

## OBITUARY.

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BY TOWNSEND WOLCOTT.

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CHARLES EDWARD EMERY, PH.D. (Associate Member, June 26th, 1891, member, April 19th, 1892,) was born at Aurora, New York, on March 29th, 1838, and died in Brooklyn, on June 1st, 1898. He was a descendant of a branch of the Emery family that came from England to Newbury, Massachusetts, in 1635. He attended the Canandaigua Academy, and at the same time lost no opportunity to acquire information from independent sources, by which means he early became acquainted with practical engineering. A branch of the Erie Railroad terminated at Canandaigua, and one of the engineers on that road took D. K. Clark's work on the locomotive, in numbers, which young Emery borrowed and read in detail, and then after thoroughly mastering the contents, he explained it to the enginemen at night in the roundhouse. The enthusiastic spirit which prompted such a course of study, soon found an opportunity for the practical application of the information thus gained, and carried the application to success. The engines on that division of the road had been running for over two years without repair, and the valves were working badly on account of lost motion. Young Emery recommended that the eccentrics be advanced to restore the lead, and the recommendation being adopted, he superintended the operation, school-boy as he was, while the gray-haired men pinched the engines along the track and reset the eccentrics as directed. He then ran one of the engines over the road, under the eye of the engineer, to try the effect of the new adjustment, which proved to be quite satisfactory. Incidentally it may be remarked that he was not strong enough to hook back for expansion, without assistance.

Another boyish exploit of our budding engineer, was the

building of a steam engine with his own hands, and almost without tools. The majority of boys who have a natural liking for machinery, at some time during their youthful days, either build or attempt to build steam engines, and young Emery's engine and the process of construction thereof, bore many points of resemblance to the typical form. There was the usual poverty of tools and material, and wealth of more or less ingenious make-shifts, but in one respect this engine was differentiated from the usual form: it eventually ran with real steam, generated in its own boiler. The specifications of this remarkable engine were, so far as recorded, as follows. The fly-wheel spokes and connections were of wood, the cylinder was an old syringe made of type-metal or similar alloy; the cylinder ports were capped with an iron plate, which with the type-metal valve, was accurately laid out and finished, as our young engineer had advanced ideas in regard to valves and valve gear. The boiler was made from a length of stove-pipe, with wooden ends nailed in, and made tight by boiling bran inside, which in those days was the most approved method of stopping small leaks in steam boilers. The most remarkable thing about this engine, however, was the construction of the valve gear. Young Emery was an engineer on his own account, and not a mere imitator. He designed for this engine, a valve gear in which the principal motion was given by a link turning on a fixed center, the lead being obtained independently from the cross-head. This device was long afterward brought out in Germany and became well known under the name of the Waelschaert valve gear. It was used in the heavy pushing locomotives in Belgium, in the Fairlie type of engines built by the Mason Locomotive works at Taunton, Massachusetts, and in some steamships by Bryce Douglas. Another model contained the germ of one of the radial valve gears now in use.

After leaving school Mr. Emery was for a short time employed in the drafting room of a railroad company, and afterwards in a country foundry and machine shop, where he helped in the foundry, ran the engine, operated iron and wood-working tools, made drawings of machinery or prepared cases for the patent office, as circumstances required. This was a course of training of great value to an engineer, and Mr. Emery made the most of his opportunity. He took a special course of study in the office of Marvin Porter, C. E.; next at the solicitation of friends he entered the law office of Hiram Metcalf, Esq., where he studied

law for two years, with a view of becoming a patent lawyer, and at odd times busied himself as a land surveyor, and in making maps and plans of buildings.

The first shot at Sumter found him on a sick bed, but soon after he organized a military company which was, however, disbanded without having seen service, owing to the premature proclamation of President Lincoln that no more troops were needed. A little later Mr. Emery entered the navy as an assistant engineer, and was on the steamer *Richmond* in the engagement at Fort Pickens, the capture of New Orleans, and the naval attacks of Vicksburg and Port Hudson. Some suggestions made by Assistant Engineer Emery as to experimental steam apparatus reached the ears of Engineer-in-Chief B. F. Isherwood, who ordered him to experimental duty at the Novelty Iron Works, New York, where he had unusual opportunities for several years. Mr. Emery resigned from the navy on January 1st, 1869, and was engaged for a year in making experiments for the Novelty Iron Works in connection with the proposed manufacture of steam engines, and prepared the elaborate circular afterwards published in book form by the vice-president, W. P. Trowbridge, entitled "Condensing and Non-Condensing Engines."

Mr. Emery was engaged in the fall of 1869 as the general superintendent of the American Institute Fair, it being at the time arranged that he should go back to the Novelty Iron Works as general superintendent. The establishment, however, was closed before his return, and Mr. Emery entered into business for himself as consulting engineer and patent expert, writing occasionally for the scientific papers. He had previously however been appointed consulting engineer of the United States Coast Survey and United States Revenue Marine, in connection with which he was also made superintendent of some work for the supervising architect of the Treasury Department. Mr. Emery built several vessels for the United States Coast Survey, and was actively interested in the revival of the compound engine in this country. The first engine built for the Coast Survey steamer *Hassler*, was probably the most economical engine of its size ever constructed. Reports on file show that the vessel, with a displacement of 400 tons, made with half boiler power, a speed of eight knots, most of the time running a line of soundings, on a consumption of two and one half tons of coal per day. While in the naval service at the Novelty Iron Works,

Mr. Emery was employed as consulting engineer by the Hecker Brothers of this city, to initiate and superintend repairs to the engines and the construction of new boilers, with such success that the output was increased 50 per cent. in the larger mill. Mr. Emery was at this time a strong advocate of the compound engine and was criticized in some quarters on that account, but his judgment has been amply vindicated by the later performance of compound engines.

