the Metropolis, and mingling with the friends and associates of former years, with the same interest and kindly feeling as when he was actively engaged in similar pursuits.

He devoted the last few years of his life, chiefly to the study of astronomy, into which he entered with all the energy of his nature, and in the contemplation of the wonders of those realms to which he calmly awaited his removal, he drew his last breath, on the 1st of January 1852, in his seventy-fifth year, without a struggle; his latter hours being, like the whole of his mortal career, gentle, and full of peace and love towards all around him.

He was elected an Honorary Member of this Institution in the year 1838, and was ever ready to lend his aid for its benefit, as he was a great advocate for the closest intimacy between scientific men of all classes, and he justly regarded the labours of the Civil Engineer as connected with the useful practical application of all scientific investigations.

MR. JOHN BARNES, who was born at Walker-Colliery, near Newcastle-upon-Tyne, on the 12th of August 1798, descended from a family of mining engineers; the five previous generations having all been "coal viewers," of considerable eminence in the north. His father, Thomas Barnes, (who died in the year 1801) was a man of education and general acquirements, and in a voluminous correspondence with Smeaton, and subsequently with Boulton and Watt, relative to the erection and duty of steam-engines, for draining mines and raising coals, erected under his direction, from their plans, he exhibited proofs of superior information on the subject of steam and its application, and demonstrated great sagacity and intelligence.

With such a father, and under the care of a mother, who was well calculated to guide and instruct him, from his earliest days, John Barnes was imperceptibly induced to study, and the plates of Dr. Desagulier's Natural Philosophy, became his hornbook and primer. At a very early age he was committed to the care of the Rev. W. Rawes, M.A., in whose school, at Houghton-le-Spring, Durham, he received the rudiments of a superior classical and mathematical education; his

predilection for mechanical construction manifesting itself, more powerfully than pleasantly, in his illustrations of the graphic descriptions in Cæsar's Commentaries, of Catapultæ, and Arbaletæ, with the models of which, made in his hours of recreation, he frequently endangered his companions and his tutors.

At the early age of fifteen he was removed from school, when, in consideration of the important services rendered by his father, to the firm of Boulton and Watt, and in consequence of the celebrated James Watt being his godfather, he was received into the Soho Works, and allowed access to all parts of the establishment, enjoying the advantage of frequent intercourse with the heads of the establishment, and receiving instruction from Murdoch, Southeron, and the other eminent men, then conducting the executive portions of the Soho Works. He there formed an intimacy with Mr. Joseph Miller, (M. Inst. C.E.) who ultimately became his partner, and during the period of his stay at Soho, his aptitude for acquiring knowledge, and his untiring industry in accumulating information, seizing only on the most essential points, with an intuitive dread of wasting time on trivialities, were remarkable features in the character of a youth not seventeen years of age.

In 1815, furnished with introductions from Mr. Watt, to Professors Playfair and Leslie, he went to Edinburgh, where he followed, with assiduity, the various classes, but more particularly those of Natural Philosophy, Mathematics, Chemistry, Mineralogy, Logic, and Drawing. Here he followed the same untiring course of study and, on quitting the university, he brought away high testimonials of the intelligence he had displayed, and for his successful mastery of subjects, to which he had devoted attention. From Professor Leslie, in particular, he obtained a letter, mentioning in terms of high commendation, the great proficiency he had attained in the study of natural philosophy, and stating that frequently, during the absence of the demonstrator, Mr. Barnes had performed the experiments, illustrative of the Professor's lectures.

On quitting Edinburgh, in the year 1817, Mr. Barnes was articled to the late Mr. F. Giles (M. Inst. C.E.), to receive instructions in surveying, and at the end of the year 1818, his master said of him, " He is now competent to the practice of

land surveying, levelling, and mapping, and as to his abilities, they are competent to anything he may follow."

