of the most beautiful draughtsmen of his day. He was also a first-rate surveyor, with skill in measuring, and with knowledge of the value of artificers' work; he was likewise a good land-surveyor, and he thoroughly understood the legal part of his profession. His industry, rapidity, exactness, contempt of money, and capability of sustaining long-continued mental and bodily fatigue, were remarkable. As an instance, it may be mentioned, that he could in one day make up the fair abstracts of the accounts of Greenwich Hospital, which occupied two of the best and hardest working clerks to copy in the same time. The beauty of his drawings attracted the attention of Sir John Soane and of Mr. John Shaw. At one period he worked for twenty hours a day for three weeks, only taking two hours' sleep daily. The soundness of his judgment, his determination and energy, his fearlessness and the tenderness of his heart, and his integrity, were apparent to all who knew him. He was a keen sportsman, excelled in athletic exercises, and was a tolerable musician. A close observer of nature, he knew the habits of all the birds and animals about the country, and the name of every indigenous plant. He was acquainted with the best English and foreign literature; but his favourite reading was travels, and as he traced the route on the map, and read the adventures, he often regretted that he had been denied the pleasure of exploring some wild and unknown land. He had during his life a large circle of friends amongst men distinguished in the arts and sciences, by whom his loss was sincerely lamented.

Mr. James Braidwood, son of a builder in Edinburgh, was born in that city in the year 1800, and received his education partly at the High School, then under the Rectorship of Professor Pillans, and partly from private masters, from whom he acquired the various branches of knowledge necessary for the business of a surveyor and builder. At the age of twenty-three, he became the superintendent of the City fire-engines; and within three weeks after receiving this appointment a series of fires, called the Great Fire of Edinburgh, took place in the High Street, which destroyed some of the loftiest and most picturesque buildings. These fires burnt for several days, and rendered between four and five hundred families houseless; while ten individuals were killed on the spot, or subsequently died from injuries they had received. Such an introduction to the profession of which he subsequently became the master, opened the eyes of young Braidwood to the importance of his new calling; and thenceforth his best exertions were devoted to the noble object of preserving the lives and property
of his fellow-creatures from the ravages of fire. On that occasion the want of efficient fire-engines, and of unity of management on the part of those to whom the existing engines belonged, became alarmingly conspicuous, and the result was the co-operation of the city authorities and of the insurance companies, in forming the Edinburgh Fire Brigade, an institution which, organised and developed by Mr. Braidwood, became the model for all similar establishments in this country. The two great principles which he then contended for were the training of firemen, and combating a fire inside the building, instead of projecting the water from the street. He argued that engines could not be managed with any general prospect of success, unless the men were properly trained and prepared for the duty which was expected from them. Also, as he said, "the great point to which everything ought to be made subservient is, that the water on its discharge from the director should actually strike the burning material. This cannot be too often, or be too anxiously, inculcated on every one connected with a fire-engine establishment. Every other method, not having this for its grand object, will, in nine cases out of ten, utterly fail; and upon the degree of attention paid to this point, depends almost entirely the question, as to the amount of damage the fire will occasion."

The Edinburgh 'Mercury,' of 14th August, 1828, bore testimony to the successful application of these principles. After referring to the excellent footing on which the fire establishment had been placed, it stated that now there were no serious fires in Edinburgh; for when a fire broke out, and they were not less frequent than formerly, it was at once checked. It was observed, "Not only is the apparatus constructed on the best possible principles, but the whole system of operations has been changed. The public, however, do not see the same bustle, or hear the same noise as formerly; and hence they seem erroneously to conclude, that there is nothing done. The fact is, the spectator sees the preparation for action made, but he sees no more. Where the strength of the men and the supply of water used to be wasted, by being thrown against windows, walls, and roofs, the firemen now seek out the spot where the danger lies, and creeping on hands and feet into a chamber full of flame, or smoke, often at the hazard of suffocation, discover the exact seat of danger; and, by bringing the water in contact with it, obtain immediate mastery over the powerful element with which they have to contend. In this daring and dangerous work men have occasionally fainted from heat, or dropt down from want of respiration, in which cases the next person at hand is always ready to assist his companion, and to release him from his service of danger."