The Coast Survey appointment terminated when the naval engineers were ordered to the vessels; that to the Revenue Marine was continued some twenty-one years, until 1891. In this service the machinery for twenty new vessels was constructed under Mr. Emery's direction, and that of all the others several times repaired and remodeled. In 1874 an opportunity was embraced to place three different types of machinery in three hulls of the same size, one a long stroke, high pressure, condensing engine; another a short stroke, low pressure, condensing engine; and a third a fore-and-aft, compound, condensing engine. These vessels as well as a subsequent one, in which the cylinder of a high-pressure, condensing engine was jacketed, were thoroughly tested by a joint board of engineers from the Navy and Treasury departments, Chief Engineer Charles H. Loring, representing the former, and Mr. Emery the latter. The results were at the time the only reliable ones extant, and the printed reports and an analysis of the same by Mr. Emery were copied in the text books and technical literature at home and abroad. The degree of Doctor of Philosophy was conferred upon him soon afterward, by the University of the City of New York.

Dr. Emery was one of the judges at the Philadelphia Centennial Exhibition, on engines, pumps and mechanical appliances, and an associate member of the scientific committee on musical instruments, electrical and other scientific apparatus, and was assigned to the position of assistant to Lord Kelvin, then Sir William Thomson. He was also appointed one of the judges in the Electrical Department of the Columbian Exposition at Chicago in 1893, and was placed on the Committee to which was assigned the examination of dynamos and motors.

In 1879, Dr. Emery while continuing his connection with the Revenue service, became the chief engineer and finally manager of the New York Steam Company. He designed and built the entire plant, providing four stories of boilers, aggregating 16,000

horse-power at the Cortlandt street station, using wrought-iron pipes of the largest size it was then possible to obtain, (some fifteen inches and even sixteen inches in diameter), designing special expansion joints and other details, and making the work a complete mechanical success. Steam was supplied through service pipes, eight and ten inches in diameter, to buildings like the Produce Exchange, the Mutual Life building, and finally the New York Court House and Post Office, at distances of one half to three quarters of a mile from the station. The plant operated very satisfactorily and still continues to do so under the original pressure of eighty to eighty-five pounds. The steam company had the prospect of an enormous business before it, but the situation has been greatly changed by the subsequent growth of the electrical industries, especially the transmission of light and power over considerable distances. In consequence of this a great many power-users take electric power from central stations, who would otherwise take steam from the steam company. On the other hand however, there are office buildings in the district served by the steam company, which have their own plants including dynamos, engines and boilers complete, but which take steam for their engines from the steam company in preference to firing their own boilers. A smaller steam station was erected on Fifty-eighth Street near Madison Avenue. Dr. Emery resigned from the steam company in October, 1877, up to which time there had been expended on the work nearly two millions of dollars, and continued business as consulting engineer and engineering expert in relation both to practical matters of engineering and those arising from litigation in patent cases, condemnations of water power, etc. Dr. Emery has been consulting engineer for the terminal facilities of the New York and Brooklyn Bridge and several of the principal plants of the Edison Electric Illuminating Company. He was for a number of years consulting engineer for the City of Fall River, Massachusetts, and prominent in connection with the compromise of the difficulties between that city and mill owners; resulting in a novel agreement, based on his report, by which water was to be thereafter furnished to the city from the Watuppa ponds in consideration of the abatement of taxes on water power. He has been connected with the building of steam yachts, a subway company and a number of similar enterprises. He has lectured at Cornell University, and other educational institutions, and

while in the government service was chairman of the engineering examining boards of the United States Revenue Marine. Many of his lectures were published in the *Scientific American Supplement*.

Besides being a member of this INSTITUTE, Dr. Emery was also a member of the following bodies. The American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, the American Association for the Advancement of Science, the British Institution of Civil Engineers, from which he received a Watt medal and a Telford premium for an approved paper, and the Brooklyn Institute of Arts and Sciences, in which institution he held the office of president of the department of engineering.

Dr. Emery always dwelt with much pleasure on his association with the New York Electrical Society, whose usefulness he held in high estimation. He was Vice-President from 1893 to 1894, and during that year of office he left an imprint on the counsels of the Society. In 1896 he was elected President, and his presidential term was distinguished by the same earnestness and wisdom which were apparent in all his relations to the Society. His inaugural address before the Society entitled "Reminiscences of Forty Years of Engineering Experience," was of more than ordinary interest and historical value.

In his official capacity of judge at the Centennial Exhibition at Philadelphia, Dr. Emery had an excellent opportunity to estimate the future possibilities of the various branches of applied science, and being impressed with the prospects of electricity, he determined to study that science, but several years elapsed before he had any business or professional connection with electrical matters. However, he never lost his personal interest in electricity, and as the different branches of the industry developed, he kept in touch with them. On June 26th, 1891, he was elected to this INSTITUTE, and on April 19th, 1892, he was transferred to full membership. On October 23d, 1895, he was appointed to the Board of Examiners, and at the next meeting of that body on November 6th, he was elected chairman, which office he held at the time of his death. Since his connection with the INSTITUTE, Dr. Emery has read four papers before the meetings, besides being a very frequent participant in the discussions. His papers were as follows; at the general meeting of the INSTITUTE at Chicago, June 6th, 1892, a paper on "The

Relation Between Magnetomotive Force and Magnetization" at the local meeting at New York, March 21st, 1893, a paper on "The Cost of Steam Power" at the general meeting at Niagara Falls, June 26th, 1895, another paper on the same subject and also a paper on "Alternating Current Curves." The papers on the cost of steam power are of great practical utility, and have become a standard of reference.