Being then twenty years of age, he thought it was time to commence his professional career, and whilst looking around for an engagement with some established civil engineer, he received some employment for engineering and surveying business; among others from Messrs. Gordon and Murphy, who desired to engage his services at the mines of Moran, near Vera Cruz, for the purpose of superintending the erection of steam-engines, and for suggesting such improvements, as might seem to him best calculated to drain and work the mines effectually and economically. In consequence of some misunderstanding arising between the Mining Company and the Spanish Government, he renounced his intention of going to South America; but was commissioned by Messrs. Gordon and Murphy to design and superintend the construction of a pumping-engine on the Cornish principle; this machine he ordered at the Butterley Iron Works, where his former companion and friend, Mr. Joseph Miller, was then engaged, and being thus again brought together, an arrangement was entered into between them, to commence business in London, as manufacturing engineers, with the avowed object of devoting their attention principally to the construction of engines for steam-vessels. Accordingly in the year 1822 the firm of Barnes and Miller commenced the construction of engines, in which, from the beginning, they introduced the use of steam expansively in marine engines, a system not generally practised at that period; but to which, with general improved proportions and better workmanship, must be attributed, in a great degree, the success they attained and the reputation they established, both in England and on the Continent, but more especially in France, where in consequence of the shallowness of the water, and the rapidity of the currents in the principal rivers, the lightness and excellent proportions of the framing and other parts, the general efficiency, and the moderate consumption of fuel of their engines, were valuable points.

Before this period, the introduction of steam power for the propulsion of passenger vessels on the Rhone and the Saone, had been scarcely deemed practicable, and the endeavour to employ it for towing barges, had been attended with very moderate suc-

cess. When attempted by some French Engineers, by Messrs. Manby, Wilson and Co., of Charenton, and by Messrs. Steele and Atkins, of La Gare, a member of this latter firm was killed by the explosion of the boiler, in an attempt to propel the vessel against the stream; and the Writer of this memoir (who had gone on board to aid his countrymen in overcoming a diffiulty,) only saved his life and those of his workmen, by ordering them in great haste from the boat, on perceiving that the working engineer had fastened down the safety valve, by a strut between the end of the valve lever and the deck carline; the explosion occurred, before the party reached the shore, and the unfortunate cause of it perished, with a number of persons of some importance in Lyons.

This catastrophe and the general indifferent success of the previous attempts, had so depressed all speculative enterprise at Lyons, that when a Company was formed, for the navigation of the Rhone, Messrs. Barnes and Miller felt themselves called upon to make a considerable investment in the affair, to impart to it some degree of confidence, which still was very wavering; when however, on the first upward voyage, intelligence was sent by courier, from each station, that the steamer was overcoming all difficulties, the value of the shares rose, as the solution of the problem approached, and when the boat reached Lyons, in two days less than the time guaranteed by the Engineers, the securities had reached a premium, and were eagerly purchased from Messrs. Barnes and Miller, who immediately secured extensive orders for engines and machinery for France, and subsequently for this country, where the reputation of the machinery from the works thus established, has been worthily maintained to the present time.

It should be mentioned, also, that the "Sophia-Jane," the first steam-vessel ever employed in Australia, was constructed by Messrs. Barnes and Miller, and was sent out to the colony, as their speculation.

At the termination of his connexion with Mr. Miller, in 1835, Mr. Barnes commenced business on his own account, giving the designs for the engines, for which he entered into contracts, and superintending their construction at the Horseley Iron Works, Tipton, near Birmingham. In this manner he supplied a number of engines, of acknowledged superiority, using an improved kind of feathering paddle-wheel, similar to "Cavé's,"

or " Morgan's" wheel, in the general features, but simpler and of a more solid and enduring construction. These engines and paddle-wheels were chiefly placed on board vessels constructed by the celebrated ship-builder, M. Normand, of Havre-de-Grace, and the success attained, was such as might have been anticipated, from the combination of the talents of two such men.[1]

Among the vessels so produced, was 'Le Napoléon,' in 1842, one of the earliest successful attempts to adapt the screw propeller to navigation; an account of which was given by M. Normand at a meeting of the Institution, on the 13th February 1844, and recorded in the Minutes of Proceedings.[2]

The following extract, from a communication from M. Normand, fils, gives an interesting account of some of Mr. Barnes' labours, and exhibits the high appreciation of his talents, and the feeling entertained for him in a foreign land :—

" Monsieur Barnes réunissait à la pratique de son art, une instruction et une érudition presque universels, qu'il est donné à peu d'hommes de posseder. Esprit calme et judicieux, il ne se livrait point témérairement aux nouveautés ; mais il savait distinguer, avec une rare sagacité, les innovations heureuses, et toutes les fois qu'il les adoptait, c'était pour les ameliorer.

