

present, Dr. George I. Adams, of the United States Geological Survey, having been recently appointed to the chair of geology and mining, and Dr. H. V. Fuller, of Zürich University, to the chair of chemistry. Next year the professorship of railway engineering will be vacant, but only properly qualified persons should apply, as the university, though small, maintains a high standard and the salary offered is sufficient to command the services of able and experienced men. I have received many applications for positions which do not exist, and beg to point out that, as stated in *SCIENCE*, March 1, 1912, the professorships now filled by foreigners are: law, two; economics and history, one; chemistry, one; geology and mining, one; metallurgy, one; civil engineering, two; mechanical engineering, one; railroad engineering, one. As stated above, none of these are now vacant. There are no professorships in mathematics, physics, biology, zoology, botany, agriculture, pedagogy and kindred subjects, nor are any likely to be created.

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#### SCIENTIFIC BOOKS

*Technology and Industrial Efficiency.* A Series of Papers Presented at the Congress of Technology, opened in Boston, Mass., April 10, 1911, in Celebration of the Fiftieth Anniversary of the Granting of a Charter to the Massachusetts Institute of Technology. McGraw-Hill Book Company. 1911. Pp. 486.

This volume of papers, covering a large variety of topics in applied science, derives its interest possibly as much from the occasion which has called it forth, as from its contents. The charter of the Massachusetts Institute of Technology was signed by Governor Andrew on April 10, 1861. The fiftieth anniversary of this event was taken advantage of for the inauguration of a congress of technology which lasted through several days, and to which the public was invited, to listen to the reading of papers contributed by graduates and professors of the institute.

The occasion was thus, in some degree, a celebration of the fiftieth anniversary of the institute, and a demonstration, so far as it was needed, of the prominent position in applied science which had been won by it and by its graduates.

It is an interesting question, in how short a time may an institution of learning, without substantial state aid or endowment, dependent almost wholly upon its own resources and the merits of what it has to offer, attain to a commanding position among institutions of learning? The lesson which has been taught by the institute is, in this respect, most instructive. Here is an institution which, in the short space of considerably less than fifty years, has become one of the leading institutions of its kind in this country or in the world, and it has attained this position solely by its own merits and exertions, with a small endowment, with little aid from the state—until within a very few years—and obliged to depend, therefore, for its maintenance and progress upon the tuition fees from students and such scattering gifts as it might receive from time to time. This position of leadership has already been held by the institute for at least fifteen or twenty years, so that from the date of the first small beginnings, when the classes met in hired quarters in the business section of the city of Boston, the school has developed in a third of a century into a position of unquestioned leadership.

Under these conditions it is not unnatural that its graduates, faculty and corporation should take advantage of the fiftieth anniversary of its birth to celebrate the progress which has been made. The papers presented at the congress have been edited and collected in the volume referred to above.

These papers, covering, as they do, the whole field of applied science, differ widely in character and subject. There are but few on any one topic, and the specialist will find but little in the volume to enlarge his detailed knowledge. Nevertheless, the papers have been kept somewhat non-technical in form and designed to be of general interest to the applied scientist, and this object has been ad-

mirably attained. The applied scientist, in whatever branch of engineering he may be engaged, will be able to read most of the papers with interest and profit, and will find that they will enlarge his view of the field of engineering. Many of them deal with the progress in certain branches of science within the last few years, giving a summary of the main events. There is little that is strictly technical in the volume, and the writer recalls but one paper which is accompanied by any mathematical formulæ.

The volume opens by a paper by President Maclaren, entitled "Some Factors in the Institute's Success." In this paper Dr. Maclaren outlines most admirably the main features which have contributed to the rapid and great success of this school. Among the important contributing elements he names the fact that the school was born in Boston, where the value of education was fully appreciated, and where the new venture received moral, if not immediate financial support; then the impetus which applied science had taken on at the time of its birth, owing to the great discoveries in engineering which had just preceded it; and finally, as a cause to which Dr. Maclaren attributes special importance, the fact that there has never been any uncertainty or indefiniteness as to what the institute is aiming at in its scheme of education. The institute was founded to emphasize *the importance of the useful*, using the term in its broadest sense and not limiting it simply to that which aids a man to earn his bread and butter, but understanding it to mean whatever cooperates in enabling a man to make his life of greater use to himself and to the community. As contrasted with the scholastic education which devotes itself to the abstract, and sometimes even decries that which is useful, the institute maintained that utility was the first object in the study of anything. In accordance with this idea, the method of teaching adopted at the institute has been termed "learning by doing," and Dr. Maclaren gives it as his belief "that the do-it-yourself method has been the greatest factor in the success of the insti-

tute." Whether this is true or not, there seems no question of the fact that the establishment of this school has had a great influence upon the traditional college education, and it probably is not too much to say that the trend in education to-day is in the direction in which the institute has always moved.

