of Botel Tobago island.

On the voyage to China, Commander Brooker visited the Andaman islands and Cocos group, rectifying the geographical positions of certain points reported to be considerably in error. He then carried a line of soundings along the coast of Martaban, through the strait of Malacca and up the China sea, from Saigon to Hong Kong.

A report on the lighting of the coast of China between Hong Kong and Shanghai had been furnished by Commander Brooker.

The *Serpent*, Commander C. Bullock, was employed examining anchorages on the coasts of Nipon, with a view to the selection of treaty ports. The ports of Hiogo and Odsaka, in the inland sea, and Nanao harbour on the west coast, were surveyed, and the entrance to Kagosima gulf and the coast about Cape Chichakoff examined.

A chart of the island of Montserrat had been received from Staff-Commander Parsons, and a survey of Barbadoes had been commenced; also an examination of the various channels among the Virgin islands to ascertain whether changes had resulted from earthquake disturbance.

Captain R. V. Hamilton, of H.M.S. *Sphinx*, between the island of Santa Cruz and the Virgin group, subsequent to the late earthquakes in that neighbourhood, obtained deep soundings.

Commander Charles Parry, of H.M.S. *Cordelia*, also obtained deep soundings between Jamaica and Cuba.

The *Gannet*, Commander W. Chimmo, was occupied on the survey of the island of Trinidad and adjacent main land. During the summer and autumn of 1867, the *Gannet* visited and explored a considerable stretch of the Labrador coast; the limits of this coast were correctly determined, and several harbours and anchorages carefully surveyed.

Staff-Commander J. H. Kerr, during the summer of 1867, procured soundings and traced out the best course for the submarine cable, between Placentia bay and Cape Breton, in Nova Scotia; as also in the recovery of the Atlantic cable eastward of Newfoundland. Subsequently the survey of the coast of Conception bay and the examination of the ground in the vicinity of Cape Freels was proceeded with.

Navigating-Lieutenant Pender had been employed in the survey of the inner ship-channels between Vancouver island and the northern boundary of British North-West America, near Fort Simpson.

Navigating-Lieutenant Archdeacon, at the Cape of Good Hope, completed as far eastward as the Kei river.

The coast of Victoria survey was being continued eastward between the Port Phillip and Wilson Promontory. There had been delay in its progress, owing to the illness of Commander Wilkinson, which terminated in the death of that lamented officer in December, 1867.

Captain Sidney surveyed the coast-line between Sydney and Ulladulla, in New South Wales, together with the re-survey of a part of Broken bay, and a plan of Jervis bay.

Commander Hutchison had been employed on the coasts of Yorke Peninsula, which separates the gulfs of St. Vincent and Spencer in South Australia, as well as the anchorages of Ports Adelaide and Glenelg.

Mr. Bedwell completed a re-survey of Moreton bay, and completed the outer coast from Cape Moreton to Point Danger, thus connecting the shores of the two colonies of Queensland and New South Wales.

Consequent on the Abyssinian expedition, additions had been made to the coasts and reefs of the Red sea between Aden and Annesley bay, Captain R. Bradshaw, of H.M.S. *Star*, being selected for the duty.

In 1868, Staff-Commander E. K. Calver, in the *Porcupine*, was employed making a minute survey of the river Medway, on a scale of 20 inches, between the dockyard at Chatham and Okehamness, in connection with the Government works then in progress.

He also surveyed the south bay of Wexford, for the purpose of testing its capability as a site for a harbour, desired for commercial purposes; a re-survey was likewise made of several of the off-lying shoals on the Suffolk coast, and of a portion of the entrance of Harwich.

Staff-Commander D. Hall made an examination of Portsmouth harbour on a scale of 30 inches, necessary on account of the extension of the dock-works, as well as with a view to dredging. He also re-examined Spithead, in connection with its re-buoyage, and the publication of a larger plan than hitherto existed.

Staff-Commander J. Richards and one assistant, with the means afforded by our vessels employed in protecting the fisheries, surveyed the northern portion of the Minquiers reef, and dangers between Jersey and the coast of France. The channels north and south of Jersey, as far west as the meridian of the Roches Douvres, were also sounded, and new dangers discovered.

Captain Shortland, in the *Hydra*, returned to England, bringing a line of deep-sea soundings from the Cape of Good Hope by St. Helena to the English Channel. The greatest depth obtained, about 200 miles south of St. Helena, was 2,800 fathoms, believed to be the deepest reliable sounding on record at that time.

The *Hydra* was replaced in the Mediterranean by the *Newport*, under Commander G. S. Nares, whose first duty was to survey the line for the sub-marine cable between Malta and Alexandria, and then to escort the cable-ship, both of which duties were successfully performed.

The *Newport* afterwards completed the survey of the western portion of Sicily, preparatory to extending the soundings to Tunis, and satisfactorily determining the position of the various banks which lie between Sicily and the African shore. Melazzo, at the entrance of Messina strait, and Syracuse, were also surveyed.

The *Nassau*, Captain R. C. Mayne, C.B., completed the eastern portion of Magellan strait from Cape Virgin to the Chilian settlement, Punta Arena. The inner channels between Port Tamar and the Gulf of Pénas were also generally examined. New anchorages were discovered and surveyed. Intricate portions of the channels, such as English Narrows, Victory Pass, and the channel between Long and Summer islands, were examined and charted on good scales.

In the western portion of Magellan strait an examination had been made of both shores from Cape Pillar to Port Famine.

When the severity of the climate prevented the *Nassau* from working in these regions, she was employed on the west coast of America, and surveyed Coquimbo and Herradura. On returning south from Chiloe, the *Nassau* passed inside the Chonos Archipelago, and into the Pacific by the Darwin passage, the navigation of which was found available for vessels of any size.

Commander Brooker, in the *Sylvia*, surveyed the coast of Kiu-siu between the port of Nagasaki, through Spex strait, as far as the Strait of Simonoseki. In November, 1868, the *Sylvia* was called away from Japan and crossed over to the Great Yang-tsze bank to search for a reported shoal at the entrance of the river.

A re-survey of the entrance of the river Min was executed, where great changes were found to have taken place since the former surveys of 1843-54; and a system of buoyage was proposed to the Chinese authorities.

Staff-Commander J. W. Reed, in the *Rifleman*, examined the eastern edge of the passage from Singapore to Hong Kong, as also some reefs in the Palawan passage, both routes being considered thereby sufficiently known for navigation with ordinary caution.

The survey of Balabac strait, between Borneo and Palawan, together with the island of Balabac and Balambangan, were also well advanced.

During a visit to the Gulf of Siam, the positions of some doubtful dangers were searched for and found not to exist.

The *Rifleman* made additions to the survey of Singapore strait, by which that chart was improved, and 30 miles of the Malay peninsula, northward of Singapore, were also re-surveyed and sounded.

Staff-Commander Reed and his officers observed the total eclipse of the sun, which occurred on the 18th August, 1868, and for this visited Baram point, on the west coast of Borneo, accompanied by Mr. Pope Hennessey, the Governor of Labuan, who went for the same purpose. The *Rifleman's* observations were communicated to the Royal Society.

Surveys of the Philippine isles and seas adjacent were in course of progress, under the conduct of Captain Claudio Montero, of the Spanish Navy, by whose co-operation with Staff-Commander Reed, and courtesy in sending copies of his surveys immediately they were made, valuable additions and corrections were made to the Admiralty charts.

Staff-Commander Parsons was employed in making a survey of the island of Barbadoes.

The West Indian surveyors had been diverted from their ordinary duties to examine whether any change had been caused by the earthquake-wave of 1867. Surveys of Virgin Gorda and its approaches had been made in reference to its capabilities as a packet-station.

Staff-Commander J. H. Kerr surveyed 200 miles of coast-line, and sounded over 700 square miles in the vicinity of Cape Freels and Fogo island on the east coast of Newfoundland. He likewise completed the survey of Conception bay, and determined several positions round the entire coast with a view to the construction of new charts to supersede those of the last century.

Staff-Commander Pender, in a hired vessel, was employed in examining the channels between the northern end of Vancouver island and the British boundary in $54^{\circ} 40' N.$; 900 miles of coast were so examined, 150 miles of which were exposed, and at all times difficult to effect a landing upon. Portland inlet was surveyed and found to extend 11 miles farther north than shown on the old charts. Several new anchorages were also found and surveyed on the main route between Vancouver island and Fort Simpson.

Navigating-Lieutenant Archdeacon completed the survey of the eastern coast of the Cape of Good Hope colony to the Bashee river, when, in consequence of negotiations

between the Colonial Government and the native tribes east of the Bashee, it was considered desirable to remove the party to the west coast of the colony, which they surveyed as far north as Saldanha bay.

The re-survey of the seaboard of New South Wales, from Cape Howe in the south to Danger point in the north, had been completed. The officers were obtaining the off-shore soundings and other data necessary to render the charts complete. The survey was commenced by Captain Sidney in 1861, but in 1868 was under the conduct of Navigating-Lieutenant J. T. Gowland, Captain Sidney having retired, after a long and meritorious service of 34 years, during which he was constantly engaged in surveying duties in various parts of the globe.

Nav.-Lieut. H. J. Stanley had surveyed the coast of Victoria between Cape Schank and Wilson's Promontory, and plans of the bays and anchorages were made on scales suitable for navigation. A re-survey of the entrance to Port Phillip had also been completed.

During the year 1868, the eastern shores of St. Vincent gulf of South Australia were examined from Adelaide to Cape Jervis. The outer coast entrance from Cape Jervis to 30 miles beyond the Murray river, had likewise been surveyed.

Captain Hutchison had been promoted, and the charge of the survey was in the hands of Nav.-Lieut. F. Howard.

Nav.-Lieut. E. P. Bedwell surveyed the coast of Queensland from Moreton bay to Indian head, or nearly to Sandy cape, and carried the soundings to a distance of 15 miles from the shore. Wide bay and the bar to the entrance of Great Sandy strait, with the south part of the strait, had also been sounded.

Commander Chimmo and the officers of H.M.S. *Gannet*, had been employed in completing the survey of Trinidad and the approach to the Gulf of Paria, and subsequently in defining the deep limits of the bank south of Newfoundland, and searching for off-lying shoals; likewise in investigating the phenomena of the Gulf stream, and in carrying a line of deep-sea soundings across the Atlantic. Commander Chimmo's investigations formed the subject of a paper which was read before the Royal Geographical Society.

H.M.S. *Serpent*, Commander Bullock, left Japan in May, 1868, and touched at Mantawalu Kiki, in the Gulf of Tomini, Celebes island, where the total eclipse of the sun of the 18th August was observed by the officers of the *Serpent*, and also by professional astronomers from Manilla, whom Commander Bullock had brought from thence for the occasion, the results being communicated to the Royal Astronomical Society. The *Serpent* proceeded to Amboyna and thence to Koepang in Timor, where some slight surveying operations were performed, and a line of deep-sea soundings was then carried south of the Isles of Flores and Sumbawa, through Bali strait to Pampang bay, on its western shore, a detailed plan of which was made as a terminus for the shore-end of the cable. The result of this survey proved that it was a suitable route for a cable.

The *Serpent* then carried a line of deep soundings across the Bay of Bengal, from Penang to Point de Galle, at the south end of Ceylon, the greatest depth found being 2,200 fathoms.

In 1869, the *Lightning* was equipped, under Staff-Commander John Richards, late in charge of the Channel island survey, which had been completed. The off-shore soundings from the Channel islands were carried west to longitude $3^{\circ} 20'$; tidal observations were also made throughout the whole extent of the group, and diagrams placed on the chart, by which the precise direction and strength of the stream can be seen at a glance for each hour.

Staff-Commander Hall was occupied on the large scale survey of Portsmouth harbour. Tidal observations were made, and levellings carried to Langston harbour, in order to ascertain the effect of the tidal scour on that of Portsmouth and its bar, when the gun-boat channel connecting the two should have been completed and opened.

Captain Nares, in the *Newport*, completed the survey of the coast of Tunis and its off-lying banks, from Cape Carthage to Tabarca island, up to which point the south coast of the Mediterranean had been surveyed by the French. The *Newport* also surveyed the island of Pantellaria in the Malta channel, and re-surveyed the port of Alexandria; she passed several times through the Suez Canal at its opening, and subsequently, with the Hydrographer of the Admiralty, and Director of Engineering Works, who were sent to report on that great work, when soundings and sections were taken, and Port Said surveyed.

The *Nassau*, Captain Mayne, had returned from the Magellan survey. The result of his last season's work consisted of the examination of 255 miles of the channels leading from the straits into the Gulf of Pênas and the survey of 20 anchorages or havens, most of which were little known.

On the return voyage, the *Nassau* was employed in searching for some of the doubtful dangers of the Atlantic.

The *Sylvia* was employed in surveying portions of the inland sea of Japan.

A part of the west shore of the Gulf of Yeddo had also been surveyed. A considerable portion of the Upper Yang-tsze river had been explored and mapped by Lieutenant Dawson, and Mr. Palmer, of the *Sylvia*.

The highest point on this river previously explored was the southern entrance of the Tung-Ting lake, about 125 miles above Hankow, and 700 miles from the sea. These officers had mapped as far as Kwei-chow, or nearly 1,000 miles from the sea.

During the year 1869, Commander Brooker was compelled to resign from ill-health and return to England, and Navigating-Lieutenant Maxwell remained in charge. The *Sylvia* had been re-commissioned in China, and Commander H. C. St. John appointed to conduct the survey.

Staff-Commander Reed, in the *Rifleman*, had made an excellent survey of Balabac strait, leading from the China into the Mindoro or Sulu sea.

The *Rifleman* was disposed of in China, and the surveying officers returned to England at the close of 1869. H.M.S. *Nassau*, under Commander Chimmo, was about to leave England in further prosecution of the China sea survey.

Staff-Commander Kerr completed 300 miles of the eastern shores of Newfoundland, north and west of Fogo island.

During the early part of the season the party were employed in surveying portions of Bona Vista bay, until driven out of it by the pack ice.

During the laying of the French Atlantic Cable, valuable assistance was rendered to the *Great Eastern* among the banks in the vicinity of St. Pierre, and in laying the shore end of the cable from that island.

Staff-Commander Parsons completed the survey of Barbadoes, and plan of Carlisle bay.

The survey had then been removed to the colony of British Guiana.

Staff-Commander Pender had examined the western shores of the off-lying islands northward of Vancouver island, and sounded the outer entrance to Queen Charlotte sound.

From Cape Calvert to the south-east point of Banks island had been surveyed. It was intended that the survey should be withdrawn at the close of 1869.

The survey of the west coast of the Cape of Good Hope, under Nav.-Lieut. Archdeacon, had completed the shores from Table bay northerly to Lambert cave, and a survey made of Saldanha bay. A re-survey had also been made of False bay. The surveying party had then worked northward towards the Orange river.

The surveyors in South Australia had examined Nepean bay and the south coast of Kangaroo island, also completed Backstairs passage between that island and Cape Jervis.

Captain John Hutchison, lately in command of the survey, and Nav.-Lieut. Guy, his

assistant, died in July, 1869, almost suddenly, and within five days of each other, from illness brought on through exposure in the execution of their duties. In the untimely deaths of these officers the service lost two able and zealous public servants.

The survey of the Colony of Victoria had been carried on east from Port Phillip, and the coast completed from a few miles west of Cape Otway to Port Albert. A survey had also been made of Portland bay, westward of Cape Otway.

The *Pharos*, Colonial Government steamer, used for the survey, had also been employed in assisting to lay the Submarine Cable between Victoria and Tasmania.

The survey of New South Wales had been completed. The work of 1869 being confined to deep-sea soundings, the limit of the hundred-fathom line having been determined from off Point Danger to Cape Howe. The party having been withdrawn from the coasts of New South Wales, Nav.-Lieut. Gowland had been kept to examine and survey the rivers and inner waters of the colony.

In Queensland, Nav.-Lieut. Bedwell had examined the outer coast of Great Sandy island from Indian head, northwards round Breaksea spit, and the west shore of Hervey bay.

Nav.-Lieut. Langdon performed good service in the examination of the mouths of the Binon and Brass rivers, the Bonny, New and Old Calabar, and the Cameroon rivers, and was engaged in correcting the survey of the Sherbro river.

Commanders Edward Dunsterville and John Burdwood; the name of the former, associated for nearly 30 years with all matters relating to charts, and the latter for a scarcely less lengthened period with the annual tide-tables and other useful compilations, retired from the Hydrographic Department in 1869.

In 1870, Staff-Captain Calver, in the *Porcupine*, was engaged at the head of Lynn Deepes in furtherance of a re-survey of the Wash, wherein changes had occurred since it was examined by the late Captain Hewett, 40 years before.

The *Porcupine* then resumed the scientific deep-sea-survey of the Atlantic slope along the coasts of Spain and Portugal, Gibraltar strait and part of the shores of the Mediterranean as far as Malta. The results were satisfactory. Interesting observations were made on the temperatures at various depths, and new light thrown on the systems of ocean circulation, and the connection between the currents of the Mediterranean and the Atlantic.

Observations were made of the surface and under-currents in the strait of Gibraltar by Dr. Carpenter, aided by Captain Calver.

A full account of these researches was published in the "Proceedings of the Royal Society," No. 125, Vol. XIX.

H.M.S. *Lightning*, under Staff-Commander John Richards, surveyed a section of the Strait of Dover, between the South Foreland and Cape Grisnez, with a view to possible engineering operations.

The result of this survey proved, from the unevenness of the ground and the strength of the current, unfavourable to a scheme which has been proposed of connecting England with France by an iron tubular subway, though not unfavourable to a tunnel.

During the latter part of the season the *Lightning*, under Staff-Commanders Richards and W. B. Calver, was occupied in surveying the estuary of the river Dee, which was found much changed since the survey of 1859.

Staff-Commander D. Hall made a minute measurement of the depths on the Bar of Portsmouth harbour. He also re-surveyed the Medina river on a large scale, with the view to deepening by dredging; and plans on 30 inches were constructed of the upper portions of Portsmouth and Langston harbours, showing the connecting channel excavated for the passage of gunboats.

Captain Nares, in the *Newport*, continued the survey of the coasts of Sicily and the coral banks between it and the coast of Tunis; a suitable deep-water channel was found south of

the Skerki reef, through which the telegraph cables connecting Gibraltar and Malta, and the latter with Bona, were successfully laid.

The *Newport* was detached from the Mediterranean in September for the survey of the Gulf of Suez, in which considerable progress had been made, and the ship was to be replaced by a vessel more suited to the climate of the Red Sea.

The Indian Government had asked that a re-survey should be made of the port of Aden previous to dredging operations. Nav.-Lieut. Ellis was sent from England in October, and satisfactorily completed this service.

Nav.-Lieut. George Stanley succeeded Staff-Commander Parsons in the conduct of the West Indian survey, and had been employed during the year 1870 in extending the survey of Demerara, which was commenced in September, 1869. This completed, off-shore soundings on the bank which fronts British Guiana, had been commenced.

Staff-Commander J. H. Kerr, in Newfoundland, sounded the eastern approach to Belle Isle strait, defining the 100-fathom edge of the bank, in the interest of passenger vessels between Liverpool and Quebec, which adopt this route during a part of the year.

The latter part of the season was spent in charting the dangers near Bonavista bay on the east coast of Newfoundland.

In the depth of winter, Staff-Commander Kerr aided in attempts to recover the broken Atlantic Cable, but owing to constant storms, intense cold, and the prevalence of ice, these efforts were unsuccessful.

Staff-Commander Pender was employed in examining the western seaboard of the islands which front the coast of British Columbia northward of Vancouver island; this service he completed, as well as the inner ship-channels of communication as far as the northern boundary of the colony, in $54^{\circ} 40'$ N. lat. Additional soundings were also obtained on the bar of the Goletas channel, at the north end of Vancouver island, and re-surveys made on a large scale, of Becher and Pedder bays, at the eastern end of St. Juan de Fuca strait. This survey being considered complete the party had been withdrawn.

Nav.-Lieut. Archdeacon completed the Cape of Good Hope survey, from Lambert bay, northward, to a few miles beyond the Orange river.

The Orange river proved unnavigable, the entrance having been found obstructed by a sand bar, and the river within a mass of sand banks. A survey of Port Nolloth was also executed.

Nav.-Lieut. Howard sounded Tipara reef in Spencer gulf, and examined the north coast of Kangaroo island, between Point Marsden and Cape Borda.

The coast was surveyed from the mouth of the Murray river to Cape Jaffa, 40 miles south of Lacepede bay.

From Cape Jaffa to Glenelg river was then completed, the off-shore soundings only remaining to be obtained.

Nav.-Lieut. H. J. Stanley completed the Ninety Mile beach, Gipp's land, and carried the survey eastward to Cape Everard. In addition, large scale plans were made of Port Fairy and Warnnambool harbour.

The coast was also closely sounded from Wilson Promontory to near Merriman creek, on the Ninety Mile beach.

The seaboard of New South Wales had been completed, and charts of the whole coast published. Navigating-Lieutenant Gowland, in succession to Captain Sidney, brought the survey to a close, but was retained in the colony for the purpose of completing the inner waters, and had finished the survey of Clarence river.

Staff-Commander Bedwell surveyed the shores of Queensland from the north part of Hervey bay almost to Port Curtis, and sounded to a distance of 25 miles off-shore.

H.M.S. *Nassau*, Commander W. Chimmo, left England in May, 1870, making an examination of various sites proposed for light-houses in the Red Sea. She then carried deep-sea soundings of from 2,000 to 3,000 fathoms between Galle harbour in Ceylon and Java head, and thence up the China sea to Hong Kong, for submarine cable purposes. Leaving Hong Kong early in December, this vessel had commenced work in the Sulu sea.

Commander St. John, in the *Sylvia*, had completed the passages on either side of the "Conqueror" bank, from Cone island on the east to Mutsu Sima on the west, in the inland sea of Japan.

The ports of Mataya and Owasi, on the south coast of Nipon, had been surveyed.

Commander St. John furnished observations on the Japan Current and on Typhoons, which prevail in this region.

In the season of 1871, the *Porcupine*, under Staff-Captain E. K. Calver, was engaged in re-surveying the Lynn Wash, comprising within the area re-examined 450 square miles.

The *Porcupine* was also employed in making a minute examination between the Thames and the Tay, and in examining the nautical works in progress at the principal sea-ports.

Staff-Commander J. Richards made a new survey of Morecambe bay, the sands of which had undergone changes since the last Admiralty survey by Captain Denham in 1845.

The *Lightning* was also employed in making a preliminary examination of the banks off the south-east coast of Ireland, which were reported to have undergone changes.

Staff-Commander D. Hall surveyed Southampton water on a large scale, which had long been required, and was to include the Bramble bank. He also supervised the dredging operations for deepening the channel into Portsmouth harbour.

Captain Nares completed the gulf of Suez as far south on the African shore of the Red Sea, as Cosire and the Brothers islands, and made a re-survey of Port Said and its approach.

A short time was spent during 1871 in investigating the currents of the Strait of Gibraltar, commenced in the *Porcupine* in 1870, by Dr. Carpenter, F.R.S., and Captain Calver. Dr. Carpenter accompanied Captain Nares in the *Shearwater* to the Mediterranean.

A paper by Captain Nares appeared in the "Proceedings of the Royal Society," and was also published in a separate pamphlet by the Admiralty.

Staff-Commander George Stanley, between July, 1870-71, was employed on the coast of British Guiana, during which time 4,000 linear miles of soundings and 90 miles of coast-line were completed. The approach to Demerara had been made clear, and distinctly charted for a considerable distance seaward.

Navigating Lieutenant Archdeacon triangulated and surveyed 250 miles of coast-line at the Cape of Good Hope colony, or from Bashee river to Point Morley.

Staff-Commander J. H. Kerr surveyed 300 miles of coast line, with 280 square miles of soundings, in Bona Vista bay of Newfoundland.

Staff-Commander Howard, in the hired schooner *Beatrice*, was engaged sounding the coast surveyed on a previous occasion in South Australia, until June, to a distance of eight miles off-shore. By January, 1872, 60 miles of Spencer's gulf was also accomplished, including Franklin harbour.

Nav.-Lieut. H. J. Stanley, in Victoria, had surveyed 70 miles of open coast westward of Cape Otway. The total amount completed for the year being about 120 miles, and 1,600 square miles of soundings.

The Richmond and Hunter rivers had been carefully sounded in New South Wales, by Nav.-Lieut. Gowland, on large scales.

Staff-Commander Bedwell, on the coast of Queensland, surveyed Port Curtis on a large scale. The outer coasts of Facing and Curtis islands were surveyed from East Point to Cape Capricorn, and the approach sounded from a distance of ten to twelve miles off-shore.

Commander H. C. St. John, in the *Sylvia*, in Japan, had circumnavigated Yezo, the northern island of the group, determined the positions of its salient points, and surveyed the harbours on large scales. The *Sylvia* also surveyed Nambu harbour in Yamada bay, on the east coast of Nipon.

H.M.S. *Nassau*, Commander Chimmo, had been employed in the western part of the Sulu sea, between Balabac strait and the islands of Cagayan Sulu; she also carried soundings and fixed the position of dangers between Balabac and Ho Ho, in the island of Panay, one of the Philippines, and commenced the survey of the channels between the Sulu and Celebes seas.

Lieutenant Dawson, aided by the officers of the Brazil Squadron, made an examination of the river Plate, between Monte Video and Buenos Ayres.

Captains E. K. Calver and John Richards both retired early in the year 1872; the former was succeeded in the command of the *Porcupine* by Staff-Commander John Parsons, the latter on the west coast of England by Staff-Commander J. Kerr, of the Newfoundland survey.

In India, from March to June, 1871, Mr. Girdlestone (late I.N.), in the *Constance*, of 186 tons, surveyed the inlet of Khor Rapeh, on the Mekran coast, between Jask and Chabor, and subsequently the same vessel, under Mr. Chapman (late I.N.), surveyed the reefs near Bahrein in the Persian gulf.

Mr. Harris, river surveyor, surveyed several creeks and rivers on the Orissa coast.

In 1872, the *Porcupine*, under Staff-Commander Parsons, was employed on a re-survey of the Port of Harwich. Near Yarmouth and Lowestoft, surveys were also made, and then carried south between Orfordness and the Naze.

The *Lightning*, for some years employed on surveying service, was found unseaworthy and broken up; and the west coast of England surveying party, under Staff-Commander Kerr, had been employed with boats in making a re-survey of Menai straits and the neighbouring shores of Carnarvonshire.

Staff-Commander D. Hall re-surveyed the harbour of Portland on a large scale, and examined Southampton water.

H.M.S. *Shearwater*; Captain Nares, having been appointed to the *Challenger*, was succeeded, in April, 1872, by Commander Wharton, who, in June, left Malta to complete the Dardanelles, with the narrow western portion of the sea of Marmora for 25 miles eastward of Gallipoli. Experiments made on the currents in the Dardanelles and Bosphorus, proved the existence of strong under-currents running counter to the surface, set from the Black sea, through these straits, into the Mediterranean. A survey was also made of the roadstead of Déde Agatch, the terminus of the railway from Adrianople. The *Shearwater* then visited Cape Bon, to select the site of a new light-house; subsequently she resumed the survey of the coast of Sicily, and proceeded on a re-examination of Port Said.

