in great measure to his success were his active habits, genial disposition and kindness of heart. His sympathy with his fellow-men, whether Europeans or natives, endeared him to all with whom he came in contact. This smoothed over ordinary difficulties and enabled him to succeed where others would often have despaired or failed. He had no enemies and has left many friends.

Exposure, hard work and anxiety, coupled with the climate of Kotah and Jhallawar, obliged Mr. Miles to leave India in December, 1894, and laid the seeds of disease from which he never recovered. He died on the 11th of June, 1895, at the residence of his father-in-law, General J. C. Brooke, in London. Mr. Miles was elected a Member on the 3rd of February, 1880.

JAMES MURDOCH NAPIER, born on the 26th of July, 1823, was a son of the late Mr. David Napier, of Lambeth, well known as an inventor and constructor of printing-machines. In 1837, when but fourteen years of age, young Napier entered his father's works in Lambeth, where he became a skilled workman and draughtsman and soon displayed considerable capacity for original design. He assisted in the construction, in 1841, of the first steam-power gun-finishing machinery used at Woolwich,[1] and, in 1844, of an hydraulic traversing-frame designed by Mr. I. K. Brunel for the Bristol terminus of the Great Western Railway.[2] He then erected for Mr. Brunel an hydraulic travelling-crane in the locomotive works at Swindon and assisted in erecting an hydraulic lift for trucks at Bristol.

In the year 1847, being then twenty-four years of age and having already gained considerable experience, Mr. Napier was taken into partnership by his father, the firm from that time being known under the style of Messrs. David Napier and Son. After spending some months in Spain, directing the erection of gun-finishing machinery, he assisted in 1848 in the design and construction of registering weighing-machines and tipping-trucks for use at Portland breakwater. In 1855 he supplied an elaborate machine for weighing stone at the Tyne works, which not only indicated the weight of the load on the weighbridge, but also registered the gross weight passed over in a given time.

In 1851 the authorities of the Royal Mint began to regard the process of weighing the coin in detail by hand as laborious,

[1] Minutes of Proceedings Inst. C.E., vol. lxxxvi. p. 347.
[2] *Ibid*, vol. iii. p. 128.

expensive and inaccurate, and the firm of Napier and Son was instructed by Sir John Herschel, then Master of the Mint, to design five automatic coin-weighing machines. The requirements of the Mint involved a complete change in the mechanical arrangement of the machine in use at the Bank of England since 1841, which was due to the invention of Mr. William Cotton, then Governor of the Bank. A description of that automaton balance was furnished to the Institution by Mr. Thomas Oldham.[1] In the course of the discussion upon that Paper Mr. Cotton stated that Mr. David Napier had been "employed to make the machine, and to him was due the suggestion of the two alternating advancing tongues, as well as several other arrangements of the machinery, which he had so successfully constructed." For the Mint Mr. James Murdoch Napier designed and constructed an automatic balance, an illustrated description of which is given in the "Encyclopædia Britannica."[2] That balance divided the coins into three classes, "too light," "too heavy" and "medium," varying between certain given limits, the latter alone being permitted to pass into circulation. From that time he gave much thought to the various processes of coining and their improvement, for which he took out several patents at intervals. In 1853 he designed machinery for the Spanish Mint; in 1861 he spent some months at St. Petersburg making plans for the re-arrangement of the Russian Mint; and in the following year he designed and constructed the "Chancellor" balance for the Royal Mint. In 1870 Mr. Napier was appointed by the Lords Commissioners of the Treasury to visit and report upon European mints, with a view to advise what new machinery would be required if the Mint were removed from its present site. His companions and colleagues in that expedition, which occupied nearly three months, were the Deputy Master, Sir Charles Fremantle, K.C.B., and the Chemist of the Mint, Professor Roberts-Austen, C.B., and the establishments inspected were those of Madrid, Milan, Rome, Constantinople, Vienna, St. Petersburg, Stockholm, Copenhagen, Berlin, Utrecht, Brussels and Paris. A copy of Mr. Napier's Report may be consulted in the Library of the Institution.[3] In 1877 he designed and constructed the "Lord Chief Justice" bullion balance for the Bank of England and a mercurial gauge for indicating speed up to 400 revolutions per minute, used with it. He also devised,

[1] Minutes of Proceedings Inst. C.E., vol. ii. (1843) p. 121; and "Ure's Dictionary of Arts, Manufactures and Mines," vol. i. p. 282.