" C'est ainsi qu'en 1836, il reprenait les roues à aubes mobiles, alors discreditées, par les mauvais résultats qu'on en avait obtenu dans la pratique. M. Barnes avait si profondément et si habilement étudié la construction de ces roues, que du premier coup, il leur donna les proportions, et les dispositions générales les plus avantageuses, en même temps qu'il introduisait dans les details de leur construction, des améliora-

---

[1] During the connexion with M. Normand, the following vessels were produced :—

	H. P.		H. P.
Le Courrier	64	Brought forward	924
Le Rotterdam	140	Une Étoile	70
Le Phœnix	160	Deux Étoiles	70
L'Amsterdam	160	L'Hercule	130
Le Castor	140	L'Alcide	130
Le Pollux	140	Le Calvados	70
Le Morlaisien	120	Le Napoléon	120
Carried forward	924	Total	1514

[2] Vide Minutes of Proceedings, Inst. C.E., 1844, vol. iii. p. 79.

tions qui ont fait disparaître les objections qui jusques là en avait fait considérer l'application comme impraticable. Les travaux de M. Barnes, sur cette question, peuvent être considérés comme le point de départ de tout ce qui c'est fait depuis, dans cette voie, ou il a lui-même continué de marcher si largement; c'est à lui, sans contredit, qu'est due la généralisation de cet excellent propulseur.

" Profondément versé dans la delicate question, de la résistance des bâtiments, science aussi nécessaire à l'ingénieur, qu'au constructeur, il excellait à évaluer, à l'avance, la vitesse, et à déterminer, par suite, les proportions des roues.

" Réunissant, ainsi, au dégré le plus éminent, une instruction théorique supérieure, à une connaissance intime de la pratique de son art, il n'est point étonnant, que tous ses travaux aient été des succès brillants.

" En 1837, il construisit les machines, du ' Rotterdam,' du ' Phénix,' et de ' l'Amsterdam ;' en 1838, celles du ' Castor,' et du ' Pollux ;' ces deux derniers bâtiments étaient les plus rapides bateaux de mer, de leur époque, et malgré le temps, comparativement éloigné, ou plusieurs d'entre eux, ont été construits, ils soutiennent encore honorablement la comparaison avec des bâtiments modernes. En 1838, il construisit aussi, les machines des bateaux de rivière ' les Etoiles ;' et malgré les obstacles multipliées, que présentaient le peu de profondeur de la Seine, et le passage d'un grand nombre de ponts bas et étroits, qui imposaient des conditions extrèmement gênantes et défavorables, il parvint à faire des machines à action directe, dont la legèreté n'a guères été surpassée depuis ; les bateaux chargés obtinrent, dans les essais, une vitesse, en eau morte, de 11·6 neuds, soit 12·2 milles Anglais, vitesse probablement sans égale à cette époque. Il construisit, dans le même temps, les machines de ' l'Hercule,' et de ' l'Alcide,' les deux plus puissants rémorqueurs du Havre ; ces deux bateaux étant destinés exclusivement au rémorquage, M. Barnes disposa tout, — machines, chaudières et roues,—en vue de ce service spécial, et arriva, ainsi, à produire des machines qui donnent un effet utile, bien supérieur à la plupart des machines appliquées au rémorquage.

" Attentif au début de l'hélice, il comprit de suite les avantages de ce propulseur, et appréciant, avec la justesse de vues,

qui lui était propre, toute la portée et l'avénir de ce fait nouveau, il contracta en 1841, envers le Gouvernement Français, des engagements qui eussent été téméraires pour des hommes moins surs que lui; l'événement dépassa ses espérances; 'Le Napoléon' fut pendant plusieurs années, le plus rapide et le plus parfait bâtiment à hélice existant, et il est encore maintenant un des meilleurs bâtiments de la flotte Française."

"Dans notre tristesse, nous sommes heureux, de rendre ces témoignages, à la mémoire de celui que nous regrettons tous, et avec lequel mon père a si souvent partagés des succès."

For some time subsequently, Mr. Barnes was principally engaged as a consulting Engineer, as referee, in cases of litigation, and to some extent in designing marine engines; until the year 1845, when, through the recommendation of his friend Mr. Robert Stephenson, M.P., the management of the works at La Ciotat, near Marseilles, was intrusted to him by MM. Louis Benet and C^ie^, and where, in spite of impediments, which would have effectually arrested any man possessing less confidence in his own powers, or less determination to exercise them, he produced, entirely from his own designs and chiefly from drawings made by himself, a number of steam-vessels advantageously known in the Mediterranean,[1] where they perform the service of the Post-office, and on other stations.