The *Sylvia*, Commander St. John, in Japan, surveyed Goza harbour, Muro bay, and the coast and off-lying dangers of Cape Sima, on the east side of Nipon; subsequently Susaki and Nomi harbours, on the south coast of Sikok, were surveyed. The Boungo channel had been partially sounded, the anchorage off the island of Uimi Sima and adjacent coast examined, and the east part of the strait of Simonoseki re-sounded. In August the *Sylvia* was ordered to England, where she arrived in April, 1873. On her voyage she carried a line of deep soundings for telegraphic purposes from the entrance of the Gulf of Aden to the Seychelles, thence to Mauritius and Natal on the east coast of Africa.

The *Nassau*, Commander Chimmo, likewise returned after an absence of about three years. She was employed during 1872 in the Sulu Archipelago, and continued to Singapore by the Flores and Java seas, examining the dangers in the track of vessels by that route to Australia. She reached Malta by the Suez Canal in March, 1873, and was then prepared for further surveying service on the east coast of Africa.

The Cape of Good Hope survey had been completed as far as circumstances would

admit; the soundings still required were to be obtained as opportunities offered. Nav.-Lieut. Archdeacon had been transferred to Western Australia, the survey of which had been commenced.

Staff-Commander George Stanley completed the survey of the island of Dominica, and carried the soundings beyond the 100-fathoms line.

During September, 1872, the Windward islands were visited by a severe storm, when the vessels in the roadstead of Dominica, including the surveying schooner, were driven ashore. The latter was totally wrecked, and several lives lost. The surveying party proceeded with another vessel to Jamaica, which island was to be surveyed.

Nav.-Lieut. Maxwell, in charge of the Newfoundland survey, completed Trinity bay, and commenced that of the south coast of the colony at the Burgeo islands, completing the coast for a considerable distance to the eastward. Soundings were obtained near Sable island.

Staff-Commander Bedwell, in Queensland, made a minute examination of the Brisbane river, and also examined the bar at Wide bay. The survey of the coast had been extended 50 miles to the north, from Keppel islands to Cape Clinton.

Nav.-Lieut. Gowland had surveyed the inner waters of Broken bay, and the course of the Hawkesbury river as far as the flow of the tide (at the expense of the colony of New South Wales).

Nav.-Lieut. H. J. Stanley had been employed during 1872, in completing the sounding of the western coast of the Victorian colony, and in the survey of King island, at the western entrance of Bass strait.

Staff-Commander Howard was employed on the west side of Spencer gulf; Port Lincoln was surveyed, and the work carried northward to Franklin harbour, where it joined the survey of 1871. The whole of Spencer gulf was thus completed. During the latter part of the year, the south coasts of Kangaroo island were examined, and the circuit of the island completed.

Nav.-Lieut. Archdeacon, in West Australia, reached Fremantle in August, 1872, and commenced the examination of the passages between the islands and the reefs of the Swan river, working with boats, the first object being to ascertain whether Cockburn sound could be made available for large vessels.

In December, 1872, H.M.S. *Challenger*, of about 1,500 tons, sailed from England under Captain G. S. Nares. In addition to naval surveyors, there were attached to her scientific naturalists, under the direction of the late Professor Wyville Thomson, F.R.S. The *Challenger* proceeded to Lisbon, Gibraltar, Madeira, Teneriffe; thence across the Atlantic to the West Indies, and so far had reached Bermuda. Continuous lines of deep soundings and temperature observations had been carried throughout this track, and many interesting discoveries were made in natural history.

The *Blanche*, in 1872, among the South sea islands, visited the Caroline, Marshall, Gilbert, and Solomon groups, as well as New Ireland and New Hanover, describing and making plans of several unknown anchorages.

The *Basilisk* visited the Ellice islands, Santa Cruz, and New Hebrides groups, and several detached islands in the western part of the South Pacific, when opportunity was taken of making such surveys as the hurried nature of her visits would permit.

In the year 1873, Staff-Commander Parsons, sounded the approaches to Harwich, and from South Foreland to Dungeness, and surveyed Dover bay.

Staff-Commander Hall surveyed the Medina river and Cowes roads, and re-examined Portsmouth bar (after dredging).*

* Until 1863, a line-of-battle ship was obliged to discharge her guns to proceed from Spithead to Portsmouth harbour; in 1874, any ship drawing 25 feet, could enter at three hours' flood, and the heaviest draft ship at high-water.

On the east coast of England Staff-Commander Kerr, in a hired steam vessel, examined the banks between Tuskar rock and Wicklow head, and also Wexford bar, the bar of the river Liffey, and Kingston harbour.

Commander Wharton, in the *Shearwater*, completed the east coast of Sicily and Taormina, and made an examination of the north coast between Castel-le-Mare and Milazzo, including surveys of Palermo bay and Ustica. Port Said and approaches were also re-sounded. The *Shearwater* was transferred to the Zanzibar coast, and completed Zanzibar island and the mainland opposite.

In the Red Sea, Lieutenant Gray, in the *Nassau*, surveyed Perim island, together with the strait and coast near Bab-el-Mandeb, and carried a line of deep soundings from Guardafui to Zanzibar.

In the West Indies, Staff-Commander G. Stanley was engaged sounding to the 100-fathom line off the south coast of Jamaica. In the latter part of the year, yellow fever carried off Navigating-Lieutenant Thompson, attached to this survey.

In Newfoundland, Navigating-Lieutenant Maxwell, in the *Gulnare*, charted 20 miles of the south coast of that island, re-surveyed Port Hood, and examined the coast of Labrador from C. St. Lewis to lat. 54° N.

The survey of the Japan coast was about to be resumed by Captain St. John in H.M.S. *Sylvia*, that vessel being again commissioned for the service in February, 1874.

In Western Australia, Navigating-Lieutenant Archdeacon surveyed the entrances to Cockburn sound, Owen's anchorage, and Gage roads, and completed the north and western approaches to Swan river.

In South Australia, Staff-Commander Howard sounded the south shores of Kangaroo island, and examined several islands and dangers seaward of Port Lincoln in Spencer gulf. Surveys were made from Cape Catastrophe to Point Avoid, of the inner waters of Coffin bay, and the sea coast thence to Point Drummond.

In Victoria, Staff-Commander H. J. Stanley completed the coast line of King island, and the soundings around that island.

In Queensland, Staff-Commander Bedwell and his assistant surveyed Port Bowen, Island head, Strong-tide passages, Shoal-water bay, Broad sound, and several of the Northumberland islands; also, portions of the Brisbane river, entrance of Endeavour river (where Cook refitted in the *Endeavour* in 1770, after nearly losing that ship on a reef).

Mr. Connor, the assistant in this survey, also surveyed the inner edge of Warrior reef in Torres strait, and the adjacent coast line of New Guinea as far as the Talbot islands.

Captain Moresby, in H.M.S. *Basilisk*, made his first visit to the south-east coast of New Guinea, discovered, surveyed, and named Port Moresby, found, and made a *reconnaissance* of China and Goschen straits.

The *Challenger*, after having visited Lisbon, Gibraltar, Madeira, Teneriffe, St. Thomas, Bermuda and Halifax, had returned to Bermuda; thence to the Azores, Madeira, Canary islands, and St. Vincent. From St. Vincent a *détour* to the African coast was made, and thence to St. Paul rocks, calling at Fernando Noronha and Bahia, to the Cape of Good Hope, touching *en route* at the Tristan d'Acunha group.

After refit at the Cape, the *Challenger*, in December, 1873, sailed by way of Prince Edward, Crozet, Kerguelen, and Heard islands, southward to the Antarctic circle, thence northward to Melbourne.

Early in the year 1874, Admiral (now Sir) George Richards retired from the position of Hydrographer.

(Continued under the hydrographership of Captain Sir Frederick Evans).

REAR-ADMIRAL A. L. MANSELL.

1856-1866.

Arthur Lukis Mansell, after having spent two years at the Royal Naval College, in 1830, joined H.M.S. *Rainbow*, in the Mediterranean, under Captain Sir John Franklin, as a first-class volunteer. After a servitude of three years, during which he became a midshipman, he was transferred to the *Britannia*, flag-ship of Admiral Sir Pulteney Malcolm.

In March, 1834, he joined the *Mastiff*, Commander Thomas Graves, employed surveying in the Grecian Archipelago, and passed his examination towards the close of the same year.

In July, 1839, Commander Graves certified respecting Mr. Mansell, "that he had served as a midshipman and mate under his command for 5½ years, in the surveying department, in which he had been constantly employed; his diligence, zeal, and activity had been very conspicuous, and that a reference to documents in the Hydrographical Office, with his name appended to them, would speak more for his proficiency in this branch than any recommendation. His conduct as an officer had always been most exemplary."

In March, 1841, after seven years, this certificate was further endorsed and added to by Commander Graves, and in August of the same year Mr. Mansell was made an Assistant-Surveyor, and in the following December, promoted to the rank of Lieutenant. He continued to serve in the Mediterranean survey, under Captain Graves, in the *Mastiff*, *Beacon*, and *Volage*, until that officer's retirement from active service and acceptance of the post of Port Officer at Malta, in about the year 1850.

On the retirement of Captain Graves, Commander Spratt succeeded him in the charge of the Mediterranean survey in command of the *Spitfire*, and Lieutenant Mansell still continued as senior Assistant-Surveyor in the Grecian Archipelago, in that vessel, until 1854, and subsequently in the Black Sea and Crimea, until promoted to the rank of Commander in September, 1855, having then been 14½ years an Assistant-Surveyor.

In 1856, he was appointed in charge of the survey of the coast of Syria to the *Tartarus*, and subsequently to the *Firefly*, the field of his labours being extended to the north coast of Egypt and the Red Sea.

In 1860, he accompanied the hydrographer, Captain John Washington, Sir Joseph Hooker, and others, on a short journey into Palestine, determining several positions and barometrical heights; also, visiting and fixing the Cedars of Lebanon, and finding the lat. and long. of Damascus and Jerusalem by astronomical observations.

In 1863, the survey of Corfu and the adjacent coast of Albania was commenced, under Commander Mansell's direction, in the *Firefly*; this was continued to the Ionian islands in the two succeeding years, in the *Hydra*, to the command of which vessel Commander Mansell succeeded on the retirement of Captain T. A. B. Spratt, C.B., at the close of 1863.

On the 1st January, 1865, Commander Mansell was promoted to the rank of Post Captain, and retired from active service in 1866. He became a Rear-Admiral on the retired list in November, 1881; also for war services he has received two medals.

During the above lengthened period of 30 years' active service, Rear-Admiral Mansell frequently received the approbation of the several officers under whom he served, and more particularly when in charge of the survey on the coast of Syria, during the massacre of the Christians, about the year 1863, when his presence was instrumental in saving the towns of Tyre and Sidon.

The following charts were published from Rear-Admiral Mansell's surveys:—

Iskanderún to Markhab.
 Alexandretta Bay.
 Ras-el-Fasori to Ras Ziaret.
 Markhab to Ras En-Nakúra.
 Ruad Anchorage.
 Tripoli Roadstead.
 Beirut Bay.
 Saida ancient Sidon.
 Sír ancient Tyre.
 Corfu Channels.
 Corfu Road.
 Prevesa Strait.
 Argostoli Port.
 Patras Gulf.
 Navarin Bay.

Ras Nakúra to El Arish.
 Haifa Bay and Acre.
 Acre Bay.
 Athlit, Kaisariyeh, Yafa, Yebnah.
 Damietta to El Arish.
 Alexandria to Damietta.
 Aboukir Bay.
 Alexandria Port.
 Ashrafi Islands and Reefs.
 Santa Maura, Ithaca, and Cephalonia Is.
 Santa Maura Roadstead.
 Meganisi Channel and Port Vliko.
 Zante Bay.
 West Coast of Morea.

CAPTAIN J. E. DAVIS, R.N.

1863-1877.

John Edward Davis entered the Navy, 5th July, 1828, as a second-class volunteer, on board the *Pearl*, Captain Blake, stationed on the coast of Ireland. From June, 1831, until May, 1837, he served in South America, with his name, chiefly as master's assistant, on the books of the *Samarang* 28; Captain Paget, and *Blonde* 46, Commodore Francis Mason. While belonging to the latter ship, he was lent to the *Beagle*, surveying vessel, Captain Fitzroy, and employed with Messrs. Usborne, master's assistant, and C. C. Forsyth, midshipman, in surveying part of the coast of Chili, and the coasts of Bolivia and Peru. For his services at this period he received the thanks of the Hydrographer of the Admiralty.

In May, 1837, Mr. Davis, who had passed for second master abroad, June, 1835, and at the Trinity House Feb., 1837, joined the *Cornwallis*, bearing the flag on the North America and West India station of Hon. Sir Charles Paget, under whose orders he acted for five months as master of the *Comus* 18, Captain Cary. He was next, in Aug., 1839, appointed second master of the *Terror*, Captain Crozier. In that vessel he sailed soon afterwards in company with the *Erebus*, Captain J. C. Ross, on a voyage of discovery to the Antarctic regions, where three persevering efforts to penetrate the limits of the southern pole resulted in the discovery of a large continent fringed with a barrier of ice from 150 to 200 feet in height, which received the name of Victoria Land, and of an active volcano, known since then as Mount Erebus, rising to an elevation of 12,400 feet. The expedition returned to England in Sept., 1843, after an absence of four years, during which many perils had been survived, and many interesting and important additions to geographical and scientific knowledge been achieved. In October of the same year, Mr. Davis, who had executed the charts and drawings, and been in charge of the surveying operations during the voyage, again received the thanks of the Hydrographer, Sir Francis Beaufort, and was promoted to the rank of master.

From July, 1844, until 1862, he was constantly employed, at first on the west coast of Ireland as Assistant-Surveyor, under Captain G. A. Bedford; next on the south coast of England, with Lieutenant H. L. Cox; and latterly, with Staff-Commander Usborne, engaged more particularly in the re-survey of Plymouth sound.

In the summer of 1862, he accompanied Staff-Commander R. Hoskyn in the first deep sounding cruise engaged in by the *Porcupine*, on the north-west coast of Ireland, towards the success of which, it is believed, he in a large measure contributed, and was favourably mentioned in the official reports in consequence.

He then became attached as a Naval Assistant to the Hydrographic Office of the Admiralty, his duties being more particularly connected with the supervision of deep-sea sounding apparatus, and in revising the catalogue of original documents, of which he was termed, the curator.

He was promoted to the rank of Staff-Commander in June, 1863, and was placed on the retired list with the rank of Captain in 1870.

He expanded, continued, and completed the valuable sun's azimuth or true bearing tables commenced by Commander Burdwood, of the same Department, but left unfinished at his death.

In 1877, Captain Davis retired from the Hydrographic Office of the Admiralty, and died suddenly, later on in the same year, from an affection of the heart.

In commenting on his sudden decease, the *Nautical Magazine* for 1877, remarks, p. 326:—

"It is with the greatest regret that we have to chronicle the sudden death of our valued friend and contributor Captain J. E. Davis, R.N. . . . Captain Davis was a great authority on Arctic matters, and has distinguished himself by his writings on various nautical subjects, and especially in regard to deep-sea thermometers."

The following are the principal amongst the works of Captain Davis, who was an excellent marine painter, and cleverly illustrated the numerous lectures he gave on Arctic Exploration and other professional subjects:—

Notes on Deep-sea Sounding.

On Antarctic Discovery and its connection with the Transit of Venus in 1882.

On Deep Sea Thermometers.

Directions for use of Six's Deep-sea Thermometers.

Paper read at the South Kensington Loan Exhibition on Deep-sea Apparatus.

Paper read before British Association, at Bradford, on the Scientific Voyage of the *Challenger*, 1873.

Sun's Azimuth, or True Bearing Tables (completed).

Directions for Davis Strait, Baffin Bay, Smith Sound, &c.

LIEUT. R. W. WHISH, I.N.

1859-63.

In 1844, when, after the suspension of the Indian Marine surveys, a few operations in this direction were again sanctioned, Mr. R. W. Whish, at that time a midshipman of the Indian Navy, accompanied Commander Sanders as one of the officers of the *Palinurus*, to the Arabian coast. He was subsequently engaged, until 1847, under Commander Montriou, in the surveying brig *Tapti*, surveying anchorages southward of Bombay.

From 1848, to 1850, he was employed as Assistant-Surveyor to Commander Selby in the *Tapti*, making an important survey of the Bombay bank of soundings. In 1850-52 he was chief assistant to Lieutenant A. D. Taylor in the Gulf of Kutch and Katiawar coast survey, which was carried out in a pattimar and the cutter *Maldiva*.

In 1859-60, Lieutenant Whish, in the *Mahi*, made an examination and reported upon the harbour in Bahrein island, and made a partial survey of a channel called Khaur-el-Bab inside the great shoal called Yarron, regarding which he wrote a memoir.*

In 1861-62, Lieutenant Whish made a complete survey of Bombay harbour in two sheets on a scale of 5 inches to the mile, which was subsequently reduced and published by the Admiralty, and until recently, or for 22 years, was the recognised official chart of that harbour.

The following charts were published from Lieut. Whish's surveys:—

Bahrein Harbour (Persian Gulf).

Bombay Harbour (W. C. India).

CAPTAIN J. PARSONS, R.N.

1853-1873.

This officer entered the Royal Navy September 1st, 1840, and first went to sea in H.M. packet brig *Spey*, Lieutenant in command Robert B. James, at that time engaged in carrying the Mexican mail between Falmouth and Crooked island, Havana, and the gulf of Mexico. In November, 1840, the *Spey* was wrecked on the tail of the Bahama bank, in the West Indies, and in consequence Mr. Parsons and J. Ward (many years afterwards the Commander

* See Memoir on Bahrein, by Lieut. Whish, I.N., in Bombay Geographical Society's Journal. Vol. XVI. p. 40.

of the *Actæon*), joined the *Thunder*, employed in surveying the Bahama banks, under Commander Edward Barnett.

From November, 1840, to April, 1846, Mr. Parsons was attached to the surveying schooner *Lark*, tender to the *Thunder*, the former being commanded by Lieutenant T. Smith, and subsequently by G. B. Lawrance, and was constantly employed in surveying, but without any remuneration. In March, 1846, he was made an Assistant-Surveyor of the second class, and continued in the *Lark*, under Lieutenant Lawrance, until the end of August, 1848.

From April, 1849, to the end of the year 1850, he continued in the same capacity under the same commanding officer, on board the *Scorpion*, which in the former year had been sent to the West Indies for the continuation of the Admiralty surveys.

In January, 1851, Mr. Parsons was made an Assistant-Surveyor of the first class, and continued, uninterruptedly, under Lieutenant Lawrance, until that officer's death from yellow fever, which occurred at Santa Cruz in January 1853 (see page 76). After Lieut. Lawrance's death he remained at Santa Cruz to continue the survey, until May, 1853, when he returned to England.

In September, 1853, Mr. Parsons re-commissioned the *Scorpion* as acting master-in-command, and in charge of the West Indian survey, until March 1857, when that vessel was sent to England, under Mr. Dillon, who had taken part in the survey for some time in the capacity of an Assistant-Surveyor. He was confirmed in the rank of master in August, 1854.

After the departure of the *Scorpion* from the West Indies, the survey was carried on in a hired schooner, under the direction of Staff-Commander Parsons, who attained that rank in 1864, until the year 1866, when he returned to England, but resumed his former post in the West Indies in 1867 with two Naval Assistants, Messrs. Harris and G. Stanley, both of whom had served in the *Swallow*, in China.

In 1870, Staff-Commander Parsons was appointed to the Hydrographic Department of the Admiralty as a Naval Assistant, being succeeded in the West Indies by Nav.-Lieut. G. Stanley.

When Staff-Captain E. K. Calver retired from the command of H.M.S. *Porcupine*, and charge of the east coast of England survey in March, 1872, Staff-Commander Parsons was selected to succeed him. He continued in command of the *Porcupine*, making several re-surveys, and extensive additions to the charts of the Home coasts until April, 1882, when the *Porcupine* having been condemned, the *Triton*, Staff-Commander T. H. Tizard, took the former vessel's place.

Staff-Captain Parsons was promoted to that rank in July, 1876, and retired as a Captain in January, 1885.

The charts published from his surveys in the West Indies and English coasts consist chiefly as follows:—

Caicos Islands, Cockburn Harbour.
Caledonian Harbour and Port Escocès.
Cartagena Harbour.
St. Lucia Island. Margot Harbour to Gros
Island.
Port Castries.
St. Vincent.
Kingstown, Greathead, and Calliaqua Bays.
Bequia—Admiralty Bay.
Barbados Island.
Carlisle Bay.
Grenada Island.
St. George's Harbour.
Carriacou to Battowia (Grenadines).
Tobago Island.
" east end.
Scarborough, Rockly Bay.

Antigua, English Harbour.
Demerara and Essequibo Rivers, approaches to.
Georgetown and Mouths of Demerara and
Essequibo Rivers.
Santa Cruz Island.
Harwich approaches.
" Harbour.
Dover Bay.
Folkestone Harbour.
Owers to Dungeness.
Newhaven.
Shoreham Harbour.
Yarmouth and Lowestoft Roads.
Humber River entrance.
Poole Harbour.
Kentish Knock and the Naze to West Swin.

MEMOIRS OF

CAPTAIN J. WARD, R.N.

1858-1865.

John Ward entered the Royal Navy in 1840, and first sailed in the *Spey* brig, employed in carrying Her Majesty's mails to the West Indies and Mexican Gulf, in which vessel he was wrecked in November of the same year on the tail of the Bahama bank, and was then transferred to the *Thunder*, Commander Barnett, employed surveying the Bahama banks in the West Indies.

He passed his examination in 1848, and was promoted to the rank of Lieutenant in October, 1850.

Early in the year 1855 he was appointed to the *Firefly* as an Assistant-Surveyor, under Captain H. C. Otter, employed on the coast of Scotland survey, under whose command he also served in the Baltic.

September, 1858, finds him promoted to the rank of Commander, and he was at the same time placed in command of the *Actæon*, and charge of the survey of the coast of China, in succession to Lieutenant C. Bullock, who had held the charge from the date at which Captain Thornton Bate was killed before Canton.

In the three succeeding years, excellent work was carried out in the *Actæon* and *Dove*, on the coasts of China and Japan. In 1859, the bay of St. Vladimir, Seau-wuhu bay of Manchuria, Tsan-liang-hai harbour, and a sound that divides the island of Tsu-sima into two parts. In 1860, Ta-lien-whan bay, in the strait of Pecheli; the north coast of the Shan-tung peninsula, with Chefoo; the Miau-tau islands, and the shores of the Gulfs of Pecheli and Lian-tung from Staunton island to Ta-lien-whan bay. In 1861, 120 miles of the river Yang-tse-kiang above Hankow as far as Yo-chau-fu at the entrance of the Tung-ting lake, were explored by the officers of the *Actæon* and *Dove*, and the strait of Simonoseki and part of the north-west coast of Japan surveyed in the former vessel, which later on in the same year was ordered to England, the *Dove* remaining in China, where she was afterwards utilised as tender to the *Swallow*, and employed on the west coast of the island of Formosa.

In 1864, when the command of the *Rifleman* fell vacant, owing to Mr. J. W. Reed, the master in command, having been obliged to invalid, Commander Ward was appointed to the post, and in charge of the China sea survey.

In the early part of 1866 he was invalided to England, and has not since served actively afloat.

In September, 1873, Commander Ward retired from the Active List with the rank of Captain.

The following charts were published from his surveys:—

Wusung, or Wongpu River.	Liau River entrance.
Nanking to Tung-liu.	Port Adams, Hulu-shan Bay.
Tung-liu to Hankau	Ta-lien-whan Bay.
Hankau to Yo-chau-fu.	Tsau-liang-hai, with adjacent coast.
Shantung Promontory.	Tsu-sima Sound.
Pe-chili and Liau-tung Gulfs.	Nagasaki Harbour.
Wei-hai-wei Harbour.	Simonoseki Strait.
Chifu, or Yeu-tai Harbour.	Victoria Harbour (Labuan).
Pe-chili Strait.	

CAPTAIN C. J. BULLOCK, R.N.

1857-1869.

Charles James Bullock, son of that well-known surveyor, the late Admiral Frederick Bullock, in June, 1844, joined H.M.S. *Lucifer*, Commander G. A. Frazer, with whom he was employed surveying on the east coast of Ireland until February, 1848. In August, 1846, as a midshipman, he was made an Assistant-Surveyor, such was his aptitude, even at that early period, for this branch of his profession.

From October, 1850, to June, 1854, he served as a midshipman and mate, and during the latter part of the commission as senior Assistant-Surveyor in the *Royalist*, Commander W. T. Bate, employed surveying Palawan island and passage, in the China sea. He passed his examination in February, 1853.

In writing to Commander Bate regarding the *Royalist's* work about this time, Sir Francis Beaufort, the hydrographer, expressed himself as follows:—

“The large amount of labour bestowed by your assistants Mr. C. J. Bullock and W. B. Calver, on that trying and difficult survey, fully justifies your strongly expressed approbation of their zealous co-operation; and together with my cordial thanks for their exemplary conduct, I beg you will acquaint them that I shall lose no opportunity of placing their services in the most favourable point of view before their Lordships.”

Promoted to the rank of Lieutenant in January, 1855, he was in the same month appointed to the *Merlin*, during the second year of the Russian war, under Captain (now Sir) B. James Sullivan. In this vessel he was actively employed in the Baltic, and present at the bombardment of Sveaborg, obtaining Captain Sullivan's approbation of his services.

From April to October, 1856, Lieutenant Bullock commanded the *Shamrock* gunboat, employed on the survey of Wexford river and bar, under the direction of Captain G. A. Frazer.

In October, 1856, he was selected as the colleague of Captain W. T. Bate, then serving in China, and who was afterwards killed in the assault of Canton, to command the *Dove* gunboat, tender to the *Actæon*.

At the death of Captain Bate, Lieutenant Bullock succeeded to the charge of the China survey, and besides taking a useful and prominent part in the operations at Canton, surveyed the river.

In 1858, he resigned charge to Lieutenant (afterwards Commander) J. Ward, and the hydrographer, Captain Washington, thus expressed himself in a letter to Commander Ward, communicated by Vice-Admiral Sir M. Seymour:—

“As Lieutenant Bullock has resigned the charge of the survey to you, I have to request that you will express to him publicly my entire approbation of his conduct of the survey, while in his hands. His clear and distinct letters and reports do him much credit.”

Subsequently, Lieutenant Bullock resumed the command of the *Dove*, co-operating with Commander Ward in the various surveys engaged in during the years 1859-60-61, in northern China and Japan. He returned to England in the *Actæon* in 1862, and from June to October of that year was borne on the *Fisgard's* books for duties at the Hydrographic Office connected with the completion of charts, &c.

In January, 1863, he was made a Commander, and again placed on the same ship's books for a continuation of the unfinished portion of the northern China chart work, and for the purpose of writing Sailing Directions. He was, while yet a Lieutenant, offered the command of the *Swallow* in May, 1862, by Rear-Admiral Washington; but preferred to wait, this offer following so closely on his long service in China.

