the Engineering department, by the establishment of a system for the transport of materials along the line, by which a centralised control was obtained, and the chances of raising prices by unconscious competition amongst the Company's officers at the various stations were eliminated.

Mr. Fletcher's exertions to promote the success of the enterprise in which he was concerned, extended even to matters having a less obvious connection with it. He was an active promoter, and indeed the originator of several projects, since carried into operation, for improving the means of transport in all parts of the country, from which trade might be expected to flow to the railway; and with this object, he took the chief part in the establishment of a line of coaches, on the English plan, between the great military station of Bangalore and the station nearest to it, a distance of eighty miles.

He was an active member of the Madras Chamber of Commerce, fully realising the importance of every measure calculated to develop the trade of that port, which is so intimately connected with the Madras Railway.

In private life, Mr. Fletcher was remarkable for his sociable and friendly disposition—for his unbounded hospitality—and for the interest he took in all public institutions of a useful, or charitable character. It may not be out of place to mention, that at the period of the outbreak of the Indian Mutinies, he took a very active part in the formation of the regiment of Madras Volunteer Guards, in which he, for some years, held a commission as Captain, and of which he was at the time of his decease the Major. His popularity amongst the officers and men of this corps was signalised at the time of his departure for England, when a subscription was entered into, for the purpose of presenting him with a sword, as a token of the esteem in which he was held. The unfortunate issue of the journey modified the carrying out of the intention, which took the form of the foundation of a scholarship in a charitable educational establishment of which he was a director—the presentation to which is for life placed in the hands of his widow. Mr. Fletcher was elected an Associate of the Institution of Civil Engineers in 1859.

Mr. LIONEL GISBORNE, M.A., &c., was born at St. Petersburg in the year 1823, where his father was British Consul General. His family had for several centuries been settled in Derbyshire, and members of it had frequently represented in Parliament both the county and the town of Derby. Mr. Lionel Gisborne received his education partly at St. Petersburg, and partly at Repton school, in Derbyshire, and he was also at the

school of Monsieur Venel, at Geneva, where he acquired a familiarity with French and other European languages, which was of great service to him in after life. His education was completed at the University of Durham, where he devoted himself principally to Mathematics and Natural Philosophy, together with other branches of study to qualify him for the profession which he had already then selected. Although he unfortunately was seized with an illness, during the final examination, which prevented him from undertaking all the papers, he nevertheless took honours, and afterwards obtained a fellowship, and the diploma of a Civil Engineer.

He immediately commenced the exercise of the profession, and from the age of nineteen, when he quitted the University of Durham, until the day of his death, he was almost uninterruptedly engaged on Engineering works. He was for a short time employed upon the Ordnance Survey of England, and then proceeded to Ireland, in 1842, where he remained for ten years in the Government service; first under the Commissioners for the Improvement of the Navigation of the River Shannon, and afterwards under the Board of Public Works, on the Arterial Drainage of the Country. Lieutenant-General Sir Harry D. Jones, R.E., K.C.B., (then Colonel Jones,) was at that time Chairman of the Shannon Commission, and he afterwards became Chief Commissioner of Public Works in Ireland; in both positions he remained the stanch friend of Mr. Gisborne, of whose powers he entertained a high opinion.

The Shannon works upon which Mr. Gisborne was employed, were of considerable importance and magnitude, consisting principally of the deepening of the river, by excavation and dredging, the removal and rebuilding of bridges that cross the river at Athlone, being one of the principal structures of that kind; and during the execution of these works he acted as one of the resident Engineers, and had at the same time charge of the building of locks, weirs, river walls, wharves, and all works incidental to these operations; keeping them clear from water formed no inconsiderable item in the difficulties that had to be contended with in dealing with a river so liable as the Shannon to sudden and high floods. He had afterwards sole charge of extensive works on the Upper Shannon, including the renewal and deepening of the Loch Allen Canal, at the head of the river. These works were finally completed in 1851, and for the last two years he had charge of them as the Engineer in Chief.

Whilst he was still employed on the Shannon, he was appointed by the Board of Works as Engineer over several extensive Arterial Drainage districts situated in the Counties of Longford

and Roscommon, most of which were completed by him previous to his leaving Ireland in 1852.

He also took an active part in the Relief Works for the employment of the labouring poor during the famine in 1846-47. He did not limit himself to fulfilling his duties as an Engineer, but in his private capacity, and with the assistance of his English friends and relations, he did much to relieve the urgent necessities of the starving population, by the establishment of soup kitchens and the distribution of clothes. He had as many as four thousand men employed under him at a time, during his engagement on the Shannon Works. He also served for a short time under Mr. Charles Vignoles (M. Inst. C.E.) in making surveys and preparing plans for the Limerick and Waterford Railway.

In all these employments, and especially in the Relief Works, he had many opportunities of displaying that comprehensiveness of mind, promptitude of decision in emergencies, and power of influencing and attaching those associated with him, for which he was distinguished in after life. One of his principal characteristics was the anxiety he always evinced for advancing the younger members of the profession who had at any time co-operated with him in any works, and this he had many opportunities of doing during his career ;—especially when at the request of the late East India Company in 1855 he formed a staff of Engineers for the Government Public Works in India. This corps was the origin of the present Public Works Department in that country.

