

tralian Gas Light Coy., at Mortlake, Parramatta River, as the nucleus for a new establishment in the event of the Company leaving their present works in Kent-street. The enormous gas-holder, rising 112 feet above the ground level, and about 180 feet in diameter, and the elaborate arrangement of elevated wharf and railway, are not more interesting than the beautiful mechanical appliances that "charge" and "draw" the retorts by means of compressed air. As the members of the Association will shortly visit these admirable works, I shall not dwell at length on their description.

I regret that the time at my disposal has not enabled me to obtain information respecting any works of note of especial interest that may have been executed in the private engineering establishments, particularly in reference to marine work; but my friend, our worthy Vice-President, will be able to supply that want most fully, and I am sure will do so ere long. I must not omit to direct attention, however, to the very bold, and apparently successful jetty which one of our members (Mr. H. W. Kerle, C.E.), has designed and is now constructing on the open coast line, for the North Illawarra Coal Mining Company. The method of securing the piles to the rock bottom, and the system of anchoring the whole jetty so that it will withstand the force of the waves, are well worthy of study; and it will also be a subject of interest to observe its action in resisting the mighty force of the ocean in such an unprotected site. A detailed description of the work will soon be presented to this Association by the designer in the shape of a paper, so that I will forbear further reference to this work.

Whilst thus briefly tracing a few of the works of the engineer that have been carried out in this colony, in order to illustrate its progress in civilization, it would be wrong for me to omit reference to the thorough and systematic facilities for instruction in all the various branches of the profession that are now placed at the disposal of students of all classes and positions (facilities that I regret to say were not in my own earlier days), and which are probably equal in completeness of detail and extent of range, to the opportunities afforded to the youth of any country.

First of all stands the Engineering School of the University of Sydney, whose graduates are required to pass through a complete theoretical training in a course which has been specially arranged to qualify them for all the duties of an engineer. The course extends over three years (including one year in arts), and consists of lectures and practical work in such subjects as Physics, Chemistry, and in the sciences which bear more or less upon engineering. The students are also taught the use of the various instruments used in surveying and setting out engineering work—the University grounds being well suited for the practical teaching of the subject.

Instruction is also given in designing and preparing working drawings and specifications of structures and machinery. There is a laboratory attached to the School, which is fitted with typical examples of machine tools, a pair of horizontal engines, a Brush dynamo, and a powerful and accurate testing machine. The Engineering Lecture Rooms are provided with a large and complete collection of models and parts of machines and structures, diagrams, drawings, photographs, and a good technical library. In the laboratory the student receives practical instruction in the various processes involved in the preparation of materials used in the arts of construction, the quantitative determination of the efficiencies of prime movers and machines, and the testing of the strength and other properties of materials used in engineering and architecture. The total cost to a student (including all fees), who graduates in this course, amounts to £111 4s.

THE SYDNEY TECHNICAL COLLEGE is an Institution supported by the State, which is also doing really valuable work in educating a large number of our young men who are engaged during the day in learning their various trades. The College provides instruction, by means of lectures and laboratory work, in the various sciences, as well as practical instructions in a variety of important trades, among which may be noticed boiler-making, pattern-making, the fitting and turning classes; also, brick-setting, masonry, and joiners' classes. Instruction in mechanical drawing is also given; and a most complete set of models of machinery and general constructive work is at the service of the different lecturers.

It will thus be seen that the machinery of instruction provided for men who aim at becoming professional engineers (equally with those who simply desire to attain excellence in the particular trade connected with engineering in which they are engaged) is ample and thorough; the matter for surprise is therefore that it is not more largely availed of by the public, especially in connection with the more strictly scientific course of the University. Considering the length of the course and the variety and quality of the instruction imparted, the terms can hardly be thought to be excessive; what, then, is the reason that, whilst the schools of law and medicine are well attended, so few students are seen in the engineering school? It must be conceded, I think, that the only answer to this question is that the prospects are not such as to induce young men (who are, naturally, desirous to obtain some assurance of at least a respectable and comfortable position in life) to sacrifice for them the time, money, and prolonged mental effort which is involved in obtaining a degree. The State has acted liberally in thus providing means of instruction of the most advanced character for aspirants to the various branches of engineering; but it has stopped at that point, inasmuch as no provision has been made for drafting off any of the successful students into Government employment; although, as I previously remarked, all the most important engineering works are in the hands, and under the control of the State. It is a remarkable fact that the Civil Service Act apparently ignores this diploma, and thus an incalculable injury is likely to accrue to scientific engineering in this colony. There can be no doubt of the superiority of the regular course of study in qualifying young men to enter practically on the work of their profession, as compared with a system of pupilage under which none but the few enthusiasts after knowledge who are prepared, with self-denial, to glean with difficulty their information for themselves, are likely to succeed in their career—for how can these men hope to compete in the future, as far as useful knowledge is concerned, with those who have received as a groundwork a thoroughly scientific and practical training?