In 1829, Mr. Braidwood forwarded a description of his chain
ladder fire-escape to the Society of Arts, London, for which he received the large Silver Medal,¹ accompanied by a request that he would "give a complete account of his mode of drilling firemen, and combining the use of fire-escapes with the ordinary fire-engine service." The response to this was the publication, in 1830, of his work "On the construction of Fire-engines and Apparatus, the training of Firemen, and the method of proceeding in cases of Fire," illustrated by drawings from his own hand, and embodying the result of his Edinburgh experience. The following extract, from one of the numerous reviews of this book, will give an idea of the estimation in which the Author was then held:—"The Edinburgh Fire-engine Establishment is now all but perfect. A unity of system has been accomplished, and a corps of firemen mustered, who, in point of physical vigour and moral intrepidity, are all entitled to be denominated chosen men. At the head of this band stands Mr. Braidwood, the Author of this Treatise, an individual who has on several occasions given abundant evidence of promptitude in extremity, and a noble contempt of personal danger, and whose enthusiasm, in what we may call his profession, could not have been more strikingly exemplified than by his illustrating it in the manner we now see before us. It is the only book we are acquainted with that treats of the systematic training of firemen; and from the perspicuity of its detail, it must necessarily become the manual of all such institutions, and ought to find a place in every insurance office in the United Kingdom.”

With respect to the state of London, as regarded protection from fire previous to the publication of this work, it should be remarked that, after the Great Fire of London, in 1666, various Acts of Parliament were passed referring to this matter. One in particular, in 1774, enacted that every parish within the Bills of Mortality should keep two fire-engines with their appurtenances; and as there were at that time about one hundred and fifty parishes, this would have given three hundred fire-engines for the protection of London. Before this Act was passed, several of the insurance companies kept fire-engines. Others afterwards followed their example, and the parish engines were allowed in a great measure to fall into disuse, except in so far as to evade the penalties of the statute. Several gentlemen connected with the insurance companies had tried, at various times, to amalgamate their whole force, and at last, stimulated by the success of Mr. Braidwood, in Edinburgh, this was accomplished. On the 1st January, 1833, Mr. Ford, of the Sun Fire Office, induced seven other companies to join in an association of fire-engines and fire-

The principles of this arrangement were, that all names, badges, &c., of the different offices should be given up, and the association be styled the London Fire-engine Establishment; that the expenses should be defrayed in proportion to the business done by each office in London, a minimum rate being fixed; and that a committee of management be formed of one member from each company contributing to the support of the brigade. This committee was fortunate in securing, at the outset, the services of Mr. Braidwood, as superintendent; a measure that contributed more than anything else to the success, growth, and prosperity of the infant establishment. On accepting his resignation, the Edinburgh Fire-engine Committee presented him with a gold watch and a vote of thanks, "for the singularly indefatigable manner in which he had discharged the duties of his important office, not merely by his extraordinary exertions on occasions of emergency, but for the care and attention he had bestowed on the training of the firemen, whereby the establishment had been brought to its present high state of efficiency." He had previously received from the men under him a handsome silver cup, bearing the following inscription:—"Presented to Mr. James Braidwood, by the City of Edinburgh Firemen, as a token of their admiration of him as their leader, and of deep respect for him as a gentleman."

In organising the London Fire-engine Establishment, he had to overcome the prejudices of the old firemen and their dislike to innovation. In this he succeeded admirably, and also in gaining the esteem and respect of the public, so that no body of men were more popular than the firemen of the London Brigade. The system of attacking the fire inside the building was now fully developed, and instead of standing on the pavement, and vying with each other as to which engine would shoot the water highest, the men went inside, combating the fire at its source. Nor was this done recklessly, as with all his fearlessness and intrepidity, safety of human life had Mr. Braidwood's first attention. How successful he was in this may be gathered from the fact that, notwithstanding the extremely hazardous nature of their occupation, only eleven of his men lost their lives by casualties during the twenty-eight years that he was at their head. Those insurance companies which at first held aloof soon saw the benefits of the undertaking, and in course of time nearly all gave up their separate establishments and joined the brigade.