In 1852, the works he was engaged on in Ireland being nearly completed, he removed to London, where he continued to practise as an Engineer up to the period of his death. The experience he had gained in Ireland naturally induced his attention, in the first instance, to works of a similar nature to those on the Shannon. In consequence of representations made by Dr. Cullen, as to the nature of the country across the Isthmus of Darien, between Port Escoses, on the Atlantic side, and Darien Harbour, on the Pacific, Sir Charles Fox (M. Inst. C.E.,) in 1852, requested Mr. Gisborne to undertake an expedition, to ascertain, as well as circumstances would permit, the feasibility of constructing a ship canal, in that locality, to unite the two oceans. He proceeded to the Isthmus, in April of that year, accompanied by Mr. Henry C. Forde, (M. Inst. C.E.,) who had been throughout associated with him as an Engineer in Ireland. Unfortunately they arrived on the Isthmus during the rainy season, and were prevented by the combined effect of weather, illness, and the hostility of the Indians,—amongst whom they ran great risks, and whose prisoners they were for a short time,—from making any effectual survey. It was considered, however, that in conjunction with Dr. Cullen's state-

ments, sufficient information had been collected to justify a second expedition on a more enlarged scale, which was consequently organized in 1854, the Governments of England, France, the United States and New Granada, sending ships of war to both sides of the Isthmus to protect and assist the surveying expedition. This time Mr. Gisborne took out with him a regular staff of Engineers. H. M. Government appointed Lieutenant St. John, R. E. to accompany them in their surveys, and to report to the Government. The United States Government also sent out a surveying expedition under Lieutenant Strain, U. S. N. The result of these surveys satisfied Mr. Gisborne, that the construction of a ship canal was impracticable. This conclusion was only arrived at after he and Lieutenant St. John had crossed from sea to sea, and after several series of instrumental levellings had been taken across the summit level, as far as it could be ascertained, considering the dense nature of the tropical forest. Captain Prévost, R. N. of H. M. S. 'Virago,' had attempted to penetrate the country from the Pacific side with a party of sailors immediately before Mr. Gisborne's last expedition. He failed, however, in crossing the Isthmus, and in this attempt, four of his sailors were murdered by the natives. Mr. Gisborne refused to receive any remuneration for his services in these expeditions. The summary of the report of Mr. Gisborne on the last expedition is published in the Journal of the Royal Geographical Society, illustrated by a map of the locality.[1] He also published two statements of the proceedings in the Isthmus.[2]

Mr. Gisborne was then employed to report upon a system of Railways for Switzerland. He also made preliminary surveys and reports upon several lines of Railway in Italy, and in Russia, some of which are now completed and others are in progress.

In Russia he also made a report upon the means for improving the Navigation of the River Dnieper, and prepared preliminary plans for executing the work. For the Swedish Government he made detailed surveys and plans for the Southern System of Railways which are now being gradually carried out.

In 1852, Mr. Gisborne brought forward a scheme for the Embankment of the River Thames. His proposed plan consisted of building quay walls on each side of the river from Lambeth to London Bridge, and thereby making the river of nearly uniform width between those points. Behind these walls a solid embankment was proposed, between which and the existing wharfs there

[1] *Vide* "Journal of Royal Geographical Society," vol. xxvii., page 191.

[2] *Vide* "The Isthmus of Darien in 1852. Journal of the Expedition of Inquiry for the Junction of the Atlantic and Pacific Oceans." By L. Gisborne. 8vo., maps. London, 1833.

would be floating basins with tidal entrances to accommodate the existing traffic. Upon the Embankment on the Middlesex side, a road, a railway, and a covered esplanade were provided for, as well as extensive building sites for shops and stores. The object in thus utilising the Embankment, was with a view to insure a commercial return. For the opposite side he designed a broad road with a reservation of but few building sites, and provision was made under both Embankments for a low level sewer, in conjunction with the Great Drainage plan for London, now being carried out by the Metropolitan Board of Works. These plans were brought under the notice of Lord Palmerston and Sir William Molesworth in 1853, and subsequently before the various Parliamentary Committees which sat upon this subject, as also before the Metropolitan Board of Works, where they were carefully considered and were favourably reported upon, and undoubtedly they contributed to the solution now arrived at upon the question. Mr. Gisborne also made alternative plans for carrying out the Embankment under the different circumstances which would arise, in case they were executed at the public expense instead of by private enterprise; and he continued actively to occupy himself on this subject up to the date of his death.