With the existing advantages as above described, it would certainly be a most desirable step for the Government to take, if a system of competitive examinations were established, whereby it could be ascertained if a candidate possessed natural aptitude, as well as a knowledge of the first principles that underlie the practice of engineering, before appointing him to a position for which the scope of his talents might render him unsuitable, and the duties of which would therefore be discharged in an imperfect and perfunctory manner.

Such a mode of selecting pupils would certainly be the means of securing those most likely to prove of use to the country, and to rise ultimately to some distinction in their profession; whilst it would also be an effectual death-blow to political patronage, under the shadow of which mediocrity alone appears to flourish! With engineering, however, it should be our aim never to forget the lofty standard and ideals that have been raised by many of its most distinguished members when defining its scope and objects, in order that all of us—each in his humble way—may contribute something towards their realization. As illustrative of this view of the subject, I cannot resist quoting from the conclusion of an admirable address delivered in 1878 by Mr. John (now Sir) Frederick Bateman, President, to the Members of the Inst. C.E.

“It may with proper pride be said by engineers that there is no body of men to whom such large sums of money are entrusted, or on whose honesty and judgment so much depends. \* \* \*

The responsibility of the engineer is great. Arduous and difficult duties are often placed upon him. He has almost uncontrolled command of money. He is generally the arbitrator in all questions of dispute between employer and the employed. His integrity, honesty and independence should be above all suspicion. He should lean neither to the one side nor the other, and his judgments should be so clearly those of knowledge and equity, that they should be entitled to as much respect as those of a Judge on the bench.”

It is indeed a matter for just pride that, as a rule, the whole of the engineers intrusted in this colony with important works,

however much the fierce light of public criticism may beat upon their actions, are able to show to the world that the above is not over-drawn or an imaginative picture, but a truthful representation of the qualities that are expected, and found in our leading professional men.

The long-talked of Local Government Bill, which is daily becoming more and more a necessity, should afford an opportunity to the Government for insisting on the employment of competent men in the preparation of plans and specifications for the various works of construction that will be necessary in the different districts; this would at once open up a career to those young men who have acquired the necessary knowledge, and who have been hitherto unable to make it of practical use in the daily work of life. If it is necessary for lawyers, doctors, and land surveyors to show, by examination or diploma, that they are qualified to undertake the practice of their respective vocations, it is surely not unreasonable to demand some assurance of competence from the engineer to whom may be entrusted at any time the designing of works, on which, for want of sufficient skill, thousands of pounds may be squandered; and which, for the same reason, may even be the cause of injury and death to the public.

There is nothing in these suggestions of a revolutionary tendency, nor of a character to cause alarm to those who—having been for years practically solving the very problems that the students learn from books and by theory—are conscious that they are beyond the time for competitive examinations, and who yet intuitively feel that they know their work, and can do it well. To propose examinations to such men, or indeed to any man who has given evidence of the fact that he is a competent engineer by the works he has carried out, would not only be unjust, but most injudicious, and should not be thought of; but for the youths entering on a profession which should certainly be as honorable and noble a pursuit as any of the "learned" professions, it is desirable, in the true interests of engineering, that every educational opportunity should be seized in order that the very best material may be selected.

One word more. As it would be desirable to obtain a general and thorough grounding in the principles of mechanical law and of the forces of matter, which a liberal education can alone supply for each student who aspires to become an engineer, let it also be remembered that the same liberal training acts in another way also by enlarging the mind, expanding the heart, and inculcating those principles of honorable and courteous intercourse which go to form the *etiquette* of all professions, in the absence of which the most capable and learned man yet lacks *something*—indefinable, impalpable, it is true, but still a reality, for its subtle touch, when present, creates the vast distinction between a *cultured* and a merely *clever* man! If I have dwelt at rather great length on this subject of theoretical and scholastic training, it is because I conceive it to be all-important to the young engineer, and because I see the opportunity now offered to all hard-working students to take such a draught of the cup of knowledge as would have been quaffed with avidity by many here present this evening, had such an opportunity presented itself to them in their youthful days.

And now I should like to make a few remarks upon the Association in which we are all interested, and whose President I have the honor to be at the present time. Founded in the year 1870, by a body of about twenty-five Mechanical Engineers (many of them young men, and apprentices), who resolved at a meeting held on the 24th September of that year, that it was desirable to establish "an Association for the discussion of subjects of interest in Mechanical Engineering; for watching the progress of mechanical arts in other countries; and ascertaining its adaptability to the wants of this country." The Association was virtually formed on the 12th October, 1871, when it showed a member-roll of about sixty members, and was given the name it still bears,—"*The Engineering Association of New South Wales.*" This society gradually progressed and extended the sphere of operations originally contemplated that, in the year 1884, it submitted an application to Parliament for recognition as a body entitled to represent in New South Wales the profession of Engineering (both Civil and Mechanical), and obtained from the legislature that

Charter of Incorporation under which we now work, which establishes the Association as a corporate body duly recognized by law, and thereby bestows certain powers and privileges that will—if judiciously exercised—enable its members to make its future career prosperous and illustrious.