As the means of extinguishing fires in London have, since the Tooley Street catastrophe, excited much public attention, and is expected to become the subject of legislation, a short description of the London Fire Brigade, by its late superintendent, cannot fail to be interesting. Replying to inquiries from Dresden, on the 23rd January, 1861, on the London fire extinguishing arrangements,
he writes:— “The brigade now consists of one superintendent, four foremen, each being appointed to a district consisting of a fourth part of London, which he never leaves except on some very pressing emergency, and who, in the absence of the superintendent, has the sole command of all engines, or firemen, within, or who may come within, his district; twelve engineers, ten sub-engineers, forty-seven senior firemen, and forty-three junior firemen, in all one hundred and seventeen individuals. In addition there are fifteen drivers and thirty-seven horses, all living at the several stations, and ready when required. There is also a supplementary force of four extra firemen, four drivers, and eight horses living at the stations, pursuing their usual avocations, and only paid by the Committee when required. The mechanical appliances consist of twenty-seven large engines drawn by horses, eight small engines drawn by hand, two floating-engines worked by steam, one of 40 H.P. and the other of 80 H.P., one land steam fire-engine, and twenty-eight hand-pumps, one of the latter being carried on each engine. When an engine is sent to a fire, only four firemen and one driver accompany it. The levers are worked by the bystanders, who are paid one shilling for the first hour, and sixpence for each succeeding hour, besides refreshments. Upwards of six hundred assistants have been thus employed at one time. The principal protection of London against fire is entirely voluntary on the part of the insurance companies, to whom the above establishment belongs, there being no law in any shape whatever to control or sustain the brigade; and with the exception of some fifteen or twenty, the parish-engines are comparatively useless at a serious fire. It must not be omitted, that the greatest possible assistance is given to the firemen by the police, of whom there are about seven thousand, in keeping back the crowd, &c. The fire-offices look upon the whole as a matter of private business, so that the brigade is proportioned quite as much to the amount which the offices think it prudent to spend as to the size of the place. Paris, which is not half the size of London, and the buildings of which are much more substantial, has upwards of eight hundred firemen.”

With his usual abnegation of self, he concludes as follows:— “It appears to me, that any success which the brigade may have attained depends, in a great measure, on the liberal pay given, by which the best men for the purpose can be obtained, the favourable view in which the brigade is regarded by the public, and the willing and able assistance given by a numerous and perhaps the best police in existence.”

Mr. Braidwood brought what is now called the “London Fire Brigade fire-engine” to its present efficient condition. While in Edinburgh he recommended a smaller-sized machine, but solely for the reason that he did not at that time see the practicability of
increasing the power without increasing the weight, his object being to convey the engine with men and ‘matériel’ by a pair of horses rapidly to a fire. In his endeavours to do away with all unnecessary weight in the construction of fire-engines, he was ably seconded by Mr. Tilley, of the Blackfriars Road; so that eventually a fire-engine, to be worked by twenty-eight men, mounted on springs, &c., and fitted to carry men and implements, was produced, weighing 18 cwt. He also applied the ordinary military scaling-ladders for fire brigade purposes, two being carried with each engine, and he recommended several of these ladders placed on a two-wheeled carriage as a convenient fire-escape. In 1841, he induced the Admiralty to adopt hose-reels in the various dockyards, these implements having been previously successfully applied in New York. In 1848, he introduced the hand-pump, as an auxiliary to the ordinary fire-engine. He had frequently found it difficult to extinguish slight fires without damaging much property by water, and this little instrument, worked by one man, often saves the necessity for putting a large engine to work, and causes one bucket of water to be of more use than a dozen thrown about in the ordinary way. This useful machine, for which he sought no patent, has been extensively imitated.

He soon saw the importance of making provision for fire in the waterside property of London; and shortly after his appointment, he designed and had constructed two powerful floating fire-engines for the purpose. The largest of these was worked by one hundred and twenty men, and, compared with the land fire-engines, was a very powerful machine. In 1852 he made still further progress, and persuaded his Committee to alter one of the floating fire-engines so as to be worked by steam-power instead of by manual labour. This experiment was so successful that, in 1855, an entirely new self-propelling floating steam fire-engine was constructed. Both of these engines have been of great use at numerous large fires. In 1860 he further imbued his employers with so much of his progressive spirit, as to obtain a land steam fire-engine, and he lived long enough to prove the great advantage of such machines for the extinction of fires in London.

