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CIVIL ENGINEERING

By PROF. C. M. SPOFFORD.

The detailed descriptions printed herewith are sufficient to give to the student, about to choose an engineering course an accurate and clear conception of the subject matter of the purely professional courses in Civil Engineering. In order, however, that he may understand more fully the duties of the civil engineer and thus be better able to co-ordinate the relations of these various courses to one another, it is desirable to trace briefly the development of the profession and to show in a general way the character of the work which the civil engineer is called upon to perform.

Before the invention of the steam engine and the consequent tremendous development of manufacturing and transportation, there was little engineering and few if any professional engineers. Engineering in these days may be said to have been divided into two divisions, military and civil, the first, having to do with the construction of fortifications and military roads, and the latter, with the building of bridges, and the construction of the comparatively few water and sewerage systems. The scope of Civil Engineering at that time was well covered by the classic definition included in the charter of the Institution of Civil Engineers of Great Britain which is as follows: "The art of directing the great sources of power in nature for the use and convenience



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of man." The development of steam and electrical power and the consequent changes in methods of production and transportation broadened greatly the field of the civil engineer. It became increasingly difficult for one man to keep in touch with all its numerous developments and in consequence a gradual separation occurred. Mechanical, mining, and electrical engineering became established as well defined professions distinct from Civil Engineering. Civil Engineering, however, continues to cover a broad field, and its lines are less closely drawn than those of the other engineering professions. To the civil engineer is still entrusted the location of highways and railroads, the construction of bridges and aqueducts, the design of water supply and sewerage systems, and the development of mines and harbors. In the conduct of nation and city he is ever becoming a more important factor, and upon his action depend the health and convenience of entire communities as well as the responsibility for the expenditure of great sums of money.

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HISTORY OF THE DEPARTMENT OF CIVIL ENGINEERING

By PROF. C. FRANK ALLEN.

The Course in Civil Engineering is one of the original courses provided at the Institute. Professor J. B. Henck, the author of Henck's Field Book, was the first, and for a long time, the only Professor of Civil Engineering here.



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In fact from 1865 to 1870, he carried on the instruction in Civil Engineering, to Civil, Mechanical, and Mining Engineers, practically alone, that is, without any permanent assistant. The field parties were in charge either of higher class men who had practical experience, or young graduates who happened to be available. The writer while a student assisted in this way. How it was possible for Professor Henck to do this work so well as it was done by him almost single handed, is still a marvel to some of his successors. The reputation of the Institute in Civil Engineering was early established by the men trained by him; while he never attained distinction in engineering work, he was an able man, very careful and thorough in his surveying work, a fine mathematician and a most excellent teacher, and his teaching brought results. No one in the early Faculty exerted as much influence as Professor Henck did in establishing the high, even rigid, standards of thoroughness which lie at the foundation of the Institute's reputation. Rankin's Civil Engineering which was used was practically the only available text-book on the subject; its training in fundamentals was grand.

In 1868, when the writer came here, the entire block opposite the Institute, from Berkeley to Clarendon Street, was vacant and was used for surveying and laying out curves; there was no loss of time going and coming for fieldwork. The entire section to the west of Clarendon Street was also unoccupied. The railroad survey of perhaps 1000 feet in length was made in the vicinity of the present Athletic Field in Brookline. Very early in the history of the Department, a plane table became a part of the equipment, and in 1869, Henry Mitchell, Professor of Topography, and Henry L. Whiting, Professor of Physical Hydrography, both associated with the United States Coast Survey, appeared in the Catalogue as part of the Instructing Staff. They did little of actual instruction here but doubtless influenced the work through their interest and advice. The 1869-70 catalogue

recites that "the Instruction in Topography is mainly given in the field by means of the Plane Table, as perfected and used in the United States Coast Survey." The plane table thus early introduced has later, largely through the influence of Professor Burton who also had experience in the Coast Survey, become a characteristic feature of the instruction in Topographical Surveying. Few if any other colleges have appreciated its value sufficiently to develop it to the extent found here to be desirable. Certain Boston engineering firms who fully understand its use, are for that reason in demand in various parts of the country, to the writer's knowledge as far as Pennsylvania. From 1871 to 1876, Professor Henck was assisted by W. E. Hoyt, '68, afterwards Chief Engineer of the Buffalo, Rochester and Pittsburg R. R.