In April, 1865, he was appointed to the command of H.M.S. *Serpent*, auxiliary surveying vessel, in which he carried out, under difficult circumstances, surveys of the Java sea and various parts of China and Japan, during the years 1865-69 inclusive. His last service in this respect consisted in observing the total eclipse of the sun at Mantawalu Kiki, in the Gulf of Tomini, Celebes island, on the 18th August, 1868, in company with professional astronomers from Manilla, conveyed by Commander Bullock, in the *Serpent*, for the same purpose. He then carried deep-sea soundings south of Flores island and Sumbawa, through Bali strait to Pampang bay, thereby finding a suitable route for a telegraph cable. He also obtained deep-sea soundings between Penang and the south point of Ceylon.

For these services, after paying off the *Serpent*, he was promoted to the rank of Post-Captain, dated 4th April, 1870, and accepted the retirement of 4th August, 1873, his health having suffered greatly throughout almost the whole of the *Serpent's* surveying voyage.*

* For many months he was subjected to a wrong course of treatment by his medical adviser, who had mistaken his ailment, and this lamentable mistake nearly made a confirmed invalid of one naturally of an iron constitution.

His war services, for which he received medals, comprised participation in the operations in the Baltic, 1855; Canton, 1857; Nanking, 1858; Peiho, 1860.

The following charts are from Captain Bullock's surveys, who also compiled the second volume of the China Sea Directory:—

Si-kiang, Kau-Kong to Chau-sun.
Chau-sun to Wu-chau-fu.
Lung-mun Harbour.
Yura and Wadasima Harbours.
Osaki and Tanabè Bays.

Hachken River and Yura-no-uchi.
Hiogo and Osaki.
Sau-o Bay (Formosa).
Hai-yun Island.
Hankau to Yo-chau-fu.

COMMANDER E. W. BROOKER, R.N.

1861-1870.

Edward Wolfe Brooker, born Nov., 1827, entered the Navy April, 1842, as master's assistant on board the *Shearwater*, in which vessel, and the *Blazer*, both commanded by Captain John Washington, he was employed for three years and a half in surveying the North sea.

Joining then, in October, 1846, the *Rattlesnake*, Capt. Owen Stanley, he was, during the next four years, engaged on similar service in Australia, particularly in surveying the Great Barrier reef on the east coast, and in examining the islands of the Louisiade Archipelago, and New Guinea.

In April, 1851, Mr. Brooker, who attained the rank of second-master 16th May, 1849, was appointed to the *Spitfire*, Capt. Spratt. In that vessel, in which he was made an Assistant-Surveyor in April, 1852, and promoted to the rank of Master, March, 1855, he was employed until the commencement of the Russian war, in surveying the islands in the Grecian Archipelago, and afterwards in performing surveys of the Dardanelles, the sea of Marmara, the Bosphorus, Varna, the Drobutscha, Alma Bay, Sebastopol, Khersonese bay, Balaklava, Kertch, &c. He was present at the embarkation of the troops at Varna and at the landing in the Crimea, at the bombardment of Sebastopol, Oct., 1854, in the expedition to Kertch, and at the capture of Kinburn.

During the operations connected with the latter affair, Mr. Brooker, then additional master of the *Spitfire*, was detached on board the *Cracker* gunboat, Lieut.-Commander J. H. Marryat, for the purpose of determining the course of the channel leading into the river Dnieper, and for laying down buoys along the south side of it, a service which was accomplished so completely that he was in a position to inform the Rear-Admiral of his ability to pilot in the men-of-war, the object being to take the enemy's forts in reverse. Sir H. Stewart, in his despatch addressed to Sir Edmund Lyons, writes, "to do full justice to merit and exertion must be my excuse for presuming to request your most favourable notice of Lieut. Marryat and Mr. Brooker. They have had anxious, difficult, and dangerous work to perform, and they have each of them executed it admirably." For his meritorious conduct he was promoted to the rank of Lieutenant 5th Nov., 1855. He continued in the *Spitfire* until February, 1856, and then in the *Tartarus*, Capt. Mansell, in surveying the coast of Syria, where he continued until 1861, in July of which year he was appointed to the charge of the coast survey of Tasmania. Having surveyed George's bay and Hobartown, and made the necessary arrangements for following up the triangulation of the whole of the coasts of that colony, in March, 1863, the survey was suspended, owing to the local government of Tasmania failing to vote the necessary funds for bearing half the working expenses.

On his return to England he received the annual surveying promotion to the rank of Commander on the 1st January, 1864, and was subsequently appointed to the charge of the survey of Portsmouth harbour and bar, where he continued until appointed in 1866 to the command of H.M.S. *Sylvia*, for surveying service in North China and Japan. The *Sylvia* did good work on the coast of Formosa, on the west coast of Nipon between Nagasaki and Simonoseki, in the inland sea of Japan, and at the entrance of the river Min in China.

The President of the Royal Geographical Society, in his annual address for the year 1870, remarked that "During the last year (1869) Commander Brooker, who had ably conducted the North China and Japan survey up to that time, was compelled to resign from ill-health and return to England." His illness ended fatally, and he died in the course of the year 1870.

Commander Brooker, who was an admirable water-colour marine artist, as well as a clever surveyor, wore the Crimean medal and Sebastapol clasp. He had been created a Knight of the Legion of Honour, and received the order of Medjidie of the fifth class.

The following charts were published from his surveys :—

<i>Tasmania.</i>	Atsusi-no-o-sima to Mats-sima.
George's Bay.	Hirado-no-Seto (Spex Strait) to Simonoseki Strait.
Hobartown.	Kurusima-no-Seto.
<i>S.C. England.</i>	N. entrance to Spex Strait and Yebukuro-no-Minato Harbour.
Cowes Harbour.	Yobuko Harbour.
<i>Japan.</i>	Min River (entrance).
Kagosima Gulf.	
Sagistu-no-ura.	

CAPTAIN W. CHIMMO, R.N.

1865-1873.

William Chimmo served as a midshipman during the operations on the coast of China on board the *Cornwallis* flagship of Sir William Parker, and *Modeste* of 18 guns, Captain R. B. Watson, when he was present at the capture of Woosung, Chapoo, and Chin-Kiang-Foo. He passed his examination in seamanship in January, 1848, became acting mate, and subsequently Acting-Lieutenant of the *Herald*, Captain (afterwards Vice-Admiral Sir) Henry Kellett, surveying vessel on the coast of Western America, Vancouver island, and Behring strait.

With Captain Kellett he remained until 1851, having joined him in 1845, thus completing nearly six years of foreign surveying service.

Having passed the necessary examinations he was confirmed in the rank of Lieutenant, and dated back to October, 1850. He was employed about this period for some months at the Hydrographic Office compiling charts.

In February, 1852, he was appointed to the command of the steam vessel *Torch*, employed as tender to the *Herald*, under Captain (now Admiral Sir) H. M. Denham, in the survey of the Fiji islands and Western Pacific.

In February, 1856, he was appointed additional for special service to the *Juno*, Captain S. G. Fremantle, on the Australian station, during which he conducted an exploring expedition in Torres strait. In May, 1858, we find him in the command of the *Seagull* gunboat, tender to the *Porcupine*, Captain Otter, on the north-west coast of Scotland survey. For about two years he served in the Hydrographic Department of the Admiralty as secretary to the Hydrographer, Captain John Washington.

Promoted to the rank of Commander in January, 1864, he was next employed in 1865, on the North American and West Indian station, in command of H.M.S. *Gannet*, auxiliary surveying vessel. As Second Lieutenant and Assistant-Surveyor of the *Gannet*, sailed Lieutenant (now Captain) Wharton, the present Hydrographer of the Navy.

The *Gannet* was employed at first in the Gulf of Paria, and island of Trinidad, surveys which, with plans of the entrance known as Serpent's Mouth and San Fernando anchorage were completed; also, the survey of Nova Scotia, by soundings in the Bay of Fundy. During the summer and autumn of 1867 Commander Chimmo visited and explored a considerable stretch of the Labrador coast, and surveyed several harbours and anchorages. He subsequently defined the deep limit of the bank south of Newfoundland, investigating the Gulf stream and carrying a line of deep-sea soundings across the Atlantic.

Returning to England in 1851, Commander Chinn was next employed for a year in command of H.M.S. *Porpoise*, amongst the islands of the Eastern Archipelago. During England in May, 1854, after examining various spots of lightness in the East sea, deep-sea soundings were carried from Gallie to Jant down by the China sea to Hong Kong. In January, 1855, work in the western sea was commenced between Solander strait and Capuyan Soller Islands, channels between the Sol and Calles sea but the survey was much hindered by hostility of the natives, who on one occasion attacked a boat's crew and wound the officers (See Last Chap.).

In March, 1855, the *Porpoise* returned to Malta, and was subsequently re-commissioned East India. Commander Chinn retired from active employment with the Captain in October, 1855.

He wrote the following papers, which were communicated to the Royal Geographical Society:—

Expedition to relieve Bala and Wila in Australia. R.G.S. Proceedings, Vol. I., p. 255.
Visit to N.E. coast of Labrador during 1851, in H.M.S. *Geomet*. R.G.S. Proceedings, p. 185.

Gulf Stream Soundings and Descriptions. Vol. XIII. of R.G.S. Proceedings, p. 327.
Account of Capuyan Soller and Solander. Vol. XV. of R.G.S. Proceedings, p. 364.

The following charts are from his surveys:—

Seymour's Strait. Trinidad Island and Port.
Gulf Stream.
Capuyan Soller and adjacent Islands.

San Fernando Anchorage.
Whitby Harbour, Hopkirk Harbour.
Aller Bay (Labrador).

CAPTAIN G. H. INSKIP, R.N.

1870-1874.

George Hastings Inskip* first joined the surveying service in June, 1843, as a midshipman on board the *Albatross*, under Captain Washington (afterwards Hydrographer) employed on the survey of the east coast of England and the North Sea, with who remained until October, 1845.

From October, 1845, to November, 1850, he served as second master of the *Rattle* under Captain Owen Stanley, engaged in the survey of the north-east coast of Australia Torres strait and the south coast of New Guinea, during which period he was constantly employed on surveying duties, although not borne on the books of the ship as an Assistant-Surveyor.

As acting master and master of the *Fraga*, in the Pacific, Mr. Inskip voluntarily surveyed of Port Simpson, on the north-west coast of North America, and of the harbour in the Bay of Panama. He was promoted to the rank of master in January, 1855, and in November, 1855, was appointed in that capacity and also that of Assistant-Surveyor to the *Saracen*, surveying brig, master-in-command, J. Richards. In this vessel he was employed on the China station until January, 1859.

From April, 1859, until about the year 1870, he was employed, chiefly, in the *Porpoise*, under Captain Calver, on the coast of England survey, with the exception of the summer of 1862, when he was detached under the late Captain R. Hoskyn deep-sea sounding in same vessel off the west coast of Ireland. From about the year 1870, to June, 1874, S. Commander Inskip (promoted to that rank in 1867) was engaged in the Hydrographic Department of the Admiralty as a Naval Assistant to the Hydrographer. He retired from the Active List with the rank of Captain 30th June, 1874.

* The Rev. R. M. Inskip, C.B., for many years a chaplain and naval instructor in H.M. Navy, and as held in high esteem by many of the executive officers of the present day, is the brother of Captain Inskip.

STAFF-COMMANDER G. F. M'DOUGAL, R.N.

1860-1870.

George F. M'Dougal joined the Navy in September, 1839, in H.M. brig *Star*, Lieutenant Griffin in command, in which vessel he continued until February, 1841, when he was transferred to the *Tyrian*, Lieutenant Croker, and next to the *Ranger*, Lieutenant Turner, all of which officers spoke very highly of his qualifications.

From December, 1842, to January, 1847, as a master's assistant, he was employed on board the *Samarang*, Captain Sir Edward Belcher, who wrote of Mr. M'Dougal:—

"He was chiefly employed as my boat assistant, as well as in the observatory. He is an accurate computer, and his conduct in his sphere on board has always met with approbation. I have great pleasure in recommending him as highly deserving of patronage."

Having passed for a second master Mr. M'Dougal served in that capacity in charge of the *Jackal* from March, 1847, to April, 1848. He then joined the *Victory*, until September, 1848, when, on the application of Captain G. A. Frazer, at that time in charge of the survey of the south-east coast of Ireland, he was transferred as an Assistant-Surveyor to that survey. After a servitude of 18 months with Captain Frazer he volunteered for Arctic service, and served in the *Resolute* during two expeditions extending from 1850 to 1854. He was promoted to the rank of master in October, 1851. When employed on Arctic service, under Captain Austin in 1851-52, Mr. M'Dougal made a running coast survey of about 300 miles of newly-discovered land.

In 1854, he was appointed to the south-west coast of Ireland survey, under Commander Church, and then attached to the *Mæander*, Captain Thomas Baillie, employed on special service in the White Sea. Returning to the south-west of Ireland survey, at the death of Commander Church, Mr. M'Dougal held temporary charge until 1857, when the surveys of the south-west of Ireland were merged into one, under Commander A. G. Edye, under whom he continued for a further period of nearly 3 years.

In 1859 he was selected to assist carry out the survey of the Great and Little Bassas reefs on the south-east coast of Ceylon, in the *Cyclops*, Captain Pullen. The plan adopted for lighting these dangers emanated from Mr. M'Dougal, who also made a survey of Point de Galle harbour, accompanied by a report as to the most desirable position for a breakwater, works, in which he was assisted by Staff-Commander H. R. Harris.

On his return to England in 1861 he was appointed as Assistant-Surveyor to Captain Otter in Loch Lomond, and subsequently to Captain E. J. Bedford, on the west coast of Scotland.

About the year 1865, he was appointed a Naval Assistant to the Hydrographer, and died somewhat suddenly about the year 1870, from the effects of over mental exertion. The Ice Chart of the southern hemisphere, in which is incorporated a quantity of information, was chiefly compiled by Staff-Commander M'Dougal, who also wrote the Admiralty Sailing Directions for making the passage from the Downs to the White Sea.

CAPTAIN D. HALL, R.N.

1867-1878.

Daniel Hall* entered the Navy in July, 1842, and served in the *Lucifer* and *Firefly* in the deep-sea survey of the Irish channel, under Captain F. W. Beechey, until December, 1847; he was made an Assistant-Surveyor in May of that year.

* He was employed, in charge of H.M. cutter *Gossamer*, for fifteen months, under the direction of Captain F. W. Beechey, completing the tidal observations in the English channel.

From December, 1847, to January, 1850, he served in other than surveying ships to enable him to pass his examination, and as second master of the *Centaur* and acting master of the *Philomel*, on the west coast of Africa.

From 1851 to 1864 he was continuously employed under Commander G. M. Alldridge, chiefly in the *Asp*, on the survey of the Bristol channel.

Promoted to the rank of master in March, 1855, he became a first-class Assistant-Surveyor in January, 1856.

In April, 1865, he was appointed to the *Lightning*, employed on the survey of the west coast of England, where he remained until 1867, when he succeeded to the charge of the Portsmouth survey, at the period at which the bar was being dredged, and improvements made so as to enable first-class ships to enter Portsmouth harbour at almost any time of tide.

In 1877, on the completion of the operations at Portsmouth, surveys of which port and neighbourhood he had accomplished on extensive scales, and with great elaboration of detail, the survey was transferred to the river Shannon, the work connected with which was terminated in 1878.

Promoted to the rank of Staff-Commander in 1867, he retired with the rank of Captain in 1879.

The following Admiralty charts are from Captain Hall's surveys:—

Weymouth and Portland.

Portland Harbour.

REAR-ADMIRAL R. C. MAYNE, C.B.

1866-1869.

Richard Charles Mayne entered the Navy in 1847, passed his examination in 1854, and in July, 1855, was made Acting-Lieutenant into the *Curlew*, Commander J. J. Kennedy, in the Mediterranean.

Having passed the necessary examinations he was confirmed in the rank of Lieutenant in 1856, and in 1858 joined the *Plumper*, Captain G. H. Richards, employed on the survey of Vancouver island and British Columbia. While engaged on this survey he made explorations, from which the following papers were subsequently written for, and published by the Royal Geographical Society.*

A journey through the districts bordering on the Thompson, Fraser, and Harrison Rivers.

Sketch of the country between Jervis Inlet and Fort Pemberton, with a map.

Route in exploring a road from Albernie Canal to Nanaimo in 1861, with a track chart.

He was promoted to the rank of Commander in 1861, and afterwards commanded H.M.S. *Eclipse* in New Zealand, during the war of 1861-62, when he was badly wounded. For his services he was specially mentioned in the despatches, and was promoted to the rank of Captain in 1864.

In 1866, he fitted out the *Nassau*, surveying vessel, in which he was employed for three years in the strait of Magellan, during which the eastern portion of Magellan strait from Cape Virgin to the Chilian settlement of Punta Arena was completed; the inner channels between Port Tamar and the Gulf of Penas examined; and English Narrows, Victory pass and the channel between Long and Summer islands charted.

In the western part of Magellan strait both shores were examined, from Cape Pillar to Port Famine. Also, on the west coast of South America, Coquimbo, and Herradura were surveyed, and the passage inside the Chonos Archipelago and the Darwin passage into the

* R.G.S. Proceedings, Vol. IV., p. 33. Journal XXXI., p. 297. Journal XXXII., p. 529.
Proceedings, Vol. VI., p. 107.

Pacific successfully navigated. The result of Captain Mayne's last season's work consisted in the examination of 255 miles of the channels leading from Magellan strait to the Gulf of Penas, and the survey of twenty anchorages or havens little known before. On the voyage home, the *Nassau*, which returned to England in 1869, was employed in searching for doubtful dangers in the Atlantic.

Captain Mayne, who subsequently commanded one of H.M. ships in the Mediterranean, retired with the rank of Rear-Admiral in November, 1879. He has received three medals for war service, is a C.B., and has been awarded a pension for wounds. Rear-Admiral Mayne is a member of Council of the Royal Geographical Society.

The following works are by him :—

Four years in British Columbia and Vancouver Island; an account of their Forests, Rivers, Coasts, Gold Fields, and resources for Colonization. 8vo. 1862.

Practical Notes on Marine Surveying and Nautical Astronomy. 8vo. 1874.

Admiralty charts as stated beneath were published from his surveys—

Cape Virgins to the First Narrows.
First Narrows to Sandy Point.
Royal Road and Elizabeth Island.
Sandy Point Road. Gregory Bay.
Second Narrows to Cape Pillar.
Port Gallant and Fortescue Bay.
Port Famine. San Nicolas Bay.

Wood's Bay.
Port Angosto. Playa Parda Cove. Tilly,
Swallow, Borja, Mussel, Condesa Bays.
Ports Tamar, Churruca, Mercy, Tuesday, Truxillo
Bays.
Smyth Channel, from South entrance to Fortune
Bay.

STAFF-COMMANDER J. W. REED, R.N.

1861-1870.

John William Reed joined the Royal Navy in the first instance as an assistant clerk, but subsequently changed his position for that of master's assistant. His date of promotion to a second master was 3rd July, 1851.

For five years, or from the end of 1853 to the end of 1858, he served in H.M.S. *Saracen*, under the command of Mr. (afterwards Captain) John Richards. During the earlier part of this period he was engaged on the following surveys: River Min, west coast of Formosa, port Hamilton in the Corea, a running survey of part of Japan, Tsugar strait.

On the 1st January, 1856, he was made an Assistant-Surveyor. Between 1856 and 1858, the *Saracen* was employed on the survey of the gulf of Siam, during which period more than 1300 miles of coast were triangulated. Mr. Reed then received, through his Commander and Sir Henry Parkes, the thanks of the Foreign Office for determining the four mile boundary, round the city of Bangkok in Siam, a service entailing much exposure, under which other officers had broken down.

Owing to the continuous illness, resulting in the death of Mr. Obree, the senior second master and Assistant-Surveyor of the *Saracen*, Mr. Reed was from the first employed on most responsible duties in that vessel, and upon her Commander giving up charge he recommended Mr. Reed for the command of the *Saracen* and charge of the survey. For a few months this was allowed, but later on, Mr. William Stanton succeeded to the command, under whom Mr. Reed continued to serve for a space of eighteen months. It was during this period that the survey of the strait of Banka was carried out, resulting in the discovery of the Stanton channel. This was a service, the great value of which was acknowledged by the Hydrographer (Captain Washington), the Netherlands government, the Singapore Chamber of Commerce, and very generally amongst the Mercantile Marine.

In March, 1860, after 6½ years service in the *Saracen*, Mr. Reed returned home. In June of the same year he was appointed Admiralty Surveyor to the *Bulldog*, under Captain Sir Leopold M'Clintock, fitted out for the purpose of obtaining deep-sea soundings along the route chosen for the North Atlantic telegraph cable. During the *Bulldog's* cruise he made a

rapid survey of Hamilton's inlet, Labrador, and surveyed the harbours of Godthaab and Julianeshaab in Greenland. Returning in November, 1860, to England, he was highly complimented regarding the manner in which the work entrusted to him had been executed. He was next engaged in sounding the bed of the river Mersey at Runcorn, and from May to August, 1861, as assistant to Mr. Scott Taylor, R.N., at that time employed in the survey of Portsmouth harbour and bar.

In November, 1861, Mr. Reed was appointed to the charge of the China Sea survey, and as master in command of H.M.S. *Rifleman*. This vessel (in which Staff-Commanders Tizard and Coghlan both served as assistant-surveyors), arrived at Singapore in June, 1862. From that period she was employed in surveying the islands between Singapore and Borneo, Pulo Sapatu, and adjacent islands and dangers in the main route to China, together with dangers lying in the route to the Palawan passage (formerly surveyed by Captain Thornton Bate), Singapore roads, &c. In February, 1864, Mr. Reed was invalided for the preservation of his life. During the period he remained in England he was engaged in compiling the China Sea Pilot, more particularly the part bearing upon the navigation between Sunda strait and Hong Kong.

He returned again to the command of the *Rifleman* in China in 1866, during the first few months of the commission, making use of the gunboat *Dove* as a tender. The eastern edge of the reefs in the passage between Singapore and Hong Kong examined, also surveys of reefs in the Palawan passage, Balabac strait and island, and Balambangan carried out. In 1868, the total eclipse of the sun was observed at Baram point, on the west coast of Borneo, and the observations forwarded to the Royal Society. Having completed the survey of Balabac strait, the *Rifleman* being found unsound was condemned at Hong Kong, and Staff-Commander Reed, who had been promoted to that rank in January, 1867, returned to England.

He subsequently contributed an article on hydrography to the magazine "Naval Science," which was brought out under the editorship of his brother, the present Sir E. J. Reed, M.P., at that time chief constructor of the Navy.

Staff-Commander Reed, who never quite recovered the effects of his long and trying servitude in the warmest parts of southern China, died in the year 1874.

The following were amongst the charts published from his labours:—

Greenland.

Godthaab.
Julianeshaab.

China.

Tambelan Islands.
Singapore Strait.
,, (main Strait).

Singapore Road.

Rho Strait.

Balabac Strait and Channels between Borneo and Palawan.

Also, large contributions to the charts of the China Sea.

Boddam Cove.

CAPTAIN D. PENDER, R.N.

1862-1871.

Daniel Pender joined the surveying service of the Navy in 1847, under Captain (now Admiral) J. L. Stokes, on board the *Acheron*, employed on the survey of the coasts of New Zealand, in which vessel he continued to serve as a master's assistant until December, 1851, when the *Acheron* was paid off at Sydney, having been relieved by the *Pandora*, and the officers returned to England. He was subsequently employed in the *Britannia* in the Mediterranean, and passed for the rank of second master in October, 1853.

From January to May, 1856, he was employed as second master and Assistant-Surveyor of the *Merlin*, Captain (now Admiral Sir) B. James Sullivan, attached to the Baltic fleet as a special surveying vessel. On his return to England in May, 1856, he was appointed to the command of H.M. gunboat *Lively*, employed on the survey of the Hebrides, under Captain H. C. Otter.

December, 1856, finds him appointed to the *Plumper*, Captain (now Vice-Admiral Sir) George H. Richards, under whom he continued in that vessel from 1857 to 1860, and subsequently up to December, 1862, in the *Hecate*, employed on the survey of Vancouver island and British Columbia. He was promoted to the rank of master in June, 1859, and during the greater part of the Vancouver island surveys performed the duty of Chief Assistant-Surveyor, under Captain Richards. On the *Hecate* being ordered to England in December, 1862, he was left in charge of the survey to complete the coasts of British Columbia adjacent to Vancouver island, making use of a hired paddle steamer (the *Beaver*) for the purposes alluded to.*

In January, 1869, he received the surveying promotion to the rank of Staff-Commander, and in 1871, having brought the Vancouver and British Columbia survey to a close, returned to England, and was then appointed a Naval Assistant to the Hydrographer, at the Admiralty. On the retirement of Vice-Admiral Sir George Richards from the post of Hydrographer, Staff-Commander Pender was appointed the chief Naval Assistant to his successor, Captain (now Sir) Frederick J. Evans. He was placed on the retired list in 1879.

In 1884, by Order in Council, he was promoted to the rank of Captain on the retired list, and the official title of his position was, at about the same time, changed to that of Assistant Hydrographer.

The following Admiralty charts are published from Captain Pender's surveys, besides additions to the more general sheets of Vancouver island and British Columbia :—

Sooke Inlet.
 Becher and Pedder Bays.
 Blunden, Cypress, Tracey, and Cullen Harbours.
 Cape Caution to Port Simpson, including Hecate Strait, and part of Queen Charlotte Islands, in two parts.
 Approaches to Fitz-Hugh and Smith Sounds.
 Lama Passage and Seaforth Channel.
 Klemtoot Passage and Anchorage, Nowish Cove.
 Welcome Harbour. Port Blakeney. Morris Bay. Bela-Kula Anchorage.

Port Canaveral. Port Stephens, Klewnuggit Inlet. Lowe Inlet. Coghlan Anchorage.
 Ogden Channel with Anchorages between Cape Caution and Port Simpson.
 Brown and Edye Passages, with Qlawdzeet Anchorage and Refuge Bay.
 Port Simpson and adjacent Anchorages.
 Nass Bay.
 Skidegate Inlet with Anchor Cove.

COMMANDER GEORGE R. WILKINSON, R.N.

1864-67.

This officer joined the Navy 18th October, 1843, as a master's assistant, and subsequently by the recommendation of Sir Lucius Curtis, was transferred to the rank of a midshipman, and in that capacity and as acting mate, served in the surveying vessels, *Volage* and *Spitfire*, under Captain T. A. B. Spratt. During the Crimean war he was employed in the Black Sea in surveying the bays of Cosloe and Erekli, and also the coast from Kustendjeh to Sizopoli, including the bays of Baljik, Varna, and Gulf of Bourgaz. He was present at the destruction of Soulina, and was afterwards engaged in surveying the coast from Alma to Sevastapol, and in making a plan of the battle field of Alma. His first appointment as an Assistant-Surveyor took place in January, 1850.

Taking an active part in H.M.S. *Spitfire* in numerous operations connected with the Crimean war, he was in temporary charge of that vessel when employed at night in towing the French line of battle ship *Montibello*, bearing the flag of Vice-Admiral Bruat, from under the Russian batteries, when she had become accidentally disabled.