In the latter years of his life Mr. Gisborne was principally engaged in connection with the long submarine telegraphs which he projected to connect England with her Eastern possessions. Few submarine telegraphs, in any part of the world, have up to the present time proved permanently successful, although the cable laid between Malta and Alexandria in the autumn of 1861, the last line to which he was Engineer, gives fair promise of proving so. As far back as 1854 he projected a submarine telegraph to India. As a first step to this he made arrangements with the Ottoman Government for laying a submarine line between the Dardanelles and Alexandria. The cable was successfully laid, as far as the Island of Candia, in December 1858, and has since remained in perfect working order; but the attempts to complete the line across the deep water to Alexandria have failed. In 1855 he sent his brother, Mr. Francis Gisborne, to complete the arrangements, with the Ottoman and the Egyptian Governments, for establishing the Telegraph to India. The necessary powers for constructing the line across Egypt, and for establishing stations on the coasts of the Red Sea, reserving to the company complete control over the line of communication, having been obtained by him, the Red Sea and India Telegraph Company was formed, and Mr. Lionel Gisborne was appointed their Engineer. The cable was laid in 1859 and 1860 from Suez to Aden, and thence to Kurrachee, a distance of upwards of 3000 nautical miles, in six sections. The Suez-Aden line, of 1,360 miles, worked well for

nine months without requiring repairs; the other portions of the line failed within a short time after submersion, and in consequence of the Company being unprepared to repair it, the line has hitherto remained inoperative, but exertions will be made to restore the communication.

Mr. Gisborne also projected lines to Australia via Rangoon and Singapore, to Java, and thence, viâ the Northern and Eastern coast of Australia, to Sydney. In furtherance of those plans he induced the Dutch Government to lay a line between Singapore and Batavia in 1859, a distance of six hundred nautical miles. This line has been subject to frequent interruptions through the fracture of the cable by anchors, but being in shallow water, it is easily repaired. He left behind him matured plans for the continuation of this line to Australia, which were brought under the notice of the several Australian Governments by Mr. F. Gisborne in 1860, and subsidies were voted to enable them to be carried out.

For two years before his death, he, in conjunction with his partner Mr. Henry C. Forde, was Engineer to Her Majesty's Government for their submarine telegraphs. Although the laying of the Malta-Alexandria cable was not completed till some months after his death, yet the manufacture of the cable had been finished and all the arrangements for the laying were made previous to that event. The merit also of the adoption of the perfect system of testing, which was for the first time introduced in the case of this cable and was carried out by Mr. C. W. Siemens (M. Inst. C.E.), may be claimed for Mr. L. Gisborne. The system of laying the cable in moderate depths and, as far as necessary, within sight of land, in order to fix its position, and with a view to its subsequent recovery for repairs, was first carried out in this case, and is due to his foresight. Other improvements, such as carrying out the cable in water-tight tanks, fitted on board the ships, to enable it to be continually tested under water, until the time for submersion, were likewise for the first time adopted in this instance, and they have greatly diminished the risk and uncertainty which have hitherto attended such undertakings. Mr. L. Gisborne was also Engineer to the French Government for the cable successfully laid between France and Algiers. It may be stated, with reference to long submarine lines, that no Engineer of his day was so successful in procuring the adoption of the routes he pointed out, in the face of rival routes influentially supported. This was particularly the case with reference to the telegraphs to India and to Australia. The practice of submarine telegraphy dates only from about 1851, and within the ten years which he devoted to it, no one of his day laboured harder in extending the system, or did more towards the attainment of success. He led an untiringly active life, and his wide views introduced

him to undertakings of great magnitude and corresponding risk. He was very successful in gaining the adhesion of others to his plans, and the influence he exercised over all whom he approached was generally acknowledged. He particularly distinguished himself on the occasion of the wreck of the Steam Ship "Alma," in 1859, in the Red Sea, and by his exertions during several days, whilst the passengers remained on a coral reef near the island of Little Harnish, exposed to the heat of the sun, without shelter and almost without fresh water; services which were recognized by a complimentary address from his fellow-sufferers. The goodness of his heart and the excellence of his disposition were never better exemplified than on that occasion, when his best energies were devoted to the safety and comfort of the women and children. It is but justice also to state, that in all money matters, Mr. L. Gisborne was peculiarly generous and disinterested. His energy was untiring, and though he died at an age when many men only begin to be known, his name will undoubtedly live in the future, in connection with the branches of Engineering to which he devoted his attention.

He died on the eighth of January, 1861 at the early age of thirty-eight, after a short but very active career. He joined the Institution of Civil Engineers as an Associate in the year 1852, and when he was in London he evinced great interest in the proceedings of the Society.

MR. WILLIAM NEWTON was born in London, in the year 1786, and he was early inducted by his father into the practice of land surveying, levelling and mechanical drawing, branches of professional employment which had been exercised by his predecessors for two centuries back, in conjunction with the manufacture of globes "at y^{e} Globe and Sun, Chancery Lane, Fleet Street."

At an early age Mr. Newton evinced a desire to study Archæology and Heraldry, sciences which with Astronomy he cultivated with ardour in after life, and upon which he eventually published some works; he also gave lectures on those subjects before the "City Philosophical Society," of which Michael Faraday and other now well-known men were members. On the breaking up of that society, he joined the Society of Arts, of which he was for many years an active member.

His professional surveying engagements rendered him familiar with many out of the way and almost forgotten localities and sites of ancient buildings, and gave him a store of archæological knowledge which many years after he embodied in a "Map of London in the Olden Time," a work of great merit and infinite research.