The technical papers in the volume are sixty-eight in number, averaging, therefore, only about seven pages in length. They are divided into six sections.

Section *A* deals with scientific investigation and the control of industrial processes, and contains seventeen papers, treating of such subjects as the conservation of metal resources, some causes of failure in metals, metallography, improvements in cotton bleaching, the gas industry, fire prevention, the utilization of blast furnace wastes, reclamation in the west and similar topics.

Section *B* treats of technological education in its relations to industrial development, and consists of thirteen short papers, several of which emphasize the importance of the method and aim at the institute, the value of a thorough training in engineering, and the influence of the institute upon education.

Section *C* treats of administration and management, and contains nine papers, several of them devoted to the modern subject of scientific management. One of these, entitled "An Object Lesson in Efficiency," is contributed by Mr. Lewis, president of the Tabor Manufacturing Company, of Philadelphia, the company in which the principles of Mr. F. W. Taylor have been most thoroughly carried out. The applicability of scientific management to various branches of industry are discussed in this section, and one of the most interesting papers in the volume is that of Mr. H. G. Bradlee, of the firm of Stone & Webster, entitled "A Consideration of Certain Limitations of Scientific Efficiency," in which he points out the fact that scientific management has distinct limitations which, at the present time, we may be apt to overlook. We are an hysterical nation, and the pendulum swings rapidly from extreme to extreme. After reading the highly colored ac-

counts of the results attained by scientific management as depicted by some of its enthusiasts, and after being solemnly assured that the railroads of this country could save a million dollars a day by introducing the principles of scientific management, it is refreshing to read a calm, dispassionate, but keenly analytical paper like that of Mr. Bradlee, and, after finishing it we shall find ourselves less enthusiastic but more sane.

Another important paper in this section is that contributed by Mr. S. M. Felton, president of the Chicago Great Western Railroad, on the scientific management of American railways. This is the longest paper in the volume covering, with cuts, 46 pages. It gives a very interesting account of the development of American railways since 1850, with cuts illustrating the differences between rolling stock at the present time and forty or fifty years ago, and many interesting facts, figures and historical comparisons, both as to the physical characteristics of railways and the operating results.

Section *D* treats of recent industrial development, and includes 15 papers treating of improvements in electric lighting, illuminating engineering, gasolene engines, electric propulsion, the mechanical handling of materials and mail, electro-chemistry power plants, ore-dressing, etc.

Section *E* treats of public health and sanitation, and contains nine papers. This section is especially indicative of the work of the institute, for this school, it is fair to say, has been the leader in the training of sanitary engineers. The graduates from its department of sanitary engineering have taken a foremost part in the modern improvements in methods of water supply, filtration, and sewage disposal, and are found occupying positions of responsibility all over the country. The part that the institute has played in this development is traced in one of these papers by Professor George C. Whipple, himself one of the most eminent examples of the leadership of the institute in this department. Another paper, by Professor Phelps, gives an account of the work of the sanitary research labora-

tory and sewage experiment station, a novel and important adjunct of the institute.

Section *F* is devoted to architecture. In comparison with the splendid architectural department of the institute and the eminence of the men who have graduated therefrom, this section is the least satisfactory in the volume. It contains but four papers, two of them written by civil engineering graduates, and one by a mechanical engineering graduate, only one being contributed by a graduate in architecture. Possibly this is due to the fact that in pure architecture there may have been less development in recent years than in the other branches of applied science, most of the improvements in the construction of buildings having been of an engineering rather than of an architectural nature.

As a whole, the volume will well repay reading. Almost everybody will find material of interest in it, and will be struck with the excellence of the papers as a whole, and especially by the fact that one institution should, in so short a time, have been able to turn out so many men who have attained to leading positions as applied scientists. In this respect, however, the volume is almost as noticeable for the names that are absent as for those that are represented among the authors. Some of the most eminent of the institute graduates have not contributed papers, and it is probably safe to say that the school is quite capable of producing another similar volume of equal size and equal interest.

GEO. F. SWAIN

*The Mechanics of Building Construction.* By HENRY ADAMS, M.Inst.C.E., M.I.Mech.E., F.S.I., F.R.San.I., M.S.A., etc. Longmans, Green, and Co. Cloth; 5½ × 9 in. Pp. xi + 240; 589 figures. \$2 net.

A rare combination of qualities is requisite to the authorship of a really good engineering text book. In addition to the literary polish of the novelist one must have the broad point of view of the practising engineer as well as the didactic skill supposed to characterize the college professor. The author of this book is an engineer who has received many tokens of confidence and esteem from his fellow engi-