Promoted to the rank of Acting Lieutenant 13th July, 1854, he was employed in surveying the approach to Kertch, and present and engaged in the capture and destruction of that place, and of Yeni Kaleh.

* For a more detailed description of the surveys undertaken by Captain Pender, see pages 140, 141, 142, 144, 145, 147, 149, 151.

In March, 1856, he passed his examination, and was confirmed in the rank of Lieutenant. He then served as Lieutenant and senior Assistant-Surveyor in H.M.S. *Medina* in the Mediterranean, under Captain Spratt, until April, 1863, when he returned to England to superintend the fitting out of H.M.S. *Hydra*, which vessel he commanded on her passage out to the Mediterranean at the end of that year.

Early in 1864, on the retirement of Captain T. A. B. Spratt from further active surveying employment afloat, the command of the *Hydra* surveying vessel in the Mediterranean devolved upon Commander Mansell, of the *Firefly*, to the charge of the surveys conducted in which latter vessel Lieutenant Wilkinson succeeded.

In 1864 and 1865 he conducted the survey of the coast of Tunis from Carthage to the Gulf of Kabes, and the west coast of Sicily from Cape St. Vito to Cape San Marco, with the south coast of Sardinia.

Receiving the annual surveying promotion to Commander's rank 1st January, 1865, he returned to England, and paid off the *Firefly* in February, 1866, and in the ensuing June was appointed to the command of the survey of the colony of Victoria.

He died and was buried with naval honours at Melbourne in December, 1867, Captain H.R.H. the Duke of Edinburgh, who was in port at the time in H.M.S. *Galatea*, personally attending his funeral.

Commander Wilkinson was considered an admirable maritime surveyor, most accomplished draughtsman and excellent officer, gaining the esteem of all with whom he came in contact by his earnestness of purpose, and placidity of demeanour.

In commenting on the death of Commander Wilkinson in the R. G. Society's annual address in 1868, Sir George Richards remarked "that by that officer's death the Navy had lost a most able and zealous officer, and the surveying branch, one whose whole professional life had been conscientiously spent in its service."

The following were the principal charts published from the surveys conducted by Commander Wilkinson :—

Mehediah to Ras Makhabez.

Sphax Roadstead.

Fratelli Rocks to Mehediah.

Soussa to Mehediah, with the Kuriat Islands.

Tunis Bay.

Cefalù to Mazzara (Sicily).

Trapani to Marsala.

Apollo Bay, Louttit Bay, &c. (S.C. Australia).

CAPTAIN SIR GEORGE S. NARES, K.C.B., F.R.S.

1865-1878.

George Strong Nares entered the Navy in 1845, passed his examination in 1851, and was promoted to the rank of Lieutenant in October, 1854.

As a mate he served on the Arctic expedition in the *Resolute*, under Captain Henry Kellett, during the years 1852-53-54.

Subsequently we find him, in 1855, Second Lieutenant of the *Glatton*, Captain A. Cumming, and Gunnery Lieutenant in 1856, of the *Conqueror*, in the Mediterranean; also as First Lieutenant of the *Britannia*, training ship for Naval Cadets. He then wrote his book on Seamanship, since accepted as a standard work on this subject.

Promoted to the rank of Commander in December, 1862, he succeeded to the command of the *Salamander*, employed on special service on the coast of Australia in 1864. This appears to have been his first opportunity of employment in the surveying service. In the *Salamander*, which was a paddle-wheel steam vessel, employed generally in connection with the colony formed at Cape York, of Australia, no opportunity was lost of adding to the hydrography of the Inner Passage to Torres strait and coast survey of Queensland, in parts which had only been approximately examined before, and he also surveyed the eastern coast of Hinchinbroke island, the Palm island group, and Cleveland bay. On the way to

England through Torres strait a line of deep soundings was carried by the *Salamander* through the Arafura sea. After a brief servitude in command of the *Boscawen*, training ship for boys, Commander Nares was appointed in 1868, on the withdrawal of the *Hydra*, under Captain Shortland, from the Mediterranean, to the *Newport*, for the continuation of the *Hydra's* work. In this vessel he surveyed the line for a sub-marine cable between Malta and Alexandria, completed the west coast of Sicily, and surveyed Milazzo and Syracuse. Next, he completed the coast of Tunis from Cape Carthage to Tabarca island, surveyed Pantellaria island and the port of Alexandria, and conveyed the Hydrographer and Director of Engineering Works to the Admiralty to the Suez Canal, sounding and taking sections, and assisting generally in contributing towards the Official Report subsequently drawn up and referred to at page 138. For his services on the occasion of and prior to the opening of the Suez Canal Commander Nares was posted in 1869. During the next year he continued the survey of the coasts of Sicily and the coral banks between it, and the coast of Tunis, finding a suitable deep-water channel south of the Skerki reef, through which the telegraph cable connecting Gibraltar and Malta was successfully laid. In September, 1870, the *Newport* was detached from the Mediterranean for the survey of the Gulf of Suez, which was accomplished as far south as Kosair and the Brothers islands.

Captain Nares was next appointed to the command of the *Shearwater*, a vessel fitted out with a view to following up the work commenced in the *Newport* in the Red Sea.

On the passage out from England investigations of the surface and under-currents in the strait of Gibraltar were made by Captain Nares, conjointly with Dr. Carpenter, of the Royal Society, in the month of August, 1871, and formed the subject of a paper drawn up by him for the Royal Society, and also published separately by the Admiralty.

His successor in the *Shearwater*, Commander Wharton, R.N., followed up these experiments with a similar series made in the Dardanelles and Bosphorus.

In April, 1872, when the *Challenger* deep-sea exploring voyage was decided upon, Captain Nares was selected for this important command, which he continued to hold until his return to England to take charge of the last English Arctic Expedition.

In the early part of 1875, he was specially offered the command of the Arctic Expedition in the *Alert* and *Discovery* which left our shores in the early summer of 1875. This expedition having succeeded in reaching a higher northern latitude than any yet attained returned to England at the close of 1876.

In 1878, Captain Sir George Nares, who had been created a K.C.B. for his services, re-commissioned the *Alert* for special surveying service, in the first instance in the neighbourhood of the river Plate and Magellan strait of South America. Here he continued until 1879, when, on the death of Vice-Admiral G. A. Bedford, he was selected for and accepted the post of Marine Adviser to the Board of Trade, an appointment created in 1850, and successively held by Admirals F. W. Beechey, Sir James Sullivan, and G. A. Bedford.

Sir George Nares, who is a Fellow of the Royal Society, was granted a Captain's Good Service Pension in January, 1885.

The following were written by him :—

Seamanship. 8vo.

Investigations of the Currents in the Strait of Gibraltar, in August, 1871. 8vo.

On the Circumpolar Sea. (R.G.S. Proceedings, Vol. XXI., p. 96).

Narrative of a Voyage to the Polar Sea, in H.M.S. *Alert* and *Discovery*, in 1875-76.

And charts as stated beneath :—

Rockingham Bay to Palm Islands, with Port
Hinchinbrook.
Gibraltar, New Mole.
Palma to Catania.
Syracuse Harbour.
Milazzo Bay.

Strait of Jubal.
Suez Gulf.
„ Bay.
„ Canal.
Additions to Kerguelen Island, &c.
N'galoa and Koro Levu Harbours (Fiji).

MEMOIRS OF

STAFF-COMMANDER E. WILDS, R.N.

1861-1866.

Edward Wilds first joined the surveying service of the Royal Navy on the west coast of Africa in 1846, under Captain (now Admiral Sir) Henry M. Denham, with whom he served as a second master for about 8 months.

He then joined the *Herald*, under the same Captain, and continued in that vessel for a period of nine years and four months, or from 1852 to 1861, employed on surveying service in the South seas, including the Coral sea, Fiji islands and Eastern Australia. He was promoted to the rank of master in July, 1855.

On the return of the *Herald* to England, Mr. Wilds was employed on the *Fisgard's* books in the Hydrographic Department of the Admiralty, under Captain Denham, completing the charts made during the *Herald's* voyage.

From November, 1861, to 1866, he commanded the *Swallow*, on the survey of Northern China, which vessel took the place of the *Actæon*, Commander Ward, and during part of the commission was assisted by the gunboat *Dove* as tender, under the present Staff-Commander G. Stanley. In the *Swallow*, after running several meridian distances, the shallows of the Wusung river were undertaken and part of the Korean Archipelago, Chin-Chu bay, the south coast of Shan-tung and Amoy harbour surveyed. A re-survey of a portion of the estuary of the Yangtsze Kiang, soundings between Chusan and Hong Kong, and in the Formosa channel, with a plan of Swatow, next occupied the vessel, with her tender the *Dove*. The Shan-tung promontory was completed, the west coast of Formosa island added to, and further soundings between the Korea and Hong Kong obtained, before the return voyage to England commenced, early in the year 1866. On the way to England a further search for dangers in the Java sea than had already been made by the *Serpent* was carried out.

Promoted to the rank of Staff-Commander in August, 1867, after the return of the *Swallow* to England, Staff-Commander Wilds did not again serve actively afloat, and accepted the retirement offered by the Order in Council of 22nd Feb., 1870.

The following charts are from the surveys of Staff-Commander Wilds when in command of the *Swallow* :—

Shantung Promontory; Kyau-chau Bay to Miautau Strait.
Kyau-chau Bay.
Swatow Port.

Amoy Inner Harbour.
Entrance to the Yang-tse-kiang.
Part of the Korean Archipelago.
Additions to the Formosa Channel.

CAPTAIN JOHN HUTCHISON, R.N.

1861-1869.

John Hutchison appears to have joined the surveying service under Captain Frederick Bullock, on the 5th April, 1842, that officer then being engaged in the examination of the mouth of the river Thames. Here Mr. Hutchison continued until December, 1842.

From January, 1843, to December, 1844, he served on the survey of the west coast of Ireland, under Commander James Wolfe.

In February, 1845, as mate and Assistant-Surveyor, he joined the *Herald*, under Captain H. Kellett, employed on the survey of the north-west coast of America and Behring strait, until promoted to the rank of Lieutenant in July, 1850.

From the 18th February, 1852, to 1st June, 1861, he served as a Lieutenant and Assistant-Surveyor of the *Herald*, under Captain H. M. Denham, surveying amongst the South Sea islands, Shark bay, West Australia, Fiji islands, Coral Sea, and east coast of Australia.

As a Commander in August, 1861, on the formation of the various colonial surveys in Australia, he was appointed to the charge of that of South Australia, with head-quarters at Adelaide. A small schooner was the only means his assistant, Nav.-Lieut. Howard, and himself had, for carrying out their work.

In January, 1865, he was compelled to invalid to England for the benefit of his health, but returned again to the colony to the same arduous duties as before.

In 1868, he was promoted to the rank of a Post Captain, but died in July of the succeeding year from inflammation of the lungs. The President of the Royal Geographical Society, in his annual address for the year 1870, remarked :—

"It is with much regret that we have to record the death of Captain John Hutchison, lately in command of the South Australian survey and of Nav.-Lieut. Guy, his assistant, which occurred in July last almost suddenly, and within five days of each other, from illness brought on through exposure in the execution of their duties. In the untimely deaths of these officers the Naval Service had lost two able and zealous public servants."

The following charts were published from Captain Hutchison's surveys :—

St. Vincent and Spencer Gulfs (2 sheets).
Woods Point to Lowly Point.
Port Augusta.
Tickera Point to Cape Elizabeth.
Victoria Port.

Macdonell Sound, Wool Bay, and Port Wakefield.
Adelaide Port, Approaches.
Ports Victor, Elliot, Noarlunga, and Willunga.

COMMANDER T. A. HULL, R.N.

1866-1880.

Thomas A. Hull joined the surveying service of the Navy on board the *Herald*, Captain Henry Kellett, in the year 1845, that vessel being chiefly employed in the survey of the western coast of North America.

When the survey of the Gulf of California was undertaken, as a Master's-Assistant, he was placed in charge of the *Owen*, tender to the *Herald*, in which much of the sounding and practical portion of the survey was undertaken. He continued to serve under Captain Kellett for 6 years and 2 months, or until the year 1851.

From 1852 to 1855, he held the appointment of second master in charge of the discovery ship *Plover*, during a considerable part of which period he had charge of the magnetical observatory at Point Barrow, under Commander Maguire, on the observations connected with which a special report was made to the Royal Society by Major-General Sabine, in November, 1857.

From 1855 to 1859, he served as Master of the *Havannah* in the Pacific, Captain Thomas Harvey, during which period no opportunity was lost when the service admitted it, of adding to the hydrography of ports and harbours visited. For his services in this respect, in July, 1858, by the recommendation of Captain Washington, at that time Hydrographer, their Lordships were pleased to present Mr. Hull with a sextant in recognition of his zeal and ability. The meteorological register of the *Havannah* also met with warm recognition at the hands of the Meteorological Department of the Board of Trade.

In 1859-60, for a period of eight months, he was employed at the Hydrographic Office as a Naval Assistant, compiling Sailing Directions for the coast of South America. In July, 1860, he was appointed as Master and Senior Assistant-Surveyor of the *Firefly*, under Commander A. L. Mansell, with whom he continued to serve until that officer was transferred to the *Hydra*, in the early part of 1864. While with Commander Mansell he co-operated largely as Senior Assistant in the surveys of the coast of Syria, the Ionian islands, and of Jubal strait in the Red Sea. For this latter work, conjointly with Commander Mansell, the subject of this memoir received the thanks of the Lords Commissioners of the Admiralty.

From 1864 to 1866, under Lieutenant, subsequently Commander Wilkinson, he was employed re-surveying part of the coast of Tunis, and western portion of the island of Sicily from the Gulf of Castel-a-Mare to Cape St. Marco, searching for the Fox rock off the south coast of Sardinia, and adding to the soundings in the Malta channel.

Staff-Commander Hull, who was promoted to that rank in August, 1867, after the withdrawal of the *Firefly* from the Mediterranean, was, in the previous year, appointed a Naval Assistant to the Hydrographer, in which capacity he continued until 1873. During this period he took an active and practical part in the compilation of the Admiralty "Wind and Current Charts."

In 1873, on the death of Captain Richard Hoskyn, Staff-Commander Hull was selected as his successor in the appointment of Superintendent of Charts at the Admiralty, in which he continued until 1880.

In August, 1878, having been five years off a ship's books, he was placed on the retired list with the rank of Commander, such having been the former terms under which the position of Superintendent of Charts was arranged to be held.

Commander Hull contributed largely towards the compilation of the Sailors' Pocket Book, the author of which useful work, Captain Bedford, R.N., served simultaneously with him in the *Firefly* on the coast of Syria. He also wrote an octavo pamphlet on Practical Nautical Surveying, for some time used at the R.N. College at Greenwich as a text book on this subject; and a paper read at the United Service Institution, termed the Unsurveyed World. The chart Barrow Point and Port Moore is from one of his surveys.

STAFF-COMMANDER D. J. MAY, R.N.

1860-1868.

Daniel J. May, who was promoted to the rank of Second Master in January, 1854, volunteered for, and was appointed to the Niger Expedition of that year, under Dr. Baikie, and as the result of his labours produced a chart of the whole river explored, which was published by the Admiralty in 1855.

In 1857 he became a member of a second expedition up the Niger, again under Dr. Baikie, which returned to England in 1859, when the map of the routes travelled over based on chronometric measurement were incorporated in the map of Africa.

In 1860, Mr. May, who had been promoted to the rank of master in September, 1859, was selected by the late Admiral Washington, at that time Hydrographer, to command the *Pioneer* for service on the east coast of Africa, under Dr. Livingstone; at the same time Mr. May was appointed an Assistant-Surveyor to the Cape of Good Hope survey, under Mr. Skead. The immediate result of the work performed in the *Pioneer* by Mr. May when associated with Dr. Livingstone was a chart of the Rovuma river. He returned to England in December, 1861, and left again early in 1862 as a *bonâ fide* Assistant-Surveyor on the Cape of Good Hope survey. In 1865, his name was specially mentioned as having been enabled to obtain many of the off-shore soundings at the Cape of Good Hope in H.M.S. *Rapid*.

Promoted to the rank of Staff-Commander in August, 1868, Staff-Commander May subsequently retired under the provisions of the Order in Council of 22nd Feb., 1870.

CAPTAIN H. C. ST. JOHN, R.N.

1869-1877.

Henry Craven St. John entered the Royal Navy in 1851, passed for the rank of mate in 1857, and was promoted to the rank of Lieutenant in the course of the same year.

About the year 1863, finds him First Lieutenant of the *Argus*, Commander J. Moresby, in China, and having subsequently been appointed to the command of H.M. gunboat *Opossum*, he took advantage of the opportunities offered in searching for Chinese pirates in some of the little visited parts of Southern China, to add hydrographic information to the existing charts. Thus, in 1865, we find him in the Gulf of Tongking, correcting and giving information respecting the island of Hainan to the Hydrographic Department of the Admiralty.

Having been promoted to the rank of Commander in 1866, he was employed for about a year in the *Hydra* in the Mediterranean, under Captain P. Shortland, gathering a practical insight into the details of marine surveying.

In 1869, he was appointed to succeed Commander E. W. Brooker in command of the *Sylvia* in North China and Japan, and re-commissioned that vessel in the following year, surveying the passages on either side of the Conqueror bank in the Inland Sea of Japan, with the ports of Matoya and Owasi, and collecting numerous observations on the Japan current and on typhoons, which were forwarded to England. He next determined the positions of the salient points of the island of Yezo, and besides other work surveyed its harbours; also those of Goza, Susaki and Nomi, with Mura bay, returning to England and obtaining deep-sea soundings *en route* in April, 1873. In February, 1874, Commander St. John re-commissioned the *Sylvia* for a continuation of the Japan survey, and was promoted to the rank of Captain in September of the same year. He then surveyed Simonoseki and Isumi straits, the entrance to Owasi bay, coast between Mura and Owasi bays, Murray sound and the Mackau group of the Korea, north part of the Goto islands, and the Kuga channel. After a servitude of seven years in China and Japan, in 1877, he was succeeded in the *Sylvia* by Captain B. W. Bax, R.N.

Captain St. John now (1885) commands H.M.S. *Repulse*.

The following charts are from surveys made under his direction :—

Simonoseki Strait.	Akishi Bay.
Oterranai Anchorage.	Matoya Harbour.
Urakawa Bay.	Mura and Goza Harbours.
Simmororan, or Endermo Har-	Owasi Bay.
bour. Mala Ya Ma.	Yezo Island (additions).
Mori Roads.	

He is also the author of a work descriptive of the Ornithology of Japan.

LIEUTENANT W. COLLINGWOOD (I.N.)

1855-1863.

About the year 1852 this officer, a midshipman of the Indian Navy, under the orders of the late Captain Felix Jones, I.N., made a survey of the city of Bagdad, under very unpleasant restrictions, for the Turkish authorities were not to be made acquainted with what was going on. At times Collingwood was obliged, in consequence, to note bearings and paces all over his white shirt, and had many narrow escapes of detection, resorting to various subterfuges to lull suspicion.

In 1855, Commander Selby succeeded Captain Felix Jones as Surveyor of Mesopotamia, with Lieutenant Collingwood as one of his assistants.*

A trigonometrical survey was made of the region west of the Euphrates, including the Sea of Nejf and the portion of Mesopotamia from Samarra on the Euphrates to a point ten miles above Bagdad on the Tigris. This survey, sent to England in 1861 by Commander Selby, was lost. The original maps and field books having been procured from Bagdad, the maps were subsequently re-drawn by Lieutenant Collingwood, who completed the work in June, 1870. This officer also surveyed and drew maps of the Shatt-ul-Arab from Bussorah to

* Abridged from Lieut. Low's History of the Indian Navy, Vol. II., p. 413, 414.

Marghill, and of the course of the Hindiyeah canal near Mesbed Hoossein. He also assisted Commander Selby in making accurate plans of the irruptions of the Tigris, showing that if no efficient steps were taken to check the evil that river would become as unnavigable as the Euphrates. The latter portion of the survey from above Bagdad to Tel Ibrahim, and from Tel Ibrahim to Samarra on the Euphrates was commenced in October, 1862; in the end of that year Commander Selby retired, and was succeeded by Lieut. Bewsher.

Lieutenant Collingwood also surveyed the city of Bussorah, which, owing to the jealousy of the Turkish authorities, he was compelled to effect by stealth as at Bagdad. He likewise surveyed the country between the Tigris and Euphrates, from Hillah to the ruins of Niffer, on the borders of the Hindiyeah marshes, tracing down the old bed of the Tigris as far as Kut-el-Amara.

Between April, 1861, and the same month of 1862, Lieutenant Collingwood was appointed to the command of the *Comet*, and as surveyor of Mesopotamia during the absence of Commander Selby in England. After the abolition of the Indian Navy at the close of 1862 he entered the India Office, where his talents and aptitude rendered him a valued Government servant.

COMMANDER F. HOWARD, R.N.

1869-1880.

Frederick Howard served under Captain (now Admiral Sir) Henry M. Denham in the *Herald*, from May, 1852, until June, 1861, on the survey of the South Sea islands (chiefly Fiji), coast of West Australia, and the Coral Sea. He was appointed, in January, 1862, as a master and first-class Assistant-Surveyor to the South Australian survey, under Commander J. Hutchison, with whom he continued until the untimely death of that officer in July, 1869, when he succeeded to the charge of the South Australian survey.

In 1865, he made an examination of the north coast of Australia, in the neighbourhood of Port Darwin and the Victoria river, in the small hired schooner of about 100 tons, in which the South Australian survey was chiefly conducted.

Having completed the surveys of the coast of the South Australian colony, in 1880, Staff-Commander Howard, who had been promoted acting of that rank in August, 1871, was recalled to England, and having passed the necessary examination became confirmed in that rank of the same date as his acting appointment. He then obtained leave to visit New South Wales, where he accepted a post in the Department of Harbours and Rivers under the Colonial Government.

He retired with the rank of Commander in October, 1883. The following charts were published from his surveys:—

Cape Catastrophe to the Great Australian Bight.
Venus Harbour.
St. Vincent and Spencer Gulfs (2 sheets).
Port Lincoln.
Franklin Harbour.

Cape Jervis to Guichen Bay.
Guichen Bay to Glenelg River.
Cape Stewart to Port Essington, } N. Coast
Liverpool River Entrance. } Australia.

STAFF-COMMANDER E. P. BEDWELL, R.N.

1866-1879.

Edward Parker Bedwell, who joined the Royal Navy in about the year 1849, was promoted to the rank of second master in January, 1855, and in December, 1856, was appointed in that capacity to the *Plumper*, Captain G. H. Richards.

He continued to serve in that vessel and the *Hecate*, on the Vancouver island and British Columbia survey, until the return of the last-named ship to England in 1863, throughout

the whole 6½ years, taking a large share in the detached and much exposed duties connected with this survey. He had been promoted to the rank of master in August, 1860.

His next appointment was as chief assistant to Captain F. W. Sidney on the survey of the coast of New South Wales, where he remained until 1866, when he was appointed to the charge of the survey of Queensland in succession to Staff-Commander Jeffery, and at once commenced active operations by surveying some 60 miles of Moreton bay. This he followed up by surveying the coast from Moreton bay to Indian head, Great Sandy island, Wide bay, and from Indian head, round Breaksea spit, and the west shore of Hervey bay to Port Curtis, continuing subsequently many miles to the northward.

The vessel in which his surveys was executed was a hired schooner, *The Pearl*, and generally with but one assistant. He was promoted to the rank of Staff-Commander in August, 1870.

He returned to England from the Queensland survey in 1880, and afterwards served, for about three years, in H.M.S. *Defence*.

He retired about the year 1883 under the provisions of the Order in Council of 22nd Feb., 1870.

The following charts are published from the surveys of Staff-Commander Bedwell:—

Danger Point to Cape Moreton.
Brisbane River.
Moreton Bay to Sandy Cape.
Great Sandy Strait (south portion).
Mary River.

Burnett River.
Port Curtis.
Approaches to Shoalwater Bay.
Approaches to Broad Sound.
Percy Islands.

COMMANDER F. J. GRAY, R.N.

1873-1875.

Francis John Gray entered the Navy as master's assistant in 1854. In 1858, he left H.M.S. *Princess Royal* and joined the surveying service under Commander Mansell, who at that time was engaged in the *Firefly* on the survey of the coast of Egypt and Syria. He continued in the *Firefly* until 1866, assisting Commander Wilkinson in the surveys of the coasts of Tunis and Sicily. Mr. Gray was promoted to a second master in June, 1860, made acting master of the *Firefly* in February, 1865, and confirmed in that rank in March, 1866. On his return from the Mediterranean he was appointed master and chief Assistant-Surveyor to the *Nassau*, under Captain R. C. Mayne, C.B., for the important survey of the Strait of Magellan. This vessel returned to England in the summer of 1869. When on this survey Mr. Gray received the Royal Humane Society's medal for saving the life of Sub.-Lieut. J. Orlebar.

Mr. Gray was next employed at the Hydrographic Office to compile charts from the surveys of King and Fitzroy, and the *Nassau's* charts of the Strait of Magellan and the channels northward to the Gulf of Penas, or the inland navigation of Cape Horn. With this matter at his command he produced charts of that locality.

In April, 1870, on the *Nassau* being commissioned by Commander W. Chimmo, R.N., Mr. Gray again sailed in his old position as master and senior Assistant-Surveyor. His labours now lay in the Sulu Sea, and while at Dalrymple harbour, in the island of Sulu, Mr. Gray and a boat's crew were attacked by a party of Malays. The Malays were beaten off with a loss of seven killed and many wounded; and with the exception of a few flesh wounds he brought his party off in safety to the ship.

For this he was on his return to England, in 1873, transferred to the Lieutenant's list.

On the *Nassau's* being re-commissioned in October, 1873, he was appointed as Lieutenant in command. He commenced surveying operations off Zanzibar, and in less than two years surveyed and sounded over 100 miles of that unhealthy coast. The *Nassau* took part in the

attack on the fort of Mombaza, to the northward of Zanzibar, reducing the Sultan to submission, and bringing him to Zanzibar. Lieut. Gray, on this occasion, took on shore the *ultimatum*, and negotiated the surrender.

In October, 1875, the *Nassau* left Zanzibar to recruit. Calling at Port Mozambique, Lieut. Gray proceeded inland to fix the position of a mountain used as a landmark; it was during this trip he contracted the fever that proved fatal to him; he died on the 12th December, 1875, and was buried on the following day off Natal. His promotion to the rank of Commander arrived too late, it took place, we believe, in September, 1875.

The following charts were published from his surveys:—

Perim Island.

Rás Pekawi to Cape Delgado, including the north part of the Querimba Islands.

Cape Delgado to Kilwa.

Mto Mtwara and Mikindani Harbours.

Lindi River and Mgau Mwanja.

Mchinga Bay (Port Nungwa).

Kiswera Harbour.



CAPTAIN SIR FREDERICK J. O. EVANS, K.C.B., F.R.S.

Hydrographer, 1874 to 1884.

CHAPTER IV.