As I happen to know that the comparative youth of our Association, and the fact that its list of members is small as compared with the large societies of England, has been the reason why some engineers in Sydney (who belong to one or other of these societies), have refrained from joining our ranks, and who thereby imagine that it would be hardly consonant with their dignity to belong to us, I am tempted here to quote from an interesting description of the early days of the *Institution of Civil Engineers of England* given by Mr. (now Sir John) Fowler, in his address in 1866 (*vol. 25, page 223, Min. Prods. Inst. C.E.*), as an illustration of how impossible it is to judge of the future development of any organization from its size or importance during its stages of early growth.

Mr. Fowler said:—"The origin of the Institution was very humble. About the year 1816, Mr. Henry Robinson Palmer, who was then articled to Mr. Bryan Donkin, suggested to Mr. Joshua Field the idea of forming a Society of Young Engineers for their mutual improvement in Mechanical and Engineering Science. The earliest members were Mr. Palmer, Mr. Field, and Mr. William Maudesley, to whom was shortly added Mr. James A. Shovell. When the society was constituted, on January 2nd, 1818, these six young men were joined by two others, Mr. Thomas Maudesley and Mr. John T. Lethbridge, Mr. James Jones acting as secretary, and during the remainder of that year there was no increase in the number, and there were only three additional members in 1819. In the following year, when Telford became President, there were thirty-two elections. At the end of 1822, when the institution had been established five years, there had been fifty-four elections."

At the close of 1836, when the institution had existed nineteen years, the number of members of all classes who had been

elected was 369, and the number of those still remaining on the books was 252, or about five-seventh of those elected."

— When we constrast these humble beginnings with the position of that truly influential institution at the present time, possessing (according to the list for June, 1886), 4,884 members of all classes; having a splendid library, lecture-theatre and offices; publishing the whole of the papers and proceedings of its body, and distributing the same amongst its members in all parts of the earth; whilst also making provision for special lectures on technical and scientific subjects by men of eminence in each—it must surely strike the thoughtful mind that—in a much smaller degree certainly, but in a somewhat similar way should our own Association progress, if those men will come forward and lend their hands to increase our usefulness and capacity for good, who now stand selfishly aloof and declare that *our* business is none of their concern!

Although, as is thus admitted, it cannot be urged that we have yet attained such general support and encouragement from the numerous members of both branches of the profession as the Association has a right to expect (and as it will undoubtedly command before many years elapse), I yet venture to congratulate the members upon the progress already achieved in the hope that it will stimulate them to further efforts in the interest of the Association, in order that it may, ere long, actually become a potent factor in the advancement and elevation of our profession in this colony, and also a valued and respected body amongst kindred societies in other parts of the world. The fact that amongst our ranks we now number representative men from nearly every branch of Engineering, that the Association possesses the necessary Parliamentary Charter recognising its station and giving it all requisite powers for the transaction of its business and management of its own affairs, are but small reasons (in my humble opinion) why I should recommend it to the favourable consideration of all Engineers who do not yet belong to it, in comparison with the evident need that exists for some such organization in which mutual support, sympathy, and advice may

be possible amongst Engineers, and where—simply from the *prestige* and influence which attaches to a duly recognized body of men over that possessed by an individual—the legitimate claims of our profession may be brought forcibly, yet with dignity, before the notice of the public, should occasion require.

I earnestly hope that in thus outlining the aims and aspirations of the Association, my meaning may not be misunderstood; no one could deprecate more strenuously than myself anything at all approaching to undue interference with laws and regulations of the country, whether exercised by public bodies or private individuals, so long as they are justly and reasonably interpreted; nor under our free democratic institutions should anything of the kind be needed. Still it is for every man to consider whether the promotion of the interests of our profession cannot be fostered by community of sentiment, brotherly feeling and action, rather than by the isolated (and necessarily spasmodic and ineffectual) efforts of individuals.

Independently of these ideals, it will be the constant endeavor of our body to encourage a taste for study amongst its junior members, and to promote a healthy spirit of emulation by offering rewards for papers, drawings, models, or other work of sufficient merit to justify recognition.

With motives such as these I feel convinced that the *Engineering Association of New South Wales* will not fail to prosper and do good work; strong in the consciousness of being engaged in a good cause, untainted by selfish aims, petty strife, or ignoble ambitions!

In conclusion, permit me again to thank the members for the honor they paid me this year, as their President, as well as for the consideration and attention they have been good enough to accord to this rather lengthy address.