On the completion of the 'Charlemagne,' screw steam frigate, his last, and probably, his most successful work, he received the decoration of the Légion d'Honneur, with a highly complimentary testimonial from the Government, for the services

[1] The principal engines constructed by Mr. Barnes, at La Ciotat, were for the following vessels:—

	H. P.
Le Philippe Auguste	180
L'Hellespont	180
Le Bosphore	180
Le Courrier de Corse	120
La Ville de Grasse	70
Le Bonaparte (à hélice)	120
La Salamandre (à hélice)	120
L'Ariel (à hélice)	120
Le Progrès	120
Carried forward	1210

	H. P.
Brought forward	1210
Le Charlemagne (Vaisseau de ligne, à hélice)	450
L'Industrie	120
L'Etna (remorqueur)	50
Le Dragueur	25
Le Periclès	120
En outre la machine, pour l'épuisement du bassin à Gènes	20
Total	1995

rendered to France, in the improvement of her steam navy; services, which it is deeply to be regretted, could not have been secured for his own country, and which were not only offered, but were pressed on the Government, by those friends who knew Mr. Barnes' value, before he consented to accept the engagement at "La Ciotat."

Mr. Barnes was a man of profound and varied knowledge; in addition to the wide range of scientific subjects connected with his profession, in all of which he was soundly versed, he understood the most minute practical details of construction, indeed, he was frequently blamed for expending his valuable time, on minor points, which might have been intrusted to others. His recreation was the study of the early history of mankind, and he was deeply read in the antiquities of Egypt, Greece, and Rome, as well as in Architecture, Archæology, Numismatics, and Ethnology; he had devoted much attention to Theology, and entertained sound and original views of the correspondence between the Mosaic accounts of the Creation, and modern Geological investigations. He was a good Greek and Latin scholar, spoke and wrote French with great fluency, and for the purposes of aiding his studies had acquired several modern languages. He was a good executive musician, and was thoroughly versed in the theory of the science.

He was a sound and original thinker, and it was impossible to come in contact with him, without being struck by the philosophical character of his views, and being instructed by his conversation.

He joined the Institution, as a Member, in the year 1823,—frequently distinguished himself in the discussions at the meetings, imparting freely the rich stores of knowledge he possessed; and always mindful of its interests, he bequeathed to the Library a considerable portion of the correspondence of his father with Mr. Smeaton, and Messrs. Boulton and Watt, which it is anticipated may exhibit some interesting facts connected with the history of engineering at that period.

During the last few years of his life, he was subjected to severe trials in his professional career, which he was aided in supporting by the unfailing devotion of his excellent wife; a lady descended from the old Staffordshire families of Biddulph and Burnet, and who possessing most excellent sense and

talents, unobtrusively influenced her husband and supported him, under trying circumstances, when without such incitement his energies might have flagged. Her deep solicitude was for his welfare and happiness, as her sole ambition was to see his fame established; to the former she devoted her life, and the latter must be amply satisfied by the universal testimony of esteem and respect paid to his memory.

He died at La Ciotat, on the 24th of September 1852, in the fifty-fourth year of his age, after a very short illness; his remains were brought to England by his only brother, and laid beside those of his parents, at Long Benton, near the place of his birth.

He was an upright, honest man, who used well the talents he had been blessed with, and he carried with him, to the grave, the esteem and respect of all who knew him.

Mr. DAVID BREMNER, the second son of Mr. James Bremner, M. Inst. C.E., was born at Wick, Caithness-shire, on the 14th February 1818. Whilst at school he exhibited great steadiness and assiduity, and a decided inclination for the studies most necessary for the profession he subsequently adopted. He then devoted himself to the acquisition of the theory and practice of surveying, and among his first mechanical efforts were some ingenious improvements in cranes used in harbour-works. Upon one of these works, the completion of the harbour of Keiss, Caithness (in 1833), for which his father had the contract, David Bremner may be said to have commenced his active career. In 1834 he was transferred to the works at Sarclett, four miles south of Wick, another contract taken by his father, where the proprietor, aided by the Fisheries Board, had vainly attempted to raise a structure for sheltering the fishing-craft; but the violence of the waves had baffled all the constructive skill and power, of those who preceded Mr. Bremner. By the united skill and perseverance of the father and son, the work was brought to a satisfactory termination, and in 1835, David Bremner, still acting under his father, was chiefly intrusted by him with the execution of the works, designed by him, for the new harbour of Lossiemouth, the port of Elgin, in Morayshire. Here he was very successful, in the methods of damming out