Evans, Progress of Marine Surveys 1874 to 1884. Appendix,—Marine Surveys of India,—United States Coast Survey,—Chronological Table of Discovery,—Early History of Chronometers.

Frederick John Owen Evans, born at Southsea, Hants, in March, 1815, entered the Royal Navy in July, 1828, as volunteer of the second class on board the *Rose*, a corvette of 18 guns, employed on the North American and West Indian station, and remained in that vessel until March, 1832, when he was transferred to the *Winchester*, flag-ship of Sir E. G. Colpoys; and in June, 1833, appointed as Master's Assistant to the *Thunder* (his first surveying vessel) in the West Indies, Commander Richard Owen.

He continued in the *Thunder* until February, 1836, the latter part of this period as acting second master, and was engaged on the surveys of the River Demerara, coasts of Nicaragua, Honduras and Belize; as also on the Bahama banks. His duties throughout, in the *Thunder*, were equally divided between compiling in the chart room, and in boats on detached service.

In 1836, he joined the *Caledonia* flag-ship in the Mediterranean, and subsequently served in the *Asia* and in the *Rapid*, 10 gun brig, as second master in pilotage charge.

From February to May, 1838, he became acting master of the *Dido* in the Mediterranean, during which period he contributed to the Nautical Magazine, Volume VIII., some hydrographical remarks spoken of by Captain Becher (the editor) as "most valuable," descriptive

of the north-west coast of Africa between Cape Spartel and Arzilla; and from Cape Blanco to Mogador, with directions for the latter place.

From September, 1838, to the same month of 1840, he served as second master in charge of the *Rolla*, 10 gun brig, Lieut.-Commander Charles Hall, on the west coast of Africa, and assisted in the capture of several slave vessels, as also in the destruction of the notorious slave factories at the river Gallinas. Made acting master of the *Wolverene*, Captain W. Tucker, the senior officer's ship on the west coast of Africa, he returned to England in that vessel in the autumn of 1841, and in November was promoted to the rank of master.

He was then appointed to H.M.S. *Fly*, Captain F. P. Blackwood, fitting for special exploring and surveying service in Australia and New Guinea, and continuously employed, from March, 1842, to July, 1846, in the capacity of master and senior Assistant-Surveyor on the survey of the Barrier reefs of Australia, Torres strait, and the neighbouring coast of New Guinea, regions then comparatively unknown. An account of the voyage of the *Fly* was published in 1847, by J. Beete Jukes, Esq., the naturalist to the expedition, in two volumes. The present Admiral Sir Charles Shadwell was the first Lieutenant of the *Fly*.

From August, 1846, to October, 1847, finds him employed on the survey of the Isle of Man with Commander George Williams.

He was then appointed master and Assistant-Surveyor to the *Acheron* steamship, Captain J. L. Stokes, employed in New Zealand, chiefly on the little known coasts of the Middle and South islands. These surveys covered a great extent of seaboard, and have proved of especial service to that prosperous colony.

The *Acheron* was paid off in Sydney, N.S. Wales, towards the close of 1851, the officers and crew returning to England.

From January, 1852, to August, 1853, he was engaged at the Admiralty Hydrographic Office, chiefly completing for publication the numerous charts and plans resulting from the New Zealand survey.*

Between the months of August, 1853, and March, 1854, finds him employed on the survey of the coast of Devon, near Dartmouth, conjointly with Lieut.-Commander H. L. Cox.

In the early part of March, 1854, prior to the declaration of war with Russia, and the sailing of the Baltic fleet, he was ordered as surveying officer on secret service to the Gulf of Finland in the *Miranda*, Captain E. M. Lyons, the object being to reconnoitre the port of Revel; on the successful completion of which service he joined the *Lightning*, surveying vessel, Captain B. J. Sullivan, attached to the Baltic fleet, assisting in the preliminary examination of the Aland islands, and the reconnaissance of the forts at Bomarsund; his services were constantly required in piloting the French as well as our own men of war, occasionally under fire.

For these services he was personally thanked by the Commander-in-Chief, Sir C. Napier, on board the *Lightning*, and was also noticed in the gazetted despatches.

Remaining in the *Lightning* until April, 1855, he was then appointed Superintendent of the Compass Department of the Admiralty in succession to Captain E. J. Johnson, who had held the post from its formation in 1842 until his death in 1853.

From 1855 to 1865 he was engaged in the duties of this office, which were rapidly becoming more complicated and responsible, from the rapid introduction of iron ships for war purposes, and the employment of massive iron plates for their armour. During this period, in addition to the preparation of a chart of the curves of equal magnetic variations, and of a manual for the deviation of the compass in iron ships jointly with a well-known mathematician of the day (the late Archibald Smith, F.R.S.), he contributed many papers

* For about six months of this time he was further engaged in preparing for the Press, a new edition of the Day and Night signals of the Fleet, under the direction of Captain (now Admiral of the Fleet, Sir) Alexander Milne, one of the Admiralty Lords.

on compass action in iron ships to the Royal Society and professional journals and institutions. For his labours in this field of magnetical science he was elected a Fellow of the Royal Society in 1862, and shortly afterwards served on its council.

In 1865, he succeeded the late Rear-Admiral Becher as Chief Naval Assistant to the Hydrographer, and in charge of the magnetic department. The duties then pertaining to this combined office are best given in the words of his chief, who thus described them :—

"The Chief Naval Assistant is a Staff-Captain; his position as chief of the Magnetic department in connection with the general duties of his office, is strictly fortuitous, resulting from the fact of his having for many years studied, and was thus enabled to introduce magnetism as an applied science in connection with ships' compasses into the Naval Service, at the critical period of great change in the construction of ships of war, and from his possessing the necessary qualifications and experience as a surveying officer, to fulfil both duties—a combination of circumstances not likely to occur again. This extension of the Compass department was made in 1865, when the great revolution in shipbuilding was reaching its height, and rendered the increase essential to the security of our iron navy; the officers of the Compass department (established in the year 1862) are therefore immediately connected with him. All the observations and calculations necessary for the magnetical character of each type of iron ship are made under the care of and discussed by the head of this department, and the results have been from time to time communicated, with their Lordships' sanction, to the Royal Society, and published in its transactions. The various manuals on the subject of compass deviation which are furnished to the Navy have been likewise prepared by him, in conjunction with Mr. Archibald Smith, an eminent mathematician and authority on magnetism, whose services have long been rendered gratuitously, and whose name must always be intimately associated with, and gratefully remembered by, the Navy, in connection with this branch of science."

From 1865 to the early part of 1874, Captain Evans continued in office as Chief Naval Assistant. During this period a series of wind and current charts for the Atlantic, Pacific and Indian oceans were brought out under the direction of the Hydrographer (Captain G. H. Richards), and the special personal supervision of the Chief Naval Assistant. These, with an ice chart of the southern hemisphere, have had a marked influence in diffusing a knowledge of ocean meteorology.

In December, 1867, he was promoted by Order in Council to the rank of Staff-Captain for his services to nautical science; placed on the retired list with the rank of Captain in 1872; and made a Companion of the Bath (Civil) in 1873.

In February, 1874, on the retirement of Rear-Admiral G. H. Richards from the office of Hydrographer, Captain Evans succeeded his old shipmate and respected chief, retaining the responsible post until June, 1884, when he retired. He was created a K.C.B. in 1881.

In February, 1874, when Captain Evans became Hydrographer, the following were the Admiralty surveys in progress, with the respective officers in charge :—

SURVEYS.	OFFICER IN CHARGE.	SHIP OR OTHER MEANS.
East Coast of England	Staff-Commander J. Parsons . . .	H.M.S. <i>Porcupine</i> .
West " "	Staff-Commander J. Kerr . . .	Hired Vessel.
Portsmouth	Staff-Commander D. Hall . . .	Steam Launch.
Mediterranean	Commander W. J. L. Wharton . .	H.M.S. <i>Shearwater</i> .
Japan	Captain H. C. St. John . . .	H.M.S. <i>Sylvia</i> .
East Africa	Lieutenant F. J. Gray . . .	H.M.S. <i>Nassau</i> .
Newfoundland	Nav.-Lieutenant W. F. Maxwell .	Hired Steam Vessel.
West Indies	Staff-Commander G. Stanley . .	Hired Schooner.
Victoria	Nav.-Lieutenant H. J. Stanley .	Colonial Steamer.
South Australia	Staff-Commander F. Howard . .	Hired Schooner.
Queensland	Staff-Commander E. J. Bedwell .	Hired Schooner.
West Australia	Nav.-Lieutenant W. E. Archdeacon	Hired Boats.
Special Scientific Service	Captain G. S. Nares	H.M.S. <i>Challenger</i> .

In 1875, the expedition to endeavour to reach the North Pole was determined upon, the *Alert* and *Discovery* being the vessels selected, and the supreme command given to Captain (now Sir George) Nares, of the *Challenger*. The late Captain, F. T. Thomson, was transferred from the *Modeste* in China to the command of the *Challenger*, which continued her scientific voyage, the nautically scientific portion of the duties consigned to the expedition practically devolving on Staff-Commander T. H. Tizard.

From the experience gained afloat in many seas during the early career of Captain Evans, hydrography in a wide sense received attention at his hands. We accordingly find him contributing to the conferences held in connection with the Special Loan Collection of Scientific Apparatus at South Kensington Museum in 1876 (Physical Geography Section), a paper entitled "Hydrography—its present aspects."

Elected as President of the Geographical Section of the British Association for the Advancement of Science, held at Glasgow in September, 1876, the address incumbent on the office was mainly devoted to the physical geography of the sea. Some of the obscure problems connected therewith are dealt with in an original manner, and deserve the attention of the physicist.

In 1881, the British Association held its jubilee meeting at York. At the request of its Council, Captain Evans prepared a paper on "Oceanic or Maritime Discovery for the period 1831-81 (to be found *in extenso* in the proceedings of the Royal Geographical Society for the same year).

In February, 1884, Captain W. J. L. Wharton, who about that time was engaged in command of H.M.S. *Sylvia* in surveying in the strait of Magellan, was ordered from the Cape of Good Hope station, to which his vessel had been latterly transferred, to England, and his name placed on the books of the *President*, prior to relieving Sir Frederick Evans of the duties of the Hydrographership; the latter, like his predecessor, having held the post for ten years.

In August, 1884, the appointment of Captain Wharton as Hydrographer was officially announced. Captain Sir Frederick Evans received a special pension in addition to that earned by naval service, as well, it is believed, as the warm encomiums of the Lords Commissioners of the Admiralty, for his services in the department. He has since served as one of the English delegates on "the Prime Meridian Conference," recently held in Washington, United States of America.

It will thus be seen that Captain Sir Frederick Evans, who wears the Baltic medal, served for nearly thirty-one years in the Hydrographic Department of the Admiralty, twenty-nine of which were continuous; nine years as Chief Naval Assistant and ten years as Hydrographer. He entered the Department as a master in the Navy, and left it a Captain, a K.C.B., and an F.R.S., at the age of sixty-nine years.

Apart from his power of taking pains, attention to detail, and all over the world knowledge, Sir Frederick Evans happens to be gifted with a markedly retentive memory—a matter of no small aid to an officer in the position of Hydrographer of the Navy.

The intimate relation between terrestrial magnetism and of navigation seems to have been clearly discerned at an early stage of his professional career, and never to have been lost sight of. Deputed, so far back as 1842, to make magnetical observations afloat and ashore under the auspices of the late Sir Edward Sabine, enjoying further the friendship of that able man of science in many subsequent years, gave a direction to his natural tastes; he thus diligently pursued magnetical science in its direct bearing on accurate navigation both as a professional duty and a labour of love. His perseverance reaped its reward.

Among the contributions to this special branch of applied science, already incidentally referred to, deserving of record as written for and in the immediate interests of seamen, is an Elementary Manual prepared to serve as an introduction and companion to the Admiralty Manual for the deviations of the compass. This was published in 1870, has gone through several editions, and been translated for the use of several European navies. A lecture delivered at the Royal United Service Institution in 1872, on the present state of our knowledge respecting the magnetism of iron ships and the treatment of their compasses, holds good to the present day.

As a general exposition of terrestrial magnetism from its historical and scientific sides, a lecture on the "Magnetism of the Earth," delivered before the Royal Geographical Society in 1878, deserves record. It is descriptive of the distribution and direction of the earth's

magnetic force at the present time, the changes in its elements, and on our knowledge of the causes.

In July, 1884, when Captain W. J. L. Wharton, R.N., succeeded Sir Frederick Evans as Hydrographer, the following were the Admiralty surveys in progress, with the officers in charge:—

SURVEYS.	OFFICER IN CHARGE.	SHIP OR OTHER MEANS.
Cape of Good Hope and E. Coast of Africa	Captain Pelham Aldrich	H.M.S. <i>Sylvia</i> .
West Coast of England	Staff-Commander W. E. Archdeacon	Hired Steam Vessel.
Canada	Staff-Commander J. G. Boulton	Colonial means.
Red Sea	Commander A. Carpenter	H.M.S. <i>Myrmidon</i> .
West Australia.	Staff-Commander J. E. Coghlan.	Colonial Schooner <i>Meda</i> .
China	Captain J. F. L. P. Maclear	H.M.S. <i>Flying Fish</i> .
Newfoundland.	Staff-Commander W. F. Maxwell	Hired Steam Vessel.
Australia	Lieutenant C. F. Oldham	H.M.Sch. <i>Lark</i> .
East Coast of England	Staff-Commander T. H. Tizard	H.M.S. <i>Triton</i> .
West Indies.	Lieutenant W. S. White	H.M.Sch. <i>Sparrowhawk</i>

The *Maggie* had just returned to England, and the survey of Queensland was on the eve of being again set going.

Before the close of the year 1884, Commander Carpenter, of the *Myrmidon*, succeeded Commander Dawson in the Marine Survey of India, Commander R. F. Hoskyn taking the former officer's place in command of the *Myrmidon*.

Commander the Hon. Foley C. P. Vereker, recently in command of H.M. surveying ship *Maggie*, commissioned H.M.S. *Rambler* for surveying service amongst the eastern passages to China. Lieutenant T. F. Pullen succeeded Lieutenant C. F. Oldham in command of the *Lark*, and the charge of the Queensland survey devolved upon Lieutenant G. E. Richards, a Naval Assistant in the Hydrographic Department, who had formerly had charge of the Fiji island survey, and commanded H.M.Sch. *Renard*, engaged on general surveying duties in Polynesia.

During the ten years which had elapsed since the resignation of Sir George Richards the following changes had taken place.

In the surveying service afloat, the surveys of Victoria and South Australia had been completed, and Queensland suspended. Surveys in the Mediterranean and on the east coast of Africa also suspended. The surveys in the China Sea and of the Coral Sea again taken up; Fiji islands and Red Sea surveys inaugurated.

The *Challenger* voyage had been brought to a successful termination. The *Alert* and *Discovery* returned to England from the Arctic regions, and the former ship fitted for a special surveying voyage, practically, round the world, under the commands successively of Captains Sir George Nares and Maclear.

Progress of Marine Surveys, 1874 to 1884, under Captain Sir Frederick Evans.

In 1874, Staff-Commander Kerr examined the banks between Greenore point and the Hill of Howth, Dublin bay, and entrance to Lough Carlingford.

Staff-Commander Parsons examined Cockle and Hewett channels, and approaches of the Colne and Blackwater rivers, and surveyed from Dungeness to Hastings.

Staff-Commander D. Hall surveyed Southampton water, and minutely sounded out Portsmouth harbour.

Nav.-Lieut. Millard, in a hired yacht, completed the coast of Sicily from Castelmare bay to Milazza.

Lieutenant Gray, in the *Nassau*, completed the east coast of Africa from Owvon bay to Cape Delgado, with plans of Kiswere, Mikindani, Mto Mtwara harbours, Mchinga bay, with Lindi and Mgan rivers.

Commander Wharton, in the *Shearwater*, carried the Transit of Venus party from Mauritius to Rodriguez, took part in the Transit observations, and surveyed the island with Port Maturin; also, Coetivy and Platte islets, and La Perle reef, of the Seychelles group.

Captain St. John, in the *Sylvia*, in Japan, examined Sendai bay and the Kii channel between Itsiye Misaki and Owasi bay.

Nav.-Lieut. Maxwell completed 20 miles of the east side of Placentia bay, and examined Venison Tickle, Fishing-ship, Curlew, and Independent harbours on the Labrador coast, as well as the channel south of Crane island in the river St. Lawrence.

Staff-Commander G. Stanley, in Jamaica, surveyed the coast between Morant and Helshire points, including Port Royal and Kingston harbours; Nav.-Lieut. Hoskyn was detached to examine the island of Antigua.

Nav.-Lieut. Archdeacon, in Western Australia, surveyed the coast between the Swan river and Jurien bay, and completed Champion bay.

Staff-Commander Howard examined the coast of South Australia from Cape Catastrophe to Streaky bay. Re-surveyed Port Adelaide, and examined Investigator group.

Staff-Commander H. J. Stanley sounded the channels into Port Phillip, and commenced Banks strait.

Staff-Commander Bedwell, in Queensland, completed the coast north of Cape Palmerston, including Broad sound, extending the soundings to the Northumberland islands.

Captain Moresby, in the *Basilisk*, assisted by Lieut. Dawson, followed up the exploration of Goschen strait, the east end of New Guinea, and coast to Astrolabe bay; between Teste island and the D'Entrecasteaux islands, the islands and route recommended were approximately surveyed.

The *Challenger*, after leaving Melbourne, visited Sydney, thence through Cook strait to Wellington, New Zealand, and on to Tongatabu and Ovalau in Fiji. After surveying Kandavu the expedition in this vessel called at Api, New Hebrides, thence through the Raine island passage to Somerset in Torres strait, then touched at the Arru and Ki islands, Banda, Amboina, and Ternate, Samboangan, Ilo Ilo and Manila, reaching Hong Kong in November, 1874. In January, 1875, Captain Nares returned to England to take command of the Arctic Expedition of 1875-76, and was succeeded in the *Challenger* by the late Capt. F. T. Thomson. From Hong Kong the vessel then visited Carmiguin island, Humboldt bay of New Guinea, and continued to Japan.

The survey of British India was, in 1874, again resumed, under the direction of Commander A. D. Taylor (late I.N.) The coasts to be undertaken embraced the seaboard from the Pakchan river in Tenasserim on the east, to Karáchi on the coast of Sindh on the west, and included the various islands in the Bay of Bengal, the Maldivh and Lakadivh Archipelagoes. The head-quarters of the survey were established at Calcutta, and the naval officers appointed as Commander Taylor's deputies and assistants, consisted of Staff-Commander Ellis, Nav.-Lieutenants Coghlan, Jarrad, Hammond, and Nav.-Sub.-Lieutenants George and Petley.

In 1875, Staff-Commander Kerr was employed in Solway Firth, and completed the English channel from Wokington to Silloth, and also re-examined Fishguard bay in Wales, and in Ireland the coast between Dublin bay and Wicklow.

Staff-Commander Hall completed Southampton water, Cowes roads, and the ground therefrom towards Spithead.

Staff-Commander Parsons, in the *Porcupine*, re-surveyed the entrance of the Humber and sounded the Dogger bank.

Staff-Commander Millard re-surveyed Port Said, and made investigations regarding the currents between that port and the Damietta mouth of the Nile.

Lieutenant Gray, in the *Nassau*, completed the coast between Cape Delgado and Shanga island on the east coast of Africa, but on the return of this vessel to the Cape of Good Hope to re-fit, having called at Mozambique *en route*, Lieut. Gray fell a victim to the effects of the African climate; promotion to Commander's rank being at that time on the way out to him from England. He was succeeded in the *Nassau* by Commander R. J. Napier.

Captain St. John, in the *Sylvia*, in Japan, surveyed Simonoseki and Isumi straits, the entrance to Owari bay, and coast between Mura and Owasi bays, and visited the south-east coast of the Corea.

Staff-Commander Maxwell completed the east side of Placentia bay in Newfoundland, and the shores of Labrador as far north as Halton harbour, and between the latter and the Moravian Missionary settlement of Nain, the coast had been explored.

Lieutenant Pullen, in Jamaica, surveyed the coast between Milk and Black rivers, having succeeded Staff-Commander G. Stanley, who, in September, 1875, was compelled by ill-health to return to England, having lost his assistant, Nav.-Lieut. Hoskyn, the previous month from yellow fever.

In Western Australia, Staff-Commander Archdeacon surveyed the coast from Swan river to lat. 28° S.

In South Australia, Staff-Commander Howard examined the coast between Cape Catastrophe and Streaky bay, and one of his assistants surveyed Port Pirie and the mouth of the Murray river.

In the colony of Victoria the survey of Hobson bay was carried out in detail, and that of Banks strait was in progress.

In Queensland, the region bounded on the north by the line between West hill and the Percy islands, and the approaches to Broad sound, had been sounded out.

In Fiji, Lieut. Dawson, in a steam cutter, had surveyed Suva bay on the south coast of Viti Levu.

The *Challenger* had been employed in dredging and trawling operations in the Inland Sea of Japan. From Yokohama a section was run across the Pacific between lat. 35° and 38° N., as far as 156° W. longitude, thence direct to the Sandwich islands, and on to Tahiti. Leaving Tahiti Oct. 3rd, 1875, the vessel proceeded southward to about lat. 40° S., long. 133° W., and thence to Valparaiso, Juan Fernandez being visited on the way. From Valparaiso the expedition proceeded to the southward in the prosecution of ocean work, anchoring in Port Otway, of the Gulf of Penas, Dec. 31st, 1875. In Messier, Smyth, and Sarmiento channels and Magellan strait, sounding and trawling operations were carried out, from whence the *Challenger* continued to the Falkland islands, and having corroborated the mean sea level determined by Ross in 1842 at Port Louis, continued to Monte Video, Tristan d'Acunha, Ascension and the Cape de Verd islands, to England.

The Arctic Expedition, under Captain Nares, in the *Alert* and *Discovery*, which left England in May, 1875, had parted from the *Valorous* at Disco in Davis strait, and proceeded to Smith sound, and from the Carey islands had been heard of up to July, 1875.

In 1876, Staff-Captain Parsons, in the *Porcupine*, examined the shoal ground between Yarmouth roads and Dover, and re-surveyed Shoreham harbour.

Staff-Commander Kerr completed Solway Firth from the sea to Bowness railway bridge, and also St. Tudwall bay.

Staff-Commander G. Stanley surveyed the bar of the river Tay.

In Ireland, Staff-Commander D. Hall re-surveyed the upper part of the river Shannon, from Wellesley bridge to Cains island.

Commander Wharton, in the *Fawn*, examined the seaboard from the Damietta mouth of the river Nile to Port Said. Passing into the Red Sea, after defining some of the dangers near the Sawákin islands and the Arabian coast opposite, the port of Jiddah was surveyed, and the Musawwa channel commenced.

Nav.-Lieut. Coghlan surveyed the shores of the northern part of Mauritius, together with Port Louis, and commenced Grande Port.

Commander Napier, in the *Nassau*, surveyed the Dinding islands in Malacca strait, and sounded between Penang and Rangoon.

Captain St. John, in the *Sylvia*, surveyed Murray sound and the Mackau group of the Korea, the northern part of the Goto islands, and the Kuga channel.

Staff-Commander Maxwell, in Newfoundland, made an examination of Frenchman's run and the western shores of Placentia bay.

Lieut. Pullen, in Jamaica, continued the survey of the south coast of the island between Milk river and Luana point, and made a plan of Black river anchorages.

Staff-Commander Archdeacon, in Western Australia, completed the Western Australian coast line from Swan river to West Cape Howe, and sounded the anchorages at Koombanah, and in Géographe bays.

In South Australia, Staff-Commander Howard completed the coast from Cape Catastrophe to the northern shores of Streaky bay.

In Victoria, Staff-Commander H. J. Stanley, having completed Banks strait, made large scale surveys of Waterhouse anchorage and the Bay of Fires in Tasmania.

In Queensland, Staff-Commander Bedwell surveyed the Fitz-Roy river from the sea to the town of Rockhampton, the shoaler parts of the Mary river, and the Noosa river in Laguna bay.

Amongst the Fiji islands, Lieut. Moore completed Kandavu island and reefs as far as North rock on Astrolabe reef.

In 1877, Staff-Captain Parsons in the *Porcupine* re-sounded the central part of the English Channel, between Dungeness and Varne shoal to the Owers. The river Humber, near Hull, and an examination of the changes at the entrance of Harwich harbour were also brought to a conclusion.

Staff-Commander J. H. Kerr was engaged in the river Shannon and completed a survey of Foynes harbour; towards the close of the season this officer was seized by illness which terminated fatally; the survey was then transferred to Staff-Commander George Stanley, who was employed in the examination of the shoal ground in the immediate neighbourhood of the Smalls and Bishops rocks, and of Ramsay sound near Milford haven.

Staff-Commander Hall completed the re-survey of the upper part of the river Shannon.

In the Red Sea, Commander Wharton, in the *Fawn*, assisted by Staff-Commander Millard, completed the survey of the Massuah channel, and determined positions of prominent points of the Hanish islands. During August, 1877, the latter officer examined the approaches to Port Said.

On the east coast of Africa, Commander Wharton surveyed the coast-line and reefs north and south of Zanzibar. On the passage from the Red Sea visited the Abd-el-Kuri islands, and searched for a rock on which the steam-ship *Hong Kong* struck in 1875.

From July, 1877, to February, 1878, the *Fawn* was employed on the African coast, completing it from latitude 7° S. to 9° S., with the island of Mafia and harbour of Kilwa Kisiwari; also, northward of Zanzibar, the harbours and approaches to Tanga Kisimaya, Manda, and Lamu. Commander Wharton, on the passage to the Cape of Good Hope from Zanzibar obtained deep-sea soundings.

The survey of Mauritius, with plans of Port Louis and Grand Port, were completed by Nav.-Lieutenant Coghlan.

In China, the *Nassau* surveyed Haitan strait and made plans of Lianu bay, Dodo passage, Amoy, Breaker point, Cupchi bay, the Middle-ground of Foochow river, Snipe island, in Wanchow river.

The *Sylvia*, under two new commanders in succession to Captain St. John (Captain B. W. Bax and Commander P. Aldrich), had been engaged in sounding the channels amongst the group of islands extending seaward of the south-west part of the Korea; examining the positions of off-lying islands westward of the southern part of Kiusiu, Japan; and making a survey between Omai-saki and Irako-saki on the south coast of Nipon.

In Newfoundland, Placentia bay, its banks and shoals, occupied Staff-Commander Maxwell for a part of the working season. The remainder was devoted to a triangulation of Notre Dame bay and survey of the coast-line in the neighbourhood of the mines worked on its shores.

In Jamaica, Lieutenant Pullen completed the coast-line to the westward of Black river as far as St. John point, together with large scale plans of Blewfields and Savanna-la-Mer. This survey had been strengthened by the purchase of the schooner *Sparrowhawk*.

In Western Australia, Staff-Commander Archdeacon charted the coast-line from West Cape Howe to Haul-off rock—a station about 50 miles to the eastward of King George sound. An elaborate plan of this sound and its inner harbour (Princess Royal) had also been completed.

In South Australia, Staff-Commander Howard made plans of small ports and anchorages in Spencer gulf, and completed the surveys of Denial and Smoky bays, near the western boundary of the province.