As early as 1841, the Government began to profit by his experience, the Lords of the Admiralty having in that year consulted him on the subject of floating fire-engines for the various dockyards. These were eventually constructed, from his designs and under his superintendence. In the following year he inspected all the dockyards, and reported fully on each, with regard to both floating and land fire-engines, the supply of water, the alterations of buildings to prevent spread of fire, and the proper care required in dangerous trades. From this time, although not holding any appointment, he acted as Government consulting Engineer on all
questions relating to fire prevention and extinction, and he advised, from time to time, the precautions to be taken for the protection of the royal palaces and various other public buildings: this position enabled him, not without a great deal of opposition, to induce the Government to adopt in all its departments a uniform size of hose-coupling. This is the one which he introduced in Edinburgh, now known as the London Fire Brigade coupling, and is in almost universal use; and its application has been found, comparatively, of as much utility for fire brigade purposes, as the adoption of the Whitworth gauges of screw-bolts for mechanical engineering.

Although so fully occupied, he never refused advice on professional matters to all who sought it. The various Dock Companies, Public Institutions, Country Fire Brigades, private firms, &c., benefited largely by his experience. The numerous inquiries from foreign countries and the colonies, with regard to the best means of extinguishing fires, also made great inroads on his time. In 1833 he became an Associate of the Institution of Civil Engineers, to which, in 1844, he contributed a valuable Paper "On the means of rendering large supplies of Water available in case of Fire, &c.," for which he was awarded a Telford Medal; and in 1849 a second Paper, "On Fire-proof Buildings." In 1856, a Paper on "Fires—the best means of preventing and arresting them; with a few words on Fire-proof Structures," was read by him before the Society of Arts.

He took great interest in the passing of Acts of Parliament for regulating buildings in the metropolis, was consulted by the framers of these Acts, and used his utmost influence to prevent the endangering a whole neighbourhood, by the erection of monster warehouses for private profit. He strongly contended for the principle of dividing buildings by party-walls carried through the roof, and restricting these divisions to a moderate cubic content. Writing to Lord Seymour, Commissioner of Woods and Forests, on the 28th June 1851, he said, "that no preparations for contending with such fires will give anything like the security that judicious arrangements in the size and construction of buildings will do.”

The wise provisions introduced, through his instrumentality, into these Acts of Parliament, were continually being evaded, and clusters of warehouses quickly rose which he saw would, if on fire, defy all his means of extinction. In a letter to Sir W. Molasworth, First Commissioner of Public Works, dated 10th February, 1854, on the subject of a proposed warehouse in Tooley Street, he wrote,

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2 Ibid., vol. viii., p. 141.
"The whole building, if once fairly on fire in one floor, will become such a mass of fire, that there is now no power in London capable of extinguishing it, or even of restraining its ravages on every side, and on three sides it will be surrounded by property of immense value." How literally this was realised, and at what cost, was shown by the great warehouse fire of Tooley Street, on the 22nd June, 1861, at which Mr. Braidwood lost his life! The distressing circumstances are so well known as not to require repetition. He died as he had lived, doing his duty, the last act of which was attending to the safety of his men.

Few men ever received such a public recognition of esteem and affection as was accorded to Mr. Braidwood at his funeral, the long line of thoroughfares through which the procession passed, on its way to the Abney Park Cemetery, being crowded with people, while a vast number of police and others attended as mourners. To show the universal, as well as national, esteem in which he was held, two extracts may be given from the numerous letters of condolence addressed to his bereaved family, from all parts of the world. Mr. G. H. Allen, Secretary to the Boston (America) Fire Department, writes:—"It gives me pleasure to unite with the Board in testimony to the extreme kindness of Mr. Braidwood in the conduct of our correspondence, whereby we have been greatly benefited and received extensive information. Allow me also to extend our sympathy to those who have lost one who will ever be remembered as standing at the head of the most valued arm of the Government, and one that you can hardly expect to be replaced, except by years of experience and great natural ability." Mr. T. J. Bown, Superintendent of the Sydney (Australia) Fire Brigade, in a letter dated 22nd August, 1861, says, "On receipt of the sad news our large fire-bell was tolled, the British ensign hoisted half-mast high, and crape attached to the firemen's uniform, as a token of respect for one of the noblest and most self-denying men that ever lived, who spent and lost his life in the service of his fellow-creatures."

Mr. CHARLES FREDERICK CHEFFINS was born in London on the 10th of September, 1807. His father had for many years acted as official manager to the New River Waterworks Company, in superintending the boring by machinery of the wooden pipes then in use for the supply of water to the metropolis. Having been so fortunate as to obtain a presentation to Christ's Hospital, young Cheffins was, in July, 1815, admitted as a scholar into that institution, where he remained till the year 1822, prosecuting his studies with a fair amount of diligence, and obtaining several gold medals for his proficiency in arithmetic and