[2] Ninth edition, vol. xvi. p. 490.

[3] Tracts 8vo., vol. 363.

for use in the Indian mints, a beautiful machine which first ascertains how much it is necessary to cut from each blank piece in order to reduce it to the standard weight, and then removes the necessary amount of metal and no more.[1]

Another matter to which Mr. Napier devoted considerable attention was the printing of bank-notes. In July, 1853, he took out a patent for improvements in letter-press and other raised-surface printing-machines,[2] and in the following year he designed and constructed a machine for printing the Bank of England notes. The feature of that press was a platen with contrivances for both the tables and the inking-rollers to traverse, by which means an effect was produced equivalent to rolling with a single hand-roller twenty different times. The form of every note was made to one gauge, and every denomination had its separate tympan and overlaying. By those means, when a note-plate was once made ready for press with its overlaying, it was always ready at a moment's notice for taking impressions. At each end of the press were counting-machines, so that no impression could be taken without being registered, the rate of printing being 3,000 notes per hour.[3] This was at the time of the substitution for the copper-plate printing—until then employed at the Bank—of surface-printing from electrotypes, a much more rapid process and one which does not require damping. In 1857 Mr. Napier took out two patents for further improvements in printing-machines,[4] and he continued throughout his life to give much thought to that branch of mechanics, taking part no less than thirty years later in a discussion on the subject at the Institution.[5]

Mr. Napier's brain, however, was far too active to confine itself to automatic balances and printing machinery. The list of inventions for which he was responsible is too long to be given in detail; but the variety and wide range of the subjects which occupied his mind may be gathered from the fact that the patents he took out included registering tide-gauges, mariners' compasses, barometers, machinery for producing cold the lead bullets for the Government rifles instead of cast bullets, an apparatus for paying out submarine telegraph cables, machinery for the manufacture of soda, speed indicators and governors, and numerous smaller matters.

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[1] "Encyclopædia Britannica," ninth edition, vol. xvi. p. 489.

[2] Patent Office, Abridgments of Specifications, Printing, 1533–1857, p. 370.

[3] Journal of the Society of Arts, 1854–55, p. 86.

[4] Patent Office, Abridgments of Specifications, Printing, 1533–1857, pp. 602, 610.

[5] Minutes of Proceedings Inst. C.E., vol. lxxxix. p. 278.

Mr. Napier died at his residence adjoining the works in Lambeth on the 23rd of March, 1895, at the age of seventy-one, death being due to an affection of the throat. Springing from a family of engineers, he did much to maintain and increase the reputation of the name he bore. He was elected a Member on the 2nd of December, 1884.

JAMES CRAWFORD PARK was born in Liverpool on the 1st of July, 1838. In 1856 he entered the locomotive works of the London and North Western Railway Company at Crewe. After serving his time as an apprentice he remained engaged in the drawing office until 1866, in which year he left Crewe and took charge of the drawing office of the Great Northern Railway at Doncaster, at first under Mr. Sturrock and subsequently under Mr. Patrick Stirling, Locomotive Superintendents. In 1873 he was transferred to the Company's New England Works at Peterborough, at which place he remained as Assistant Shop-Manager until his appointment as Locomotive Superintendent to the Great Northern Railway of Ireland in January, 1881. From that time until his death Mr. Park had charge of all the locomotives, carriages, wagons and rolling-stock of this line, 523 miles in length.

The Great Northern Railway of Ireland consists of several lines amalgamated together, or purchased under agreement, each of which possessed rolling-stock of its own special description. Great care and organisation were required to work to the best advantage this mixed stock, which varied considerably. New and more suitable stock had to be added every year. Many of these engines, carriages and wagons were constructed from Mr. Park's designs in the Company's works at Dundalk, and others were obtained from builders elsewhere. All the repairs of engines and rolling-stock were effected at Dundalk, or at the branch works in Belfast, Dublin, and Londonderry. Mr. Park designed and constructed several handsome saloon-, drawing-room, and dining-cars.

For some months before his death Mr. Park was afflicted with a serious internal complaint, which rapidly assumed an aggravated form and terminated fatally on the 27th of May, 1895. He was most energetic and took a deep interest in his duties to the last. He was elected a Member on the 3rd of May, 1887.