In Victoria, Staff-Commander H. J. Stanley extended the survey from Banks strait to Flinders island.

In Queensland, Nav.-Lieutenant Connor (during the absence on leave of Staff-Commander Bedwell) sounded the channels and shoals between West Hill and Cape Palmerston, and made extended tidal observations in Broad sound.

Lieut. G. E. Richards completed the entrances into Port Jackson on either side of the Sow and Pigs shoal. This officer also completed a survey of Elizabeth reef, at which a life-boat with provisions and water is moored in a reef-lagoon, for the relief of shipwrecked mariners.

Lieutenant W. U. Moore, in the *Alacrity*, completed the south coast of Viti Levu, and Kandavu passage.

In 1878, Staff-Captain Parsons sounded out the deep water area between the Owers and Portland Bill, and Staff-Commander G. Stanley between Milford Haven and the Scilly islands. Examinations were also made of the Cockle channel off Yarmouth, the Needles, Poole harbour approaches, St. Bride's bay, and the coast between St. David's head and New Quay.

The *Alert*, under Captain Sir George Nares, left England in September and had commenced active operations in the Trinidad channel of Magellan strait.

The *Fawn*, under Commander Wharton, charted Farquhar island, Cosmoledo group, Assumption and Aldabra islands, examined the Bassas da India reef, searched for Pilot shoal, and made a running survey of the north and east sides of Comoro island. Resuming the Zanzibar survey to the north near Pemba island; the *Fawn* was ordered to the Sea of Marmara in December, the survey of which was at once commenced.

The anchorage of Famagousta in Cyprus island was surveyed by Staff-Commander J. Millard.

The *Nassau*, Captain Napier, surveyed the Wên-chow river and the San-pwan pass, and added to the chart of Hong Kong, from thence proceeding to Hainan.

The *Sylvia*, Commander Aldrich, nearly completed the Goto islands, charted the Pallas rocks, Meac Sima or Asses' ears, triangulated the coast between Noma Saki and Cape Chichakoff, and commenced Van Diemen strait of Japan.

Staff-Commander Maxwell completed Placentia bay, and commenced that of Notre Dame.

In Jamaica, Lieut. Pullen completed the western part of that island, from Savannah-la-Mar on the south, to Falmouth harbour on the north.

The Victorian survey having been completed, Staff-Commander H. J. Stanley and his assistant were this year withdrawn.

In South Australia, also nearly complete, Staff-Commander Howard was at work near Nuyts Archipelago and Fowler bay.

In Western Australia the coast from 28° S. latitude to Cape Leeuwin, and thence eastward to 118° 40' E. longitude, had been closely examined and charted by Staff-Commander Archdeacon and one assistant.

Nav.-Lieut. Tooker had this year been detached from this survey and determined the positions of Impériouse, Ritchie, Mermaid, Clarke, Scott, Seringapatam, Ashmore, and Hibernia reefs.

In Queensland, Staff-Commander Bedwell completed the coast as far north as Flat-top island, and surveyed the Mary river on a large scale.

In Fiji, Lieut. Moore, in the schooner *Alacrity*, surveyed the Lau or eastern group, as far south as the Oneata passage.

Lieut. G. E. Richards, in the *Renard*, surveyed the Indispensable reef, and added to our knowledge of the Bampton reefs.

In this year Admiral G. A. Bedford, Marine Adviser to the Board of Trade, died. Capt. Sir George Nares was chosen as his successor; Captain Maclear succeeding to the command of the *Alert*.

In 1879, Staff-Captain Parsons was employed re-surveying the Solent Channel, the shoals off Saint Helen's in the Isle of Wight, the bar of Portsmouth harbour, and that of Salcombe river. Plans of Lynmouth, Minehead, Watchet, Porlock, Morte bay, and Lundy island, in the Bristol Channel, were executed by Staff-Commander Stanley. Both officers ran sectional lines of soundings across the English Channel, as also at the entrance of the Bristol Channel, to verify and amend the soundings of existing charts.

In the Sea of Marmara, Captain Wharton, in the *Fawn*, surveyed from Erekli on the north, eastward to the Gulf of Ismid, and thence westward to Mudania bay and Papa island, and triangulated the whole sea.

In China, Captain Napier, in the *Maggie*, surveyed the ports of Pak-hoi and Hoi-how; determined the position of Guie Chau island and Cape Cami, and searched for the Actæon shoal. A survey of the entrance of the Yang-tze-kiang, including plans of the outer and inner bars of this river was nearly completed.

In Japan, Commander Aldrich, in the *Sylvia*, completed the Goto islands; also the west coast of Kiusiu from Da Sima to Odimari bay, including the Kosiki group and the off-lying islands from the western part of Van Diemen strait. A triangulation of the coast from Odimari bay to Cape Cochrane on the east coast of Kiusiu had been made.

The *Flying Fish*, under Lieutenant R. F. Hoskyn, was to relieve the *Sylvia* in the autumn of 1880.

The *Alert*, in the early part of the year, under Sir George Nares, and subsequently under Captain Maclear, had been employed chiefly in the ship channels near Magellan strait, together with their ports and anchorages.

During the winter months the *Alert* visited St. Felix and St. Ambrose islands, and obtained soundings in an area unexplored by the *Challenger* in 1875.

The survey of the north shores of Jamaica from Falmouth harbour to Morant point was completed in the *Sparrowhawk* by Lieutenant Pullen, together with plans of the intermediate ports.

Staff-Commander Maxwell made progress in the survey of the shores of Notre Dame

bay. Lines of soundings had been run between the shores of Newfoundland and the opposite Labrador coast.

The Virgin rocks and bank from which they crop up were also examined.

In Western Australia, Staff-Commander Archdeacon completed the coast-line eastward of King George sound to 120° east longitude, including the Mary Ann river near the east Mount Barren of Flinders. This party were in future to be aided by the schooner *Meda*, built in England for surveying service in this colony.

In South Australia, the survey had nearly approached completion, Staff-Commander Howard, in the schooner *Beatrice*, having reached the province boundary at the head of the Great Australian bight. Much local work had been done at the Lower Murray river.

In Queensland, Staff-Commander Bedwell made progress to the north of his former year's work. The survey of 1879 included the area between the mainland stretching from Slade point in $21^{\circ} 10' S.$, to Whitsunday island in $20^{\circ} 15' S.$, and thence to the Barrier reefs abreast. This space, including the Cumberland islands, was sounded over, assumed dangers removed, and correct positions assigned to others.

This survey was brought to a close on the part of the Government of Queensland, on the last day of 1879, financial reasons being assigned as the cause.

The *Alacrity*, under Lieutenant Moore, had been at work among the eastern islands and reefs of the Fiji group.

Lieutenant G. E. Richards, in the *Renard*, surveyed among the Duke of York islands, in the channel between New Britain and New Ireland.

Lieutenant Bower, of the *Danae*, added to the hydrography of the Solomon and Admiralty groups.

In 1880, Staff-Captain Parsons completed a re-survey of the Needles Channel, from Hurst and Sconce points to Christchurch, also of Cowes harbour and its roads.

During July and August several sectional lines of soundings across the English Channel were obtained.

Staff-Commander Tizard, in the *Knight Errant*, was employed in re-sounding Holyhead bay and harbour; King road in the Bristol Channel, and in an examination of Cardiff grounds. Re-surveys were also made of Douglas harbour, in the Isle of Man, and Larne harbour on the coast of Ireland.

In the summer, sectional lines of soundings were obtained between Rona and the banks which lie to the south-west of the Færøe islands, also between Rona and the Nun rock.

Staff-Commander Langdon was detached for the purpose of assisting the Fishery Pier Committee in Dublin in the selection of sites for protecting piers on the western shores of Ireland.

In September, Staff-Commander Langdon sounded the entrance to the river Liffey.

Staff-Commander Ellis completed a survey of the river Clyde, from White Forland point and Roseneath patch to Ardmore head, and thence to Dumbarton.

The complete survey of the sea of Marmara had been effected by Captain Wharton, in the *Fawn*, also several plans of anchorages, including the approach to the Bosphorus.

Captain Napier, in the *Magpie*, completed part of the Yang-tze-kiang and coast anchorages between Hong Kong and Amoy.

An examination had also been made of the eastern entrance to Hainan strait.

The *Flying Fish*, Lieutenant R. F. Hoskyn, examined the offing of the Arabian coast from Ras Arah to Ras Kau, and confirmed the accuracy of the original survey made by the officers of the late Indian Navy in 1838.

Reefs extending north-west from Carimata island, the Montaran islands, and Rendezvous

island were surveyed, and several reported shoals were searched for, and Low island, the southern of the Natuna islands, surveyed.

Before leaving Japan, Commander Aldrich, in the *Sylvia*, completed the survey of Van Diemen strait, westward of a line drawn from Odomari bay (near Cape Chichakoff) to the north end of Tanega Sima.

The *Sylvia* sounded and sketched in the coast line in her run along the African coast, anchoring at Angra Pequina, Ichabo, Hottentot bay, Spencer bay, and Port d'Ilheo, verifying and amending the labours of former navigators.

The *Alert*, under Captain Maclear, made a survey of Indian reach, including a plan of Port Riofrio. English and Crooked reaches, and connected the salient points of Long reach.

Additions were made to the charts of Jerome channel, Otway water, and Fitz-Roy channel.

Leaving Coquimbo in the middle of June, Tahiti was reached in August, the ship arriving at Levuka (Fiji islands), on the 18th September.

Deep soundings were obtained when passing through the Low Archipelago, search made for the Minerva or Ebrill reef; Nassau island, Tema reef, and Danger islands were fixed; and position of Lalla Rookh bank determined.

Leaving Fiji, the Tonga islands were visited, and search made for La Rance bank, Sprague reef, Acis reef, and Le Rhin bank, without success.

In Fiji, Lieutenant Moore completed Goro island, the Ringgold isles, the east and south coasts of Vanua Levu, and Savu Savu bay.

Lieutenant G. E. Richards, in the *Renard*, completed the Russell island group, Rendova island, and a small portion of the south side of New Georgia; Pocklington reef and bank had also been visited, and its boundary defined.

Lieutenant James St. C. Bower, in command of the *Sandfly*, whilst engaged among the Solomon islands, had been foully murdered.

Staff-Commander Howard, having completed the survey of the shores of South Australia, commenced in 1861, returned to England. This year he examined the head of the Great Australian bight and Eucla roads, sounding out to the depth of one hundred fathoms the banks between Cape Northumberland and a position 100 miles west of Cape Borda.

A portion of Lake Alexandrina was also surveyed in the winter season for the Colonial Government.

Staff-Commander Archdeacon, and Navigating-Lieutenant Tooker, left England in the schooner *Meda* (built and equipped conjointly by the Imperial and Colonial Governments) in February, 1880.

Between August and November the party examined King sound (first explored and named in 1838 in Her Majesty's surveying ship *Beagle*). Port Usborne, Point Cunningham, Stokes bay, Valentine island, and the entrance of the Fitz-Roy river were visited. Eldorado reef was searched for without success, and also Beaver reef.

Lieutenant Carpenter, in the schooner *Sparrowhawk*, surveyed Morant Cays, and the bank on which they stand, and connected them by astronomical bearing with the highest point of the Blue mountains in Jamaica.

Portland rock, the Cays, and features dangerous to navigation of the Pedro bank were also surveyed, as well as the lesser Cayman islands.

Lieutenant Carpenter was transferred to the command of the *Magpie*, for service in the China seas; Lieutenant White, late of the *Fawn*, succeeding him.

Staff-Commander Maxwell completed Notre Dame bay from Yellow-foxcove (at the entrance to New bay) to Exploits, Burnt island. The Bay of islands from Little Port to North head, with the River Humber and the entrances to North and Middle Arms, were also surveyed, and the entrance to Pictou harbour re-examined.

Through the active interest taken in the expansion of the Labrador coast Fisheries by the Governor of Newfoundland, Sir John H. Glover, and the cordial assistance of the Hudson's Bay Company and its officers, advantage was taken of the yearly visit of this company's steam vessel to their extreme settlement in Ungava bay, on the south of Hudson strait.

Staff-Commander Boulton embarked in August at Rigoulette in Hamilton inlet, the stations at Davis inlet and Nachvak bay on the east coast of Labrador were visited, Cape Chudleigh rounded, and Koksoak river in Ungava bay, ascended to the port of Fort Chimo. The return voyage was made to Rigoulette, Davis inlet being visited a second time. Staff-Commander Boulton assigned positions to many of the principal headlands and islands of the Labrador east coast, and made surveys of anchorages and stations visited.

In 1881, Staff-Captain Parsons, in the *Porcupine*, re-sounded the Scroby and Corton sands, extended the sectional lines of soundings in the English Channel and approaches, including Parsons bank, and re-sounded Horse, Dean, and Motherbank shoals, and entrance of Harwich harbour.

Staff-Commander Tizard re-sounded Ramsay harbour and Port Erin, Dundalk bay, the bar and approaches to Wexford harbour, Waterford harbour and bar, with the Queen's Channel.

Sectional lines of soundings, south of Ireland, reaching to the parallel of Ushant, and extending to longitude 9° W., were made in the midsummer months. The Scarweather and North shoals were re-sounded.

Staff-Commander Jarrad surveyed Wexford harbour, as far up the Slaney river as the drawbridge above the town.

An examination was also made of a part of Wexford South bay to define the shoal ground known as "Holden's" bed. This officer completed a plan of Wicklow harbour, and re-surveyed Wicklow roadstead.

Lieutenant Field succeeded in charting the Nun entrance of the Niger river, also the mouths of the rivers New Calabar, Opobo, and the Portuguese and Man of War channels of the Bonny.

Lieutenant White completed a survey of the Grand Cayman island, an examination of the western part of the extensive Pedro bank, south of Jamaica, and then of the Little Bahama bank between Elbow Cay lighthouse and Pensacola Cay.

Staff-Commander Maxwell completed the coast of Notre Dame bay to Toulinguet island, and Hall bay and the Bay of islands.

Lieutenant Carpenter relieved Captain Napier in the *Maggie*, and completed the entrance to Hainan strait to the westward.

The west coast of Hainan was connected by running survey with the south coast of the island, as charted by Captain Daniel Ross of the Indian Marine in 1802, and this part connected by running survey with the eastern entrance to Hainan strait; an examination was also made of the Macclesfield bank.

The *Flying Fish*, Lieutenant Hoskyn, commenced an examination of the north-east coast of Borneo, which extended to the middle of April.

Proceeding to Japan, Lieutenant Hoskyn searched for the Oleander rock, and completed in Tsugar strait that part eastward of a line joining Hakodadi and Toriwi-saki, and the western coast of Yezo from Cape Rodgers to Cape Ota.

The *Alert*, under Captain Maclear, measured meridian distances to Port Curtis, the Percy islands, and Port Molle; surveyed the last-named port, as also the passage between Molle islands and the main land to Torres strait. A survey was carried out of Prince of Wales channel.

On leaving Torres strait for Port Darwin, lines of soundings were obtained until Cape Wessel was reached.

Staff-Commander Archdeacon made plans of Beagle bay and Port Walcott (Tien-Tsin), continuing the survey towards Legendre island.

The positions of Cape Preston, North-west Cape, and entrance of the Gascoyne river were amended, and the mouth of the Gascoyne, and anchorage off it, examined.

Lieutenant G. E. Richards succeeded Lieutenant Moore in the *Alacrity*, in the survey of the Fiji group, and completed part of the south coast of Vanna Levu, and north-east coast of Viti Levu.

Captain Wharton, in the *Finn*, having completed the Sea of Marmara, the ship was re-commissioned by Commander Aldrich, who surveyed the eastern side of the Hanish islands, and sounded over the Saya de Malha bank. Commander R. Moresby, of the Indian Navy, commenced this survey in 1837-8, and Commander Aldrich succeeded in defining the bank to the depth of 100 fathoms.

The *Finn* then defined the edges of the Shafeen and Lech reefs.

In India, Lieutenant Dawson, assistant by officers of the Royal Navy and Indian Marine, made plans of the ports of Malwan and Vingorla, and nearly completed a new chart of Bombay harbour.

In 1882, the *Triton* was commissioned by Staff-Commander Tizard to replace the *Porcupine* on the coasts of the United Kingdom.

During the year, that officer re-sounded the anchorage at Alderney, the approaches to Cowes, and foreshore of Southsea beach.

In the Thames, Yantlet Flat, Jenkins Swatch, and the edge of Maplin sand were re-sounded, and the Duke of Edinburgh channel.

Off the east coast of Scotland, sectional lines of soundings and temperature observations were obtained to a distance of 100 miles from the shore, as well as near Fair Isle.

From July to September, the *Triton* obtained soundings and temperatures, also dredging in the Faeroe Channel, and tested pressure gauges for the verification of deep-sea thermometers.

Mr. John Murray and Professor Chrystal embarked in the *Triton*, and conjointly with the officer commanding, carried out the scientific observations.

Staff-Commander Archdeacon re-sounded Milford haven seaward of Pembroke reach, with the approaches from Sheep island to St. Goven's head. The entrance to the river Ribble and approaches to the shore, from Formby to Fleetwood, were re-sounded.

Wexford harbour, South bay, and Lucifer, New ground, Long bank, and Holden's bed were re-examined, and Kingston harbour surveyed.

The Little Bahama bank between Elbow Cay lighthouse and Pensacola Cay was nearly completed, in the West Indies, by Lieut. White.

Staff-Commander Maxwell surveyed the northern portion of Fortune bay, from Connaigre head to Eagle point, with enlarged plans of Breton and Femme harbours.

The *Sylvia*, Captain Wharton, in May, left England for the Rio de la Plata, and Strait of Magellan.

Near the Abrolhos banks, a small coral bank, with 45 fathoms, was found. Near Monte Video the positions of the lighthouses on Capes Santa Maria and Polonio were verified.

English bank, with the Archimedes bank, were accurately delineated, and plans made of the anchorage at Flores island, and of Maldonado bay.

Magellan strait was commenced near the western entrance in Sea reach, and triangulation, and coast line to the extent of 100 miles completed.

The *Fawn*, Commander Aldrich, completed the Hânish islands at Mokhá roadstead, and the Zebáyir islands. Jebel Teir was sounded around, and with the Zebáyir islands, Hodeidah, and Mokhá, connected with Aden.

In proceeding to Mauritius, a line of soundings was carried across the south-east edge of Saya de Malha bank.

At Delagoa bay, Cockburn Channel was sounded, and a part of Port Melville; Elephant island, with the north part of Inyack island, was charted; Danae reef was examined.

Of Madagascar, the approach to St. Augustine bay, including Nos Vey, and the south entrance of Tullear bay was surveyed, and the transit of Venus observed under favourable conditions by the Reverend Fathers Perry and Sidgreaves, of Stonyhurst, and by Commander Aldrich. The *Fawn* shortly afterwards sailed for England.

The *Alert*, Captain Maclear, charted the Amirante islands, sounding across the extensive Seychelle bank. The position of Alphonse island was determined, Providence island visited; Wizard reef and St. Pierre were determined in position, and Glorioso islands surveyed.

At Port Mozambique, the entrance to the harbour and Leven bank were partly examined, and Plymouth Sound reached in Sept., 1882.

Staff-Commander Coghlan and Navigating-Lieutenant Dixon sounded between Champion bay and Cape Leeuwin. Turtle Dove shoal was examined, Pelsart bank charted, and Beaver reef searched for.

Plans of the anchorage and mouth of Gascoyne river, and the bars of False entrance to Shark bay were also made.

The *Flying Fish*, Lieutenant Hoskyn, examined the anchorage of Jinchuen and of Masanpho, together with the survey of Sir James Hall group, and then completed the part between Odomari bay and Kayeta Saki, and a plan of Abratsu harbour.

The *Magpie*, Lieutenant Carpenter, delineated the Nau Chau banks, about 30 miles of the Kwang-Tung coast line, and the east coast of Nipon between Mela head and Ohigasi saki; also part of the south coast of Korea, from Fusan to Herschel island. Douglas and Ashby inlets were surveyed, and Willes gulf examined.

Lieutenant Richards, in the *Renard*, examined a portion of the north coast of Viti Levu, the north-west shores of Vanua Levu, from Ruku Ruku bay, eastward to $179^{\circ} 8'$ east. The channel between Viti Levu and Yendua island was partially sounded, also that north of Yendua. Part of the east coast of Viti Levu between Ngoma island and Verata point was also completed.

The *Lark*, Lieutenant Oldham, charted a portion of the eastern shores of San Christoval, and channel between that island and Ulaua, also Simbo island. Princess islet and Bridgewater reef were searched for, the Rua Sura islands visited, and a sketch survey of the anchorage made.

The positions of Port Mary, Three Sisters islands, Ugi island, Mboli harbour, Simbo island, and Blanche harbour, were determined by star latitudes and meridian distances.

In India, Commander Dawson charted the west coast between Malwan and Vingorla, including the Karil Kachal passage, carrying a line of deep soundings from Vingorla to Colombo. In the Bay of Bengal, Dhumrah river was surveyed, Balasore river, and that of Chittagong. Detached parties also completed Back bay, of Bombay, Karachi harbour; re-sounded Beyt harbour, and surveyed Akyab.

In 1883, the *Triton*, Staff-Commander Tizard, re-sounded Sea reach from the Nore light-vessel to Hope reach, then examined the Shetland isles and Foula island, sounded around Fair isle, and re-sounded Wick, Fraserburgh, Peterhead, Aberdeen, and Stonehaven bays, and commenced the port of Montrose, with bar and outlet of the river South Esk.

Staff-Commander Archdeacon sounded the approaches to Lough Foyle, as far as Culmore light and Belfast Lough, from its entrance to the city. The approach to Barrow-in-Furness, including Piel harbour, was re-sounded.

Grange Channel was examined, and in the Bristol Channel, the ship channel between English grounds and Welsh hook was closely examined, and Swansea bay commenced.

Staff-Commander Maxwell completed the south shores of Fortune bay, from Eagle point to Fortune head. On the north shores of Newfoundland the survey included Connaigre and Hermitage bays, with plans of Gaultois and Picarre harbours, Brunet island, with the adjacent islets, and Mercer cove.

Lieutenant White sounded over the central part of Providence north-west channel, and completed Little Bahama bank below Elbow Cay lighthouse and Pensacola Cay, and Whale Cay channels and Green Turtle Cay. The survey of the bank between Pensacola Cay and Walker Cay was well advanced.

Captain Wharton charted Magellan strait, from Vallena cove in Long reach to Felix point in Sea reach, including Cripples Channel and Sylvia Channel, with plans of Havergal bay, Marsh basin, Rocky inlet, Field anchorage, Marion cove, Baker cove, and Sylvia cove.

The western entrance of Magellan strait was connected with Cape Pillar and the Evangelistas islands of the Pacific Ocean.

At Boca del Riachuelo, near Buenos Ayres, a newly-dredged channel was sounded, and Monte Video re-surveyed.

Assisted by the *Rambler* and *Wrangler*, Captain Wharton then examined the approaches to the Rio de la Plata, in the neighbourhood of Rouen and French banks, the latter being searched for without success.

The *Sylvia* next explored from Indio point to Archimedes bank, examined the channel between Chico and Ortiz banks, searched for shoal ground off Lobos island and off Maldonado, and discovered Sylvia bank. The area sounded over in the estuary of the Rio de la Plata amounting to 2,800 square miles.

In October the *Sylvia* left Rio de la Plata for Magellan strait, fixed the buoys and examined the channel from seaward to Port Belgrano, re-surveyed Sandy point anchorage, and made a running survey of Sea-shell Channel. A plan of Notch cove was made, and the strait from Cape Gallant, eastward to Sandy point commenced; this part of Magellan strait being completely early in 1884.

The *Magpie*, Lieutenant Carpenter, on passage to Hong Kong, disproved the existence of Fleurs Castle rock, reported near Amherst rocks; also of a reef reported south-east of Tong-ting island, in the Chusan Archipelago, and examined the West Lamma Channel, from Green island to the south end of Chung Chau island.

In May, Commander the Hon. Foley Vereker succeeded Lieutenant Carpenter in command of the *Magpie*, made a plan of part the west side of Moaro island, at the entrance to Bruni river, surveyed Labuk bay, and from Sandakan to Sibutu passage in Borneo. A sketch survey of Krakatoa with views was also made.

The ship then proceeded to Penang, in Malacca strait, for observations, preparatory to the execution of a survey from Pulo Bouton to Sayer islands.

The *Flying Fish*, under Lieutenant Hoskyn, made a partial re-examination of the depths in Hong Kong harbour.

In the Korea, the approaches to Salée river, embracing the islands between Jinchon anchorage and Tsia-tung islands to Clifford islands, were charted. In continuation, the *Flying Fish* examined the outer islands off the west coast of the Korean peninsula, between Clifford islands and Mackau group, and the south channel at the entrance to the Yang-tze-kiang, to ascertain the extent of a shoal the *Audacious* had touched on. In December this ship was re-commissioned by Captain Maclear.

Staff-Commander Coghlan added to the chart of King sound, and examined Alarm reef, Surprise reef, and Baskerville shoal. The coast line from Cape Baskerville to Roebuck, and Lagrange bay, was re-adjusted from astronomical observations and other data obtained, and Roebuck bay surveyed. The sea-board from Maitland river to the entrance of Exmouth gulf was then proceeded with, and a sketch survey made of Ashburton roads.

The *Lark*, Lieutenant Oldham, completed the eastern sea-board of San Christoval from its south-east extreme to Wano bay, Treasury island and the south approach to Bougainville strait. The north-west extreme of Choiseul island was likewise examined.

The *Renard*, Lieutenant Richards, being found unfit for further service, was put out of commission.

The *Dart*, Lieutenant Moore, made sketch plans of Foreland anchorage, Nelson and Diamond bays, and Yemyu cove, in Api island; Craig cove in Ambrym island; the south-west part of Espiritu Santo island, the anchorages of Cape Lisburn and Tongoa; also Tommans or Uru island, and the coast of Mallicolo.

Commander Dawson and his assistants, under the orders of the Indian Government, completed the following surveys during the season 1883-84:—Cochin, Quilon, Shial Bêt, Mahawa, Vizagapatam, Calingapatam, Negapatam, Rangoon port, Rangoon river and approaches, including the entrance of the China Bakir river, Cheduba strait and approaches to Tongoup and Sandoway. Deep-sea soundings were also obtained in the Bay of Bengal.

Staff-Commander Boulton triangulated the shores of Georgian bay, in Lake Huron, of Canada, preparatory to a more detailed examination. The Dawson rock, between the south shores of Georgian bay and North channel, with other dangers, were examined before the close of the season.

The North Borneo Company furnished a plan of Kudat harbour; also of Sapagaya river and bay, in Sandakan harbour.

MARINE SURVEYS OF INDIA.