In 1881, Professor Henck resigned and his place was filled by Professor George L. Vose, who came from a similar position at Bowdoin College, and who was the author of "The Manual for Railroad Engineers," the best American treatise on the subject then existing. While he remained here only a few years, nevertheless during those years there were added to the department George F. Swain, Alfred E. Burton, and Dwight Porter, all of whom have afterwards become Professors and heads of departments or courses, and whose value to the Institute is well recognized. During no period of the same length in the history of the department has there been so valuable an accession. During his administration also, the work of the department had broadened and the need of specialization become apparent; the Sanitary work was assigned to Professor Porter, the Geodetic work to Professor Burton, and the Railroad work to Mr. C. D. Jameson, Instructor in Railroad Engineering.

When Professor Vose, an older man, resigned, Professor Swain was appointed as Acting Head of the Department, and not very long after, definitely its head. After graduation in 1877, Professor Swain spent three years in study abroad, not taking an advanced degree, but pursuing the studies he deemed most useful. He returned to the Institute, at that time probably the best equipped teacher of Civil Engineering in the country; his native ability was also of a very high order. His advancement to the Head of Department while still a young man was quickly justified. He was then giving the instruction in Structures and also in Hydraulics. About this time he received appointment as Engineer of the Massachusetts Railroad Commission, which yielded him unusual opportunities on the structural side, and this may have influenced him later to retain this line of instruction rather than the hydraulic work which was turned over to Professor Porter, whose work in Sanitary Engineering was closely allied to it. During the first year of Professor Swain's administration, three options were established for the Fourth Year, which were known as the General Course, the Railroad Course, and the Course in Geodesy and Astronomy. These were continued for many years and what is now called the Hydraulic Option and the Railroad Option are still maintained. This specialization had its beginning under Professor Vose and its fruition under Professor Swain. To what, if any, extent the influence

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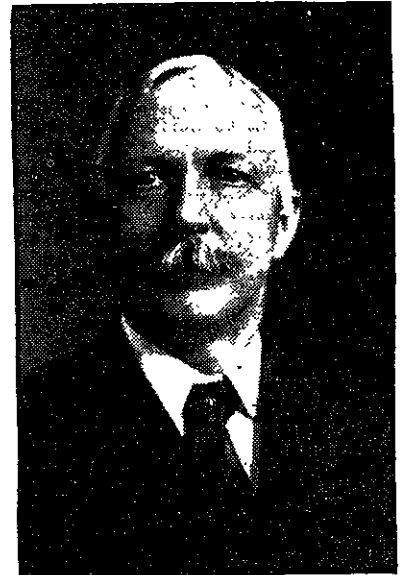
SANITARY ENGINEERING

By PROF. DWIGHT PORTER.

Assuming the profession of civil engineering to have been adequately defined, then sanitary engineering is to be thought of as simply that branch of the former which is concerned rather directly with the designing, construction and maintenance of works for the promotion of public health. In particular it is usually understood as dealing with projects for sewerage, drainage, sewage disposal, the furnishing of public supplies of drinking water and, if necessary, their artificial purification.

Numerous related questions are often referred to the sanitary engineer for solution, either alone or in co-operation with the chemist or biologist,—questions of preventing or lessening stream pollution, of the proper treatment of the garbage of large cities, of street cleaning, of house and school sanitation, and so on. The more common problems, however, are those first stated. They are of immense public consequence. Not only do they involve large expenditures of public funds, but they directly and seriously concern the health and comfort of the citizens, and the productive capacity of the great wage-earning class.

In large measure the technical knowledge, training and experience required in executing sanitary projects are much the same that are applied to various other civil engineering works. The great masonry dam on the Nashua river at Clinton is one feature of a



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splendid scheme of public water supply, but it might equally well serve, and to some extent will serve, for the commercial development of hydraulic power. A pipe line is not necessarily different in the main feature of its design because it is to carry drinking water rather than water for turning turbines, and parallel statements might be made of many other works, and especially of many details of works classed under the head of sanitary engineering.

We naturally find, therefore, that many of our graduates from Course I, a. e. or have been engaged upon projects of sanitary engineering, of which a notable example is seen in the great work under construction in the Catskills by the Board of Water Supply, of New York City, upon which a score or more of our men are employed, in positions of varying prominence from Chief Engineer downward. A similar statement could have been made with reference to our own Metropolitan Water and Sewerage works, and the Charles River

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