Before the necessity for exact surveys had come to be appreciated, but at the same time that Groeme Spence was by improved appliances adding considerably to the accuracy of the hydrography of our own shores, Lieut. J. M'Cluer, Blair, and others were performing similar service in the East. It was not until the year 1800, that the Great Trigonometrical Survey of India was commenced by Colonel Lambton, an officer of Wellington's regiment, and subsequently carried on by Sir George Everest, Sir Andrew Waugh, Sir James Walker and others. As in our own country, the maritime surveys of the East Indies are based upon the points and stations of a Great Trigonometrical Survey; but formerly in India, the connection had not been quite so carefully carried out. In 1820, the survey of the Persian gulf was begun by Captains Haines, Brucks, and other officers, in a highly creditable, though not in a complete manner.*

The coasts of Arabia and Persia were also surveyed by the same officers. During part of the time they were superintended by Captain Daniel Ross. Captain Moresby made an admirable survey (for that period) of the Red Sea, assisted by Captain Elwon, with their officers Haines, Carless, Grieve, Jones, Barker and others, who subsequently did good service in other parts.

Lieut. Ethersey made an excellent survey of the Gulf of Cambay in 1834-36, but was compelled to leave certain gaps. Westward of this, the coasts were surveyed at the same period by Lieutenant Whitelock and Felix Jones, and a portion by Lieutenant Constable. Between 1839 and 1844, these operations were in a measure suspended, but in the latter year they were resumed, and various portions of the western coasts were carefully examined by Lieutenants Saunders, Rennie, Taylor, Constable, &c., between that period and 1852.

Captain Carless's important surveys of the neighbourhood of the Indus were also then carried on, and in connexion with these, Lieutenant Grieves' services hold a prominent

* In 1860, Lieutenants Constable and Stiffe, of the Indian Navy, re-examined and completed the surveys of the Persian gulf.

position. On the eastern side of the peninsula, Captain Fell had examined the Coromandel coast and portions of the northern part of the Tenasserim provinces; Commander Lloyd had also surveyed the Hoogly and Ganges mouths, but in general, the surveys have been less perfect on this side than on the other, especially as Lieutenant Selby had completed the off-shore soundings on the west coast.

Many other officers have, since the foregoing period, been actively occupied in completing and re-examining the works of their predecessors. Of such are the surveys of the Hoogly by Captain Ward; of part of the south coast of Ceylon by Staff-Commander M'Dougall, R.N., portions of Burmah, &c., by Heathcote, and several others. Perhaps the most imperfect portion of the Indian survey is that of the south eastern side of the Bay of Bengal, from Pakchan northward, and of the west coast of the island of Sumatra, with the Andaman and Nicobar islands.

On the abolition of the Indian Navy, at the close of the year 1862, a report was drawn up with reference to the state of the Indian surveys, naming what still required to be accomplished. The hydrographer of the Navy at the period, Rear-Admiral Washington, summarises this in his report for that year (see page 106).

In July, 1874, after a preliminary visit to India, Commander Taylor (late I.N.), was appointed Superintendent of Marine Surveys to the Government of India, which surveys were attached to the Department of Agriculture, Revenue and Commerce (see page 184). Later on, this Department was in the first instance dissolved, and again re-organised, the Marine Survey being in the meanwhile turned over to the Marine Department.

The first direct criticism on the Marine Survey Department of India, was made in 1880, by Mr. O'Connor, an official of the Finance Department of India, and his remarks on this subject were subsequently printed.

In March, 1881, in consequence of Mr. O'Connor's strictures, a committee was appointed at Calcutta by the Government of India, to enquire into, and report upon the Department of Marine Surveys. The members of this committee consisted of the Surveyor-General of India as President, the Accountant-General of Bengal, the Meteorological Reporter to the Government of India, the Superintendent of Marine Surveys, and an officer retired from the Lieutenant's List of the Royal Navy, with an Assistant Paymaster of the Royal Navy as secretary to the committee; the two last-named members being also in the employ of the Government of India in other capacities.

The main result of the inquiry led to recommendations to employ retired or half-pay officers of the Royal Navy, in the first instance, to train officers of the Indian Marine for a period of 5 years, the former officers then to revert to Admiralty employment, and to appoint a "Director-General of Marine Affairs for all India," to whom the superintendents of Marine and of the coast surveys were to be subordinate.

In April, 1882, a Director of Indian Marine, selected from the Post Captains of the Royal Navy, was appointed, and one of his first duties consisted in drawing up a report on the Marine Survey of India, differing in many respects from that of the Calcutta committee of 1881.

In July, 1882, the Superintendent of Marine Surveys was retired from further active service in India, under the compulsory upwards of 55 years of age clause, and an order was issued in September, 1882, to the effect that his post would not be again filled up, and that "all business connected with the Marine Survey Office was in future to be conducted by the Director of Indian Marine."

In commenting upon a somewhat similar case, which had been suggested, Rear-Admiral Sir Francis Beaufort, when hydrographer of the Navy, remarked (see page 4)—

"Nor indeed do I think any divided command of that sort would succeed were the abilities and experience of the officer you mention of the highest order. I have no idea that a survey can be well achieved unless the planner and director is actually the principal executive labourer also, and with a mind intent on the one great object, to the exclusion of all other pursuits."

The first Director of the Indian Marine in a few months resigned, it is believed, because the practical position allotted to him by the authorities in India, did not coincide with the theoretical position shadowed forth in his appointment, as understood in England.

In February, 1883, he was succeeded by another officer of the Royal Navy of the same rank, who continues responsible to the Indian Government for the charting of the Indian coasts; the officers actually engaged in the surveys, consisting in part of officers of the Royal Navy, and in part of officers of the Indian Marine.

THE UNITED STATES COAST SURVEY.*

The survey of the United States coast stretches from New Brunswick to Mexico, and from the straits of Fuca to Old California; in the Atlantic and Mexican gulf from the 24th to the 44th parallel; in the Pacific from the 42nd to the 50th. Within that range of more than 5,000 miles, it embraces every geographical peculiarity. The coast survey accurately determine the position of every prominent point, map out every bay and harbour, fix every reef and shoal, trace the course of every current, deduce the laws of the tides, and in short, observe and measure every peculiarity in the physical geography of the coast, which the most refined science, delicate methods of observation, and perfect instrumental means, can measure or detect.

Setting out from two initial points, the survey proceeds by steps of thirty or forty miles, till the whole coast is covered with a network of large triangles, constituting what is termed the primary triangulation. The angles only of these triangles are measured, the sides being successively calculated by the aid of the angles and base. The accurate measurement of this line involves the most delicate instrumental methods. The expansions, inclinations, and flexures of the measuring bars, and the contacts of their extremities must be observed with nicety. The reflecting pyrometer measures the expansions of the bars with an accuracy which is almost without limit. Delicate levels give the corrections for the inclinations and flexures, while the contact level determines the contacts of the successive bars. The probable error in determining the length of a base five miles in length, does not, under favourable circumstances, exceed a few tenths of an inch. The base line measured, triangulation begins. Signal marks, at distances from ten to twenty miles from either end of the base, are observed in succession, and their angular distances determined. The sides of the great triangles thus obtained being calculated, the signal marks form fixed points for new angular measurements, and so the triangulation stretches from hill to hill, till the prominent points of the entire coast are determined. Of the signals, the heliotrope—a moveable mirror, placed so as to be directed by a telescope—is the most perfect. With this instrument, the sun's rays have been reflected so as to be distinctly seen with a telescope at the distance of more than 100,000 yards. It is easy to see that, as the triangulation extends, the small errors, inseparable from every physical measurement, may accumulate, so that the positions of the stations most remote from the base line may be incorrectly determined. Two methods are adopted to guard against errors of this kind. A subsidiary base line may be measured near the terminal signals of the primary triangulation, and from the extremities of this we may work backwards, so as to check the results of the first series of observations and calculations of distances,—or the geographical positions of the principal stations may themselves be determined by accurate astronomical observations, assigning their exact latitudes and longitudes, to check the calculated positions. Both these methods have been brought almost to perfection, but the latter has been especially fertile in new and beautiful results.

* Abridged from the American Journal of Science and Art.

It is easy to see that while the bases and triangles give distances, the observations of latitude and the azimuths give differences of longitude, by the aid of spheroidal formulas, a central longitude having been once determined. The differences of longitude are, in their turn, checked by the telegraph operations, to which we shall presently allude.

The base, which serves as the commencement of the primary triangulation for the eastern and middle states, lies within the state of Massachusetts, a little to the north of Rhode island. Its length is over ten miles, and its direction nearly north-east and south-west; it was measured in 1845. Surveys for a verification base have been made in the north-eastern part of the state of Maine, on Epping plains.

As the different stations of the primary triangulation are at different heights, it is necessary to measure vertical as well as horizontal angles, and finally, in consequence of the spheroidal figure of the earth, to reduce the plane triangles, which are the direct results of the measurements, to spheroidal triangles, at the level of the sea. In this manner, after considerable labour, both of observation and of calculation, the positions of the primary stations are at length fixed, and these now serve as starting points for the secondary triangulation, which determines the general outline of the coast in detail, and the positions of reefs, rocks, and islands. The triangles observed are now smaller, but very much more numerous, and the labour of observation and reduction even greater than before. Then comes the topography of the coast,—the work at every successive step running more and more into detail. The coast line is now traced and laid down in charts of elaborate minuteness and finish. Harbours are surveyed and mapped out by soundings; the exact character and value of each being determined. The nature of the bottom with reference to anchorage, the depth and direction of channels, currents, tides and prevailing winds, the proper position of light-houses, buoys and fog-bells, all form subjects of special and minute attention. But besides the bays, harbours, and sounds of the coast, the rivers receive their share of attention,—small triangulations being carried up to the head of tide waters, based upon one of the sides of the larger work. In this manner the river shores are accurately mapped, while careful soundings determine the bars and channels. The mouths of the larger rivers offer special subjects of examination of the highest interest and importance. We refer to the changes in the depth and position of the channels produced by the effects of currents. The characteristics of the delta of the Mississippi, and the enormous quantities of matter annually brought down by the current, are too familiar to require notice, but the changes in the entrance to the harbour of New York had not, until more recently, attracted attention to the same degree.

The special objects of the survey, and the peculiar character of the work done by it, have exercised influence upon astronomy itself, considered at least as a science of observation. New methods for the determination of latitudes and longitude have had their origin in the necessities of the U.S. Coast Survey, while the methods already known and practised have been developed and perfected. Special series of observations were undertaken at the two observatories of Cambridge, Mass., and at numerous minor stations, to obtain the astronomical data requisite for the determination of differences of longitudes.

The determination of differences of longitude by means of the electric telegraph—a method which doubtless suggested itself to thousands, when the telegraph passed from an idea to a reality—was first carried out properly by the U.S. Coast Survey. This method has not merely yielded results of great value to the survey itself, but the particular mode of applying it has been generalized into the American method of recording astronomical observations, and of measuring minute intervals of time.

The experiments of Mr. Wheatstone, made in 1834, with apparatus devised and executed by Mr. Saxton, gave the first determination of the velocity of electricity in a metallic conductor. This velocity was estimated at about 288,000 miles per second, and until within a recent period Wheatstone's determination was supposed to hold good, approximately, for galvanic currents as well as for electricity of high tension, and for bad as well as good conductors. The telegraph operations of the U.S. Coast Survey demonstrated at the very

outset the inaccuracy of received ideas upon this subject: they shewed that the galvanic current moves very much less rapidly than electricity of tension, varying, according to Dr. Gould's discussion of the observations, from 12,000 to 18,000 miles per second.

The successful laying of the telegraph wire between Europe and America presented the opportunity for the determination of the longitudes by the most perfect method which human ingenuity has yet devised.

In connection with its astronomical and geodetical observations, the U.S. Coast Survey has been enabled to carry out determinations of the three magnetic elements at numerous stations. These elements are the declination, inclination, and horizontal intensity. In the report for 1856, magnetic charts of the North American continent appeared for the first time. In these charts the lines of equal variation, dip, and intensity, are traced, and a comparison of the two former with those deduced from the general theory of Gauss, exhibited a satisfactory agreement in form. The U.S. Coast Survey reports contain also, valuable and elaborate discussions of the secular variations of magnetic declination and inclination upon the eastern and western coasts, reference being had to the earliest recorded observations. Formulas are also given for a number of stations, which enable the determination with a satisfactory approximation of the two angular magnetic elements, at any required epoch.

In the progress of the Hydrography of the Coast Survey, numerous observations of the tides have been made, for the purpose of correcting soundings, and of determining the establishments of the different ports. The necessity of both these classes of observations is sufficiently obvious, but the superintendent has connected with them, observations of a more permanent character, in order to ascertain the laws of the tides in particular localities, and to trace the progress of the tide wave along the coast severally, as well as in bays and rivers. For these observations two species of gauge have been used; the self-registering and the common staff gauge. The former possesses the advantage of requiring little or no attention, and of furnishing a permanent and reliable record in the form of a curve, of which the abscissas represent the times, and the ordinates the corresponding heights of water.

The results obtained have been of great practical importance, giving as they do, for the first time, accurate information with respect to the tides of the Gulf and of the Pacific coasts, and leading to the construction of accurate and reliable tide tables.

It is not saying too much to assert, that no single series of tidal observations yet made possesses so high a scientific value as those of the U.S. Coast Survey. Not only is the range of coast studied greater, but the character of the tides themselves is in a great measure sufficiently free from the effects of local causes, to enable us to obtain from them results of definite value for the general theory. On the other hand, the Gulf of Mexico and particular portions of the Atlantic coast exhibit peculiarities of much interest as yet imperfectly investigated, but seeming to show the importance of a careful study. While the tidal observations hitherto discussed have been for the most part isolated,—made at different points upon the earth's surface, by individuals, during a period of about 200 years—those of the Coast Survey have been made systematically, at numerous carefully-selected stations, upon the coasts of a continent lying between two great oceans, and under the direction of a single person.

An elaborate discussion of these observations has led to the construction of maps of the co-tidal lines of the Atlantic, Gulf, and Pacific coasts, which are of especial interest, not merely from their connection with our own shores, but from the fact that they are the only series of co-tidal lines yet deduced from an extensive and connected series of observations. The term "co-tidal line" was first introduced by Mr. Whewell, to denote a line passing through all those points which have high water at the same hour of the day. It is convenient to assume 24 such lines, and they may obviously be regarded as forming the crests of successive advancing tide waves. Their shape, velocity, and direction of motion, will depend upon the configuration of the coast, the depth of the ocean, and the various local causes which disturb the uniformity of their progress, and cause divisions and interferences

of divided waves. Were no disturbing causes present, the co-tidal lines would correspond with the meridians, each line at a certain distance behind the meridian of the moon at its culmination. It is easy to see, too, that the co-tidal lines must differ upon the eastern and western shores of a continent like that of North America, since the tide wave moves from east to west, and is therefore upon the eastern coast an incident, and upon the western a receding wave, the character of which is determined by the flow of water, and its pressure from north, south and west. The co-tidal lines of the Atlantic coast follow the general outline of the coast itself in a remarkable manner, the velocities measured in a direction perpendicular to the front of the waves, varying from 24 to 40 miles per half-hour. The tides on the Atlantic coast are of the regular semi-diurnal class; the diurnal inequality is not large, and generally difficult to trace, though easily recognised at particular periods. On the Gulf coast, on the contrary, the tides are small, the semi-diurnal being masked by the diurnal waves. The tides of the Pacific coast are remarkably regular, both in the diurnal and semi-diurnal waves, and moreover rise to such heights as to render observation easy. Throughout the extent of coast examined, the co-tidal lines for the Pacific are either sensibly parallel to, or make but a small angle with the coast.

Tide tables for the principal sea ports of the United States are published by the Superintendent of the Coast Survey; they are based exclusively upon the observations of the survey, and are extended and corrected as the survey advances.

The publication of maps and charts constitutes one of the main objects of the survey. Upon the preparation of these an immense amount of labour is bestowed, the value of the work consisting chiefly in the accuracy of the details. The most advantageous methods of presenting to the eye an easily intelligible view of the Topography and Hydrography of the coast have of course occupied a very large share of attention. The general treatment of the subject, the signs and other details being settled, and the triangulation and plane-table work finished, the maps are drawn and the work of the engraver begins. In order to render the results of the survey useful and accessible as soon as possible, and at the same time to exhibit the progress of the work, three classes of charts are engraved. These are termed sketches, preliminary charts, and finished charts. The sketches are of two kinds; progress sketches showing from year to year the advance of the work, and sketches of parts of the coast whether connected or detached. They are added to, year by year, and lithographic transfers published in the annual reports. In this manner it rarely happens that a year elapses between a survey and its publication in some useful shape. The preliminary charts serve nearly the same purpose as the sketches, but are larger and more finished.

The finished charts are divided into three classes. The first are called inshore or coast charts, and are drawn to a scale of 1 inch = 1 mile. They embrace the shore line, the interior as far as the nearest main road, and the hydrography for about fourteen miles from the shore. The second class embraces what are termed off-shore or general coast charts, drawn to a scale of 1 inch = 2 miles, giving the shore line and the general topography of the coast, so that it may be recognised by the navigator, but omitting minute details and giving the soundings to the depth of at least 120 fathoms. The third class is composed of minutely detailed charts of harbours, anchorages, &c., exhibiting the sounding, tides, and currents, the outline of the shore, the topography of the adjacent country; in short, presenting the complete results of the survey. These charts are drawn on scales varying from 1 inch = 1 mile to 1 inch = 10 miles.

The finished charts require the work of first class engravers. With a wise liberality the charts are sold at the lowest possible rates, while the gratuitous distribution of the annual reports of the Coast Survey gives a still wider circulation to its graphical results.

As the greater number of maps and charts are engraved upon copper, and as the softness of this metal renders it impossible to obtain more than a limited number of impressions from a single plate, a method of reproducing the plates themselves becomes indispensable. Such a method is found in the electrotpe process, which is applied in the office of the survey upon a large scale, and which there received a development and a perfection which leaves little to be desired.

It has been found possible to print from thin electrotypes merely folded over the edges of a stout plate of metal which serves as a support or back. In this manner plates of the first quality can be furnished for about one-third of the cost of those deposited of the usual thickness. Processes are also employed by which small plates can be pieced out in any direction and to any desirable size,—no line of junction being visible between the original and the addition.

The particular apparatus and arrangements employed in the electrotype department have nearly all originated in the department itself, and have been fully described in the annual reports of the survey. It cannot be doubted that they have exerted a positive influence upon the progress of this branch of art.

In accordance with the direction of Congress that a map exhibiting the state of our knowledge of the Gulf Stream should accompany the report of 1853, the work of investigation was pushed forward during the year, and results of great interest obtained, and illustrated in two charts.

We have adverted to the observations of latitude, azimuth, and longitude, as requisite to determine the position on the earth's surface of the stations, the relative situation of which as to distance and direction is ascertained by triangulation. They serve thus incidentally to determine the *figure* of that portion of the earth over which the work extends. While, in other countries, extensive operations have been executed for the special purpose of measuring arcs of meridians and parallels, the Coast Survey furnishes those important additions to one of the highest departments of physical knowledge, without any expenditure not absolutely necessary for the perfect attainment of its most direct and practical objects. An individual arc of $3\frac{1}{2}^{\circ}$ from Nantucket to Mount Blue in Maine—another of $2\frac{1}{2}^{\circ}$ from the head to the capes of Chesapeake bay extended $1\frac{1}{2}^{\circ}$ farther to Cape Hatteras, and an arc of the parallel extending 4° from Nantucket to New York, are among the results obtained. They exhibit a general conformity to the elements of the earth's figure deduced from all previous measurements, while they show marked local variations which have become the subject of special study.

These variations in the direction of the plumb-line are found to be not only such as would result from want of uniformity in the geological structure in the immediate vicinity of stations, but to extend like undulations over considerable regions.

In order to obtain these "station errors" as free from residual instrumental errors as possible, the capabilities of various instruments and methods for determining latitude, have been successively tried,—large vertical circles, repeating circles, the prime vertical transit, the zenith telescope (or equal altitude instrument), and Airy's zenith sector. The latter instrument is the most perfect of its kind, possessing many improvements on the zenith sector of the British Ordnance Survey, the only other of the kind in existence. The accuracy of its results, however, is rivalled by those of the zenith telescope, the application of which, to observations of latitude by equal meridian altitudes of stars to the north and south of the zenith, is of American origin, and has been greatly perfected in the Coast Survey. Combining portability and facility of use, with great accuracy, it has become the favourite instrument, and no observer who has ever used it, is willing to return to others.

In order to bring out the various elements of error, observations have been made at the same stations with different kinds of instruments, with the same instrument by different observers, and by the same observer with two different instruments of the same class. By a consistent application of the method of least squares, the observations have been severely scrutinized, and their relative values determined without the admission of anything like arbitrary preference.

Abandoning the methods by observations of the sun in low latitudes, and by transits of stars over the verticals of stations, as involving too largely, the difficult element of *time*, the observations of azimuth have been made principally on close circumpolar stars, especially the pole-star. The reduction of observations made near the time of the star's greatest eastern or western elongation, has been greatly facilitated by the use of a simple formula. An

elegant method has been introduced, of observing the star at corresponding equal times, before, and after either culmination, by which arrangement, the labour of computation is almost entirely saved, the mean of each pair of corresponding observations giving at once the meridian. The observation of azimuth have shown irregularities to exist in the direction of the plumb-line, similar in kind and amount to those indicated by the latitude observations.

One of the most important and striking features of the methods of the Coast Survey, is the total absence of eclecticism, which, in former times, was an acknowledged principle with observers, and to which there is even now a strong leaning in some quarters. The observer may indeed choose circumstances favourable to his purpose, and may affix to the observations a statement of facts affecting their quality, but here the influence of his judgment or bias ceases. The observations are made to tell their own story, and by the searching test of the method of least squares their relative weight is ascertained, and rejections, if necessary, are made according to Peirce's criterion. The step is taken or combination made; but the reasons for it are such as to be necessarily arrived at by every one, according to the principles laid down. All observations are liable to more or less uncertainty, and there are probably classes of errors which no number of observations or variety of methods can entirely eliminate; it will always be necessary to discriminate, and to apply small corrections to the results, in order to make them fulfil the theoretical relations existing between them. When this is done according to fixed mathematical rules, all uncertainty vanishes, and truth must be the gainer; while, on the other hand, when it is allowed to be done according to personal judgment or bias, results must vary with different computers.

In addition to the duties of the general direction of the survey, and inspection of the parties, the Superintendent himself personally assists in the execution of the work, taking the field, and making observations as required. The different parts of the work are entrusted to assistants, who act as directed by the Superintendent, and are responsible to him, the office of the survey being considered as a party, with an assistant in charge. Each field party consists of a chief, who may have one or more assistants, and of several hands. In the office, computers, draughtsmen, engravers, printers, mechanics, clerks, &c., are employed, as occasion may require.

In the organization of the survey, three classes of persons are recognized. These are civilians, officers of the army, and officers of the navy. The civilians form the permanent *nucleus* of the survey. Their salaries are under the control of the Department, and they are promoted or lowered according to their merit, as measured by the results of their work. As they are not, save in exceptional cases, subject to frequent changes, they form a constantly efficient and trained body, and preserve uniformity in the business and methods of the survey. Such a *nucleus* is obviously indispensable, as the whole work might otherwise be disorganized by calls for the professional services of officers of the army and navy. Thus, on the breaking out of the Mexican war, all the officers of the line of the army, and part of those of the staff, serving on the Coast Survey, were detached for active military service.

The officers of the army and navy are detailed by the heads of their respective departments, on the application of the Superintendent, through the Treasury Department, and are of course liable to be frequently changed. Their employment is, however, very advantageous both to the survey and to themselves, since they furnish to the former, active, intelligent, and zealous assistants, while they of course profit by the peculiar scientific training offered in the service to which they are detailed.

There is no part of the surveys which does not furnish advantageous practice to an officer in either branch of the service. The topographical engineer finds employment in his own department. The survey of harbours and the study of tides, currents, shoals, entrance channels, and all those peculiarities which distinguish the different seaports, are of the utmost importance in determining the proper sites for fortifications and permanent defences. They furnish weapons of offence as well as defence. In the Russian war, the success of several important operations depended wholly upon the skill and promptness with which

surveys were executed by naval officers. But even in time of peace, the advantages of having thoroughly trained hydrographers can hardly be over-estimated, for commerce, and therefore civilization, profits by every new harbour surveyed, every channel sounded, every current whose course and velocity are traced. The law requires that as many officers of the army and navy be employed as may be compatible with the successful prosecution of the work.

The work of the U.S. Coast Survey is divided into field and office work. The field work consists in the actual surveys and observations of various kinds, and is either original or of verification. The methods of conducting the work are laid down in general instructions by the Superintendent, who also directs what scientific processes and instruments are to be employed. The assistants make monthly reports in prepared forms, and keep daily journals, which are placed on file in the office. A general report is also made to the Superintendent on taking and leaving the field, and in the month of October of each year, for the annual report.

The office work consists of computing, drawing, engraving, printing, &c., and is for the most part under the care of the assistant having charge of the office. The publication and distribution of maps and the care of the accounts and property are placed in the charge of the general disbursing agent.

The minute attention required to secure accuracy in the computations of the Coast Survey is well exhibited in the system of checks employed. The field parties in the first place compute their own work, and a second computation is then made independently by persons having no connection with the field work. The assistant in charge of the office then examines and compares the two computations and reports any discrepancies to the Superintendent for examination. The records of observations and calculations are put in form for publication by the assistant in charge of the office under the direction of the Superintendent; but the records and results published as a separate work are under the charge of a special officer. Drawings are first executed by the field parties, and reductions of these to the scale of publication are then made by regular draughtsmen in the office, and these drawings are finally revised and verified. It is almost needless to mention that all the topographical signs, forms, and sizes of letters, &c., are prescribed by rule so as to be uniform. This subject, as already mentioned, is one which required special study. Thus the scale of shade is made to express the degree of slope by the strength of the hachure lines and the distance between them. The engraving of the maps and charts is under the charge of an assistant, who verifies all engraved maps; from him they pass to the assistant in charge of the office, who finally reports them to the Superintendent.

The prices of the maps and charts are fixed by the Treasury Department, upon the general principle that the sale should pay for the cost of paper and printing. The small maps are sold for fifteen, and the larger for twenty to fifty cents. Besides the distribution by sale, many copies are forwarded to literary, scientific, and commercial institutions, as designated by the Treasury Department.

In all cases, the original records of observations and field-work are transmitted to the office after duplicates have been made by the field parties. These are deposited in a fire-proof building, in charge of the general disbursing agent. The instruments belonging to the survey, properly marked and numbered, are also deposited in a fire-proof building, the repairs being almost always executed in the office.

The general estimates for the survey are made by the Superintendent, who controls the expenditures for field and office work. On receiving his instructions for work, which usually state the limit of expenditure, the assistant makes an estimate for the number of hands required, and for the general expenses of his party. This estimate, after the approval of the Superintendent, is the authority of the disbursing agent in settling the accounts.

The chief of each party keeps an account of the party disbursements, and transmits it to the general disbursing agent, who supplies funds, audits accounts, and is responsible to the Treasury Department.

Beside the very numerous duties of supervision, and of personal exertion which are discharged by the Superintendent, there are many special subjects which are under his immediate direction, and in charge of a special assistant. Such are the researches upon the tides and the Gulf stream; the preparation of the records, and results for publication; the longitude work both astronomical and telegraphic; experimental researches on various practical subjects bearing directly upon the survey; the expansion of paper, and the various modes of making and preparing it; the covering of copper plates with surfaces of iridium; improvements in different kinds of engraving, and other matters too numerous to mention.

The amount of labour, skill, and care required to maintain the harmonious action of the different parts of an organization like that of the Coast Survey, may easily be imagined, and we may ask, how many scientific men possess the extent and variety of knowledge combined with the tact and the executive capacity which such a work demands, and which it has called forth.

A Chronological Table of the Principal Geographical Discoveries of Modern European Nations.

- YEAR.**
- 861 *Færoe Islands*—discovered about this time by a Scandinavian vessel.
- 871 *Iceland*—by some Norwegian chiefs, compelled to leave their native country. According to some accounts it had been visited before this, by a Scandinavian pirate, Naddodd.
- 950 *Greenland*—by the Icelanders about this period. The first colony established was destroyed by a pestilence in the 14th century, and by the accumulation of ice which prevented all communication between Iceland and Greenland.
- 1001 *Winenland*—a part of the continent of America, supposed to have been discovered by the Icelanders. It was called *Winenland*, or *Vinland*, from the abundance of a species of vine found there. The Icelandic chronicles are full and minute respecting this discovery.
- 1344 *Madeira*—The discovery of this island attributed to an Englishman, Robert Macham; it was revisited in 1419 by Juan Gonzalez, and Tristan Vaz, Portuguese.
- 1345 *Canary Isles*—by some Genoese and Spanish seamen, having been known to the ancients.
- 1364 *Guinea*—the coast of, discovered by some seamen of Dieppe, about this period.
- 1418 *Porto Santo*—by Vaz and Zarco, Portuguese.
- 1419 *Madeira*—by the same navigators. It was first called *St. Lawrence*, after the Saint's day on which it was seen:—and subsequently *Madeira*, on account of its woods.
- 1434 *Cape Bojador* or *Nun*—doubled for the first time by the Portuguese.
- 1440 } *Senegal River*—by the Portuguese.
- 1445 }
- 1446 *Cape Verde*—by Denis Fernandez, a Portuguese.
- 1448 *Azores Islands*—by Gonzallo Vello, a Portuguese.
- 1449 *Cape Verde Islands*—by Antonio de Noli, a Genoese in the service of Portugal.
- 1471 *Island of St. Thomas*, under the Equator, discovered.
- 1484 *Congo*—by the Portuguese, under Diego Cam.
- 1486 *Cape of Good Hope*—by Bartholomew Diaz. It was originally called "The Cape of Tempests," and was also named "The Lion of the Sea," and the "Head of Africa." The appellation was changed by John II., King of Portugal, who augured favourably of future discoveries from Diaz having reached the extremity of Africa.
- 1492 *Lucayos* (or *Bahama*) *Islands*—These were the first points of discovery by Columbus. *San Salvador*, one of these islands, was first seen by this great navigator, on the night of the 11th or 12th October in this year.
- Cuba Island of Hispaniola*, or *St. Domingo*—by Columbus in his first voyage.
- 1493 *Jamaica*, *St. Christopher's*, *Dominica*—by Columbus in his second voyage.
- 1497 *Cape of Good Hope*—doubled by Vasco di Gama, and the passage to India discovered.
- 1497 *Newfoundland*—by John Cabot, who first called it *Prima Vista* and *Baccalaos*. The title of *Prima Vista* still belongs to one of its capes, and an adjacent island is still called *Baccalao*.
- 1498 *Continent of America*—by Columbus.
- Malabar, Coast of*—by Vasco di Gama.
- Mozambique, Island of*—by Vasco di Gama.
- 1499 *America, Eastern Coasts of*—by Ojéde and Amerigo Vespucci. (It is contended by some that this preceded by a year the discovery of the American continent by Columbus).

- 1500 *Brasil*—24th April by Alvarez de Cabral, a Portuguese, who was driven on its coasts by a tempest. He called it the Land of the Holy Cross. It was subsequently called Brazil, on account of its red wood; and was carefully explored by Amerigo Vespucci, from 1500 to 1504.
- 1501 *Labrador and River St. Lawrence*—by Corterçal, who sailed from Lisbon on a voyage of discovery for the Portuguese.
- 1502 *Gulf of Mexico*.—Some of the shores of this gulf explored by Columbus on his last voyage.
St. Helena, the Island of—by Jean de Nova, a Portuguese.
- 1506 *Ceylon*—by the Portuguese. Ceylon was known to the Romans in the time of Claudius.
- 1506 *Madagascar, Island of*—by Tristan da Cunha, and revisited by the Portuguese navigator Fernandez Pereira, in 1508. This island was first called St. Lawrence, having been discovered on the day of that Saint.
- 1508 *Canada*—visited by Thomas Aubert. Known before to fishermen, who had been thrown there by a tempest.
Ascension Isle—by Tristan da Cunha.
Sumatra, Island of—by Siqueyra, a Portuguese.
- 1511 *Sumatra*—more accurately examined by the Portuguese.
Molucca Isles—by the Portuguese.
Sunda Isles—by Abrew, a Portuguese.
- 1512 *Maldives*.—A Portuguese navigator, wrecked on these islands, found them in occasional possession of the Arabians.
Florida—by Ponce de Leon, a Spanish navigator.
- 1513 *Borneo, and Java*.—The Portuguese became acquainted with these islands.
- 1513 *South Sea*.—The Great Ocean was discovered this year from the mountains of Darian, by Nuguez de Balboa, and subsequently navigated by Magellan. The supposition of the New World being part of India now ceased.
- 1515 *Peru*—by Perez de la Rua.
- 1516 *Rio Janeiro*—by Dias de Solis.
- 1516 *Rio de la Plata*—by the same.
- 1517 *China*—by sea, by Fernand Perez d'Andrada.
- 1517 *Bengal*—by some Portuguese thrown on the coast by a tempest.
- 1518 *Mexico*—by the Spaniards. Conquered by Cortez, in 1519.
- 1519 *Magellan, Straits of*—passed by Magellan with a fleet of discovery, fitted out by the Emperor Charles V. The first voyage round the world was undertaken by this navigator; and his vessel performed the enterprise, although the commander perished.
- 1520 *Terra del Fuego*—by Magellan.
- 1521 *Ladrone Islands*—by Magellan.
- 1521 *Phillippines*—by Magellan, who lost his life here in a skirmish.
- 1524 *New France*.—The first voyage of discovery made by the French under Francis I., one of whose ships, after reaching Florida, coasted along as far as 50° north latitude, and gave to this part the name of New France.
- 1524 *North America*—travelled over from Florida to Newfoundland by Verrazzani, a Florentine in the service of France.
- 1525 *New Holland*—by the Portuguese about this time. For some time neglected by Europeans, but visited by the Dutch, at various periods, from 1619 to 1644. Now colonised by the English.
- 1527 *New Guinea*—discovered by Saavedra, a Spaniard, sent from Mexico, by Cortez.
- 1530 *Guinea*—the first voyage to, made by an English ship for elephants' teeth.
- 1534 *Canada*—visited by Cortier, of St. Malo; a settlement having previously been made in 1523, by Verrazzani, who took possession in the name of Francis I., of France.
- 1535 *California*—by Cortez
- 1537 *Chili*—by Diego de Almagro, one of the conquerors of Peru.
- 1541 *Labrador*—by a French engineer, Alphonze.
- 1541 *India*—the first English ship sailed to, for the purpose of attacking the Portuguese.
- 1542 *Japan*—by the Portuguese, Antonio de Meta and Antonio de Peyxoto, who were cast by a tempest on its coasts.
- 1545 *Potosi, Mines of*—by the Spaniards.
- 1552 *Spitzbergen*—observed by the English, but mistaken for part of Greenland. Visited by Barentz, a Dutch navigator, in search of a north-east passage, in 1596.
- 1553 *White Sea*—which had not been visited since the time of Alfred, was now supposed to be discovered by Chancellor, the English navigator.
Nova Zembla—by Willoughby, an English seaman.
- 1575 *Solomon Isles*—by Mendana, a Spaniard, sent by the Governor of Peru.
- 1576 *Frobisher's Strait*—by the English navigator whose name it bears.
Greenland—further explored by Frobisher, who also penetrated further between this country and Labrador.
- 1577 *New Albion*—by Drake, who was the second to attempt a voyage round the world, which he performed in three years.

- 1580 *Siberia*—by Yermak Timophéievitch, Chief of Cossacks.
- 1587 *Davis's Strait*—by the English navigator whose name it bears, in his voyage for the discovery of a north-west passage.
- 1594 *Falkland Islands*—by the English navigator, Hawkins.
- 1595 *Marquesas*—by Mendana, a Spaniard, on his voyage from Peru to found a colony in the Solomon Isles.
- Solitary Island*—by Mendana on the above-named voyage.
- 1606 *Archipelago del Espirito Santo*—by Guiros, a Portuguese sent from Peru. These islands are the Cyclades of Bougainville, and the New Hebrides of Cook.
- Otaheite*—supposed to be discovered by Guiros, who named it Sagittaria.
- 1607 } *Hudson's Bay*—by the celebrated English navigator, Hudson, on his third voyage. Venturing to pass
1610 } the winter in this bay on his fourth voyage, he was, with four others, thrown by his sailors into a boat, and left to perish.
- 1607 *Chesapeak Bay*—by John Smith.
- 1615 *Straits of Le Maire*—with the island of Staten on the east, by Le Maire, a merchant of Amsterdam, and Schouten, a merchant of Horn.
- 1616 *Cape Horn*—doubled by Le Maire and Schouten, Dutch navigators, who called it after the town of which Schouten was a native. These enterprising men performed a voyage round the world in about two years.
- 1616 *Van Dieman's Land*—by the Dutch.
- 1616 *Baffin's Bay*—by William Baffin, an Englishman. The nature and extent of this discovery was much doubted, till the expeditions of Ross and Parry proved that Baffin was substantially accurate in his statement.
- 1636 *Frozen Ocean*.—In this year the Russians discovered that this ocean washed and bounded the north of Asia. The first Russian ship sailed down the Lena into this sea.
- 1642 *New Zealand*—with the southern part of Van Dieman's Land, discovered by Tasman, a Dutch navigator.
- 1654 *Bourbon*—Isle of, occupied by the French.
- 1673 *Louisiana*—by the French. This country received its name from La Salle, a Frenchman, who explored the Mississippi, in 1682.
- 1686 *Easter Island*—by Roggewein, a Dutch navigator.
- 1690 *Kamschatka*—the principal settlement of the Russians on the coast of Asia, discovered by a Cossack chief, Morosko. This country was taken possession of by the Russians in 1697.
- 1692 *Japan*.—Carefully visited by Kemfer, a German.
- 1699 *New Britain*.—This island, and the straits which separate it from New Guinea, by Dampier. This enterprising seaman made a voyage round the world at the period of this discovery.
- 1711 *Kurile Isles*—occupied by the Russians.
- 1728 *Behring's Strait*—explored and designated by a Danish navigator in the service of Russia, whose name it bears. Behring thus established that the continents of Asia and America are not united, but are distant from each other about 39 miles.
- 1728 *Kamschatka*—ascertained by Behring to be a peninsula.
- 1741 *Aleutian Isles*—on the coast of North America, discovered by Behring. A more accurate survey of these islands was made under the Russian Government, by Captains Billing and Sarytchef, from 1781 to 1798.
- 1765 *Duke of York's Island*—by Byron.
- Isles of Danger*—by Byron.
- 1767 *Otaheite*—by Wallis.
- 1768 *Cook's Strait*—by Captain Cook on his first voyage round the World, which occupied from 1768 to 1771.
- 1770 *New South Wales*—by Captain Cook.
- 1772 *Island of Desolation*—the first land south of India, discovered by Kerguelen, and called by his name. Subsequently called the Island of Desolation by Captain Cook.
- 1774 *New Caledonia*—by Cook in his second voyage, 1772—1775.
- 1778 *Icy Cape*—by Captain Cook.
- 1778 *Sandwich Islands*—by Cook in his third voyage, which commenced in 1776. He lost his life in 1779.
- 1797 *Bass's Straits*.—Mr. Bass, Surgeon of H.M.S. *Reliance*, penetrated as far as Western Port, in a small open boat, from Port Jackson. In 1799, Lieut. Flinders circumnavigated Van Dieman's Land, and named the strait after Mr. Bass.
- 1804-5-6 *Missouri*—explored to its sources by Captains Lewis and Clarke, and the origin and course of the *Columbia* ascertained.
- 1819 *Barrow's Straits*—by Lieut. Parry, who penetrated as far as Melville Island. The strait was entered on the 3rd August.
- 1819 *New South Shetland*—discovered by Mr. Smith, of the brig *William*, bound to Valparaiso.
- 1819 } *North America*—The northern limits of, determined by Capt. Franklin, from the mouth of the Copper-
1822 } mine river to Cape Turnagain.
- 1821 *Asia*—the northern limits of, determined by Baron Wrangel.
- 1825-6 *North America*—Franklin's second expedition, in which the coast between the mouths of the Coppermine and M'Kenzie's rivers, and the coast from the mouth of the latter to long. 149½° W., were discovered.

- 1827 *North America*.—In August of this year Captain Beechey, in H.M.S. *Blossom*, discovered the coast from Icy Cape to Point Barrow, leaving about 140 miles of coast unexplored between this point and Point Beechey.
- 1854 *Macdonald Islands*.—January 1st, by Captain Macdonald, of the *Samarang*, outward bound to Sydney, New South Wales.

EARLY HISTORY OF CHRONOMETERS, AND THEIR INTRODUCTION AS AIDS TO NAVIGATION IN THE ROYAL NAVY.

It has been often erroneously supposed that the first chronometer carried afloat for the purposes of giving approximately correct Greenwich time, and thereby finding the longitude at sea, was that tested and reported on by Mr. Wales, in the *Adventure*, during Cook's second voyage, 1772-75. That this was not so, will be gathered from the following account taken from a report of Mr. Alexander Dalrymple, the first Hydrographer of the Navy.

The earliest account of marine time-pieces is in the Philosophical Transactions; Vol. I., No. 1 (1665), p. 13 "which were the invention of Christian Hugen, of Zulichen, and fitted to go at sea by the Earl Kincardin, and now brought by a new addition to a wonderful perfection."

In about 1665, they were successfully used by Major Holmes at sea, as the article goes on to say, "The relation made by Major Holmes concerning the success of the pendulum watches committed to his care and observation in his last voyage to Guiny, by some of our eminent virtuosi and grand promoters of navigation, is as followeth: The said Major having left that coast, and being come to the isle of St. Thomas under the Line, accompanied with four vessels; having there adjusted his watches, put to sea and sailed westward 700 or 800 leagues, without changing his course; after which, finding the wind favourable, he steered towards the coast of Africk, N.N.E., but having sailed upon that line a matter of 200 or 300 leagues, the masters of the other ships, under his conduct, apprehending that they should want water before they could reach that coast, did propose to him to steer their course to the Barbadoes to supply themselves with water there. Whereupon the said Major, having called the Masters and Pilots together, and caused them to produce their journals and calculations, it was found that those pilots did differ in their reckonings from that of the Major, one of them 4°, another about 5°, and the third more; but the Major judging by his pendulum watches that they were only some 30 leagues distant from the island of Fuego, which is one of the islands of Cape Verde, and that they might reach it next day, and having a great confidence in the said watches, resolved to steer their course thither, and having given order so to do, they got the very next day about noon a sight of the island of Fuego, finding themselves to sail directly upon it, and so arrived at it that afternoon, as he had said."

This account has been given in full as the first description of time-pieces being used at sea, although a less satisfactory account could not well be; for neither the time of leaving St. Thomas, nor of reaching Fuego, is mentioned, nor is the longitude between them as deduced from the watches. All that we learn from it is, that the erroneous and discordant reckonings of the vessels differed 4° and 5°, or more, from the longitude by the watches.

In the Philosophical Transactions for 1669, No. 47, "Instructions concerning the use of pendulum watches for finding the longitude at sea," observe that "they now are brought to great perfection and made to measure time very equally."

In Phil. Trans. for 1675, No. 112, is an extract from a letter, from Christian Hugen, taken from the Journal des Sçavans, concerning his new invention of pendulum watches, "useful to find the longitude, both by sea and land," of which a plate is given. In the same

year is a description, No. 113, with a plate, of a watch invented by Leibnitz, which he supposed would be serviceable at sea, but as it does not appear that this was ever tried it is not necessary to dwell upon it further. Nor do any more observations appear to have been made with those invented by Hugen, although the experiment made by Major Holmes was so promising.

The subject seems to have gone to sleep, until it was again revived about 1724, by Henry Sully, an English watchmaker settled in France, and by John Harrison in England, about 1725. There was printed at Paris, in 1726, 4to., "A description of Sully's Marine Time-piece," but it is not known whether it was ever tried at sea.

In May, 1736, one of Harrison's time-keepers was sent on board a ship of war to Lisbon; during the outward and return voyages there was no sensible alteration.

In 1737, the Board of Longitude encouraged Harrison to prosecute his labours by monetary assistance, and he received the medal from the President of the Royal Society. In 1761, his son William Harrison was sent in a man-of-war to Jamaica, and again in 1764, to Barbadoes, in H.M.S. *Tartar*, Captain Sir John Lindsay; but, although it appears the time-keeper gave the longitude of Barbadoes very exactly, it does not appear what was the result during the voyage home. In neither of these voyages were the reports satisfactorily precise; however, that was not to be ascribed to the time-keeper, for the subject was not so well understood in those days as hereafter.

In 1767, two of M. Le Roy's watches were tried in a voyage from Havre to Dunkirk, Rotterdam, Amsterdam, Texel, and back to Boulogne and Havre; in which the greatest error of those watches from one day to the next, once only, was five seconds. During 46 days on the return, the first watch not having accelerated more than thirty-eight seconds, would have given the longitude in the voyage to the West Indies to less than 9', and it was assured that this precision did not result from several errors compensating each other.

In 1768, M. Cassini went from Brest to the island of St. Pierre, near Newfoundland, and from thence to Salé, on the coast of Africa, Cadiz, and back to Brest, with two watches of M. Le Roy; this voyage is published. *Paris*, 4to. 1770.

In 1768-69, M. Flurieu made a voyage with time-keepers of Ferdinand Berthond, in the French frigate *Isis*, of which voyage M. Flurieu published a full account in 1773.

In 1771-72, M. de Verdun de la Crenne, commanding the French frigate *La Flore*, accompanied by Le Chevalier Borda and M. Pingré, made a voyage with the marine time-pieces of Berthond and Le Roy, of which an account was published in 1778.

After the discovery of the method of Harrison's time-piece, in 1765, the Board of Longitude ordered a similar time-piece to be made by Larcum Kendal.

Captain James Cook, who, in 1768-70, had sailed to the South Seas to observe the transit of Venus, but without any time-piece, made, in 1772, a second voyage, with the *Resolution* and *Adventure*; the former ship had the time-piece made by Larcum Kendal, after Harrison's pattern, and one by Arnold of his own construction. The *Adventure* carried also two time-pieces, both by Arnold; but neither of Arnold's kept time during this voyage with much accuracy. The scientific account of this voyage was published by the astronomer, Mr. Wales, from his own observations in the *Resolution*, and from Mr. Bayly's, in the *Adventure*.

Larcum Kendal was also employed to make a time-piece in which he thought he could simplify Harrison's construction. This was the watch Lord Mulgrave (then Captain Phipps) carried to sea in his northern voyage, 1773 (see Part I., page 9); he carried also a time-piece made by Arnold, but neither went so well, during that voyage, as the pocket watch made by Arnold.

In 1776, Captain Cook in his third voyage with the *Resolution* and *Discovery* had the watch made after Harrison's design, by Kendal, and the *Discovery* that which Kendal had made on his own plan. The astronomical observations made during this voyage were published by Mr. Bayly.

In 1791, Arnold published twenty-eight certificates from various nautical and other authorities testifying in high terms as to the trustworthiness of the time-keepers made by him. In addition to these, Alexander Dalrymple had himself written testimony of the great perfection of Arnold's chronometers from such authorities as Horsburgh, McCluer, Lushington, Norman and others.

The gold pelical spring was the invention of Arnold, and used at this time by him in the construction of his chronometers.

Therefore, concludes Dalrymple, "to the Arnold's, father and son, the public are indebted principally for the perfection to which chronometers are now brought." He adds "that trial on shore with chronometers is not altogether a safe guide—they should be tested at sea."

END OF PART II.

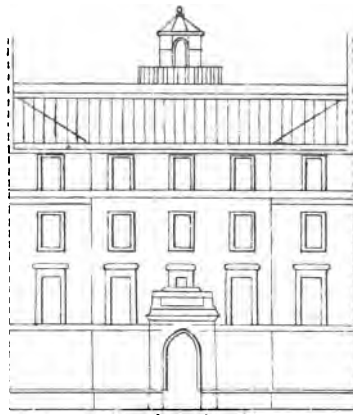
INDEX TO PART II.

	PAGE		PAGE
Aird	118	Constable	127
Alldrige	86	Cox	79
Allen, Bird	82	Creyke	128
Allen, W.	61	Cudlip	124
Appendix	195	Curtis	83
Arlett	24	Davis	157
Balleny	58	Dayman	69
Barral	23	Discovery, Chronological Table of .	204
Barrow	71	Drury	70
Bate	49	Dunsterville	77
Beaufort	1	Edye	84
Becher	48	Elwon	53
Bedford, G. A.	56	Ethersey	54
Bedford, E. J.	53	Evans	179
Bedwell	176	Fell	133
Beechey	66	Fitzroy	14
Belcher	16	Frazer	25
Bérard	30	Glover	88
Bewsher	131	Gordon	82
Biddlecombe	80	Graves	20
Blackwood	22	Gray	177
Bourchier	85	Grieve	115
Brock	41	Haines	38
Brooker	162	Hall	165
Bullock	160	Harding	73
Burdwood	68	Heathcote	129
Burstal	123	Hoskyn	118
Calver, E. K.	115	Howard	176
Carless	55	Hull	173
Chimmo	163	Hutchison	172
Christopher	72	India, Marine Surveys of	195
Chronometers, Early History of .	207	Inskip	164
Church	51	Jeffery	119
Collingwood	175	Johnson	74
Collinson	30	Jones, Felix	88

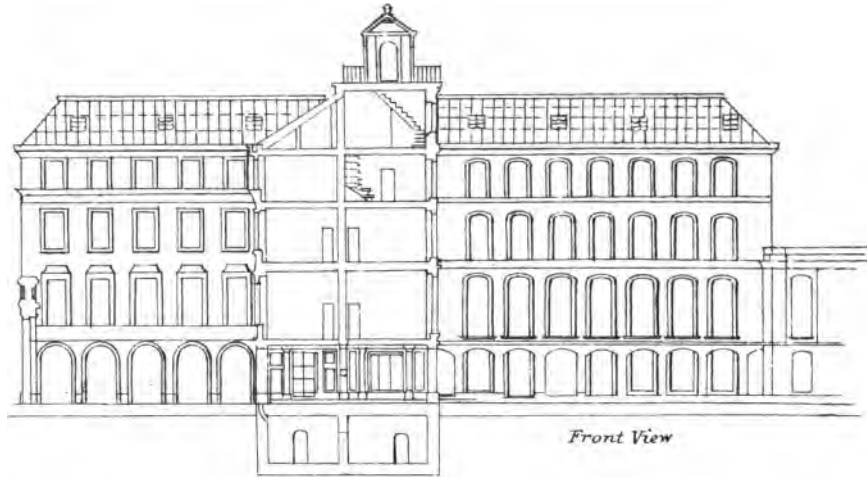
Index to Part II.

	PAGE		PAGE
Kellett	36	Sanders	112
Klint	76	Schubert	38
Kortright	74	Scott, Taylor	123
La Place	37	Selby	113
Lawrance	76	Sheringham	46
Lloyd	33	Shortland	66
Lord	68	Sidney	120
Mansell	156	Skead	121
Maury	62	Smith, T.	112
May	174	Smyth, W.	77
Mayne	166	Spratt	41
McDougal	165	Stanton	130
Miles	65	St. John	174
Mercer	86	Stokes	27
Montriau	90	Sullivan	28
Mooney	65	Sweny	132
Nares	170	Taylor, A. D.	125
Nolloth	41	Thomas	80
Orlebar	85	Thouars, Du Petit	75
Otter	34	United States Coast Survey	197
Owen Stanley	26	Usborne	122
Parsons	158	Veitch	86
Pender	168	Ward, C. Y.	129
Powell	52	Ward, J.	160
Pullen	117	Washington	93
Progress, 1829 to 1854.	5	Whish	158
„ 1854 to 1863.	99	Whitelock	90
„ 1863 to 1874.	139	Wilds	172
„ 1874 to 1884.	183	Wilkes	60
Raper	21	Wilkinson	169
Reed	167	Williams	47
Richards (<i>Sir George</i>)	134	Wolfe	58
Richards, John	119	Wood, James	57
Robinson, C. G.	45	Wood, John	73
Robinson, F.	84	Yule	67

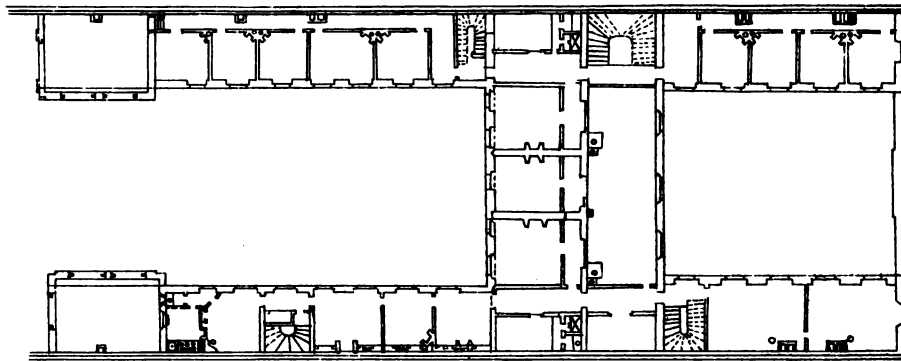




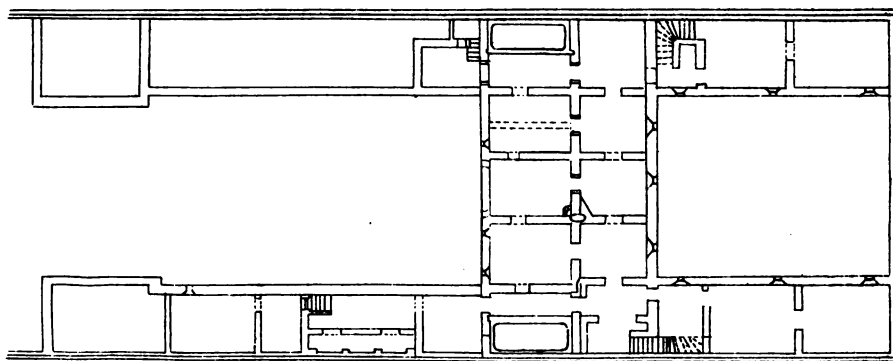
Side View



Front View



Ground Plan



First Floor

Dépôt Général de la Marine Paris.

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