

dered, and real talent receives a death-blow. Now, were a case of this kind brought under our notice, the thing would be thoroughly ventilated and at once exposed. It should, then, be the duty of this Society to root out these charlatans—men who have not the slightest pretension to real mechanical knowledge. The time has arrived when invention should receive a stimulus. One is struck with alarm at the small apparent vitality amongst us; we content ourselves to receive the inventions of other countries, which we, as a body, seem only capable of copying. It cannot be that we are less intelligent than our brethren at home. No; one cause is, we are not sufficiently organised—an invention coming from ourselves is not properly supported as it should be. Now, I trust we shall find that unity is strength, and, should any good thing emanate from our members, we, as a body, shall give it our support; and I am sanguine enough to expect that many will have good cause for congratulation that they joined the Engineering Association of New South Wales. In speaking of invention, it has often struck one that there has been nothing characteristic of us as Australians—as I before stated, we are copyists. This of all communities, where the price of labour is high, wants labour-saving machines, and yet how little has been done in this direction; we might well take a lesson from the Americans. Here is, for instance, a simple machine as a wool-press, with its massive screws or racks, a machine quite unfitted to send up to the stations, heavy, cumbrous, difficult to repair; now, I imagine it is capable of great improvement. I merely refer to these matters to show that it will be more advantageous to this institution, as well as to the community at large, if we confine our papers to the consideration of such objects as are more particularly adapted to the wants of the colony. In machinery for the cultivation

of the land we are far behind, as was lamentably shown in our late Exhibition; in sugar manufacture there is a want for some cheap, simple, and systematic kind of machinery especially adapted to local wants; and in gold machinery much has yet to be done to develop our auriferous deposits. A wide field for our discussion will be offered by the variety of constructions connected with railway and harbour works; and, providing no objection be raised in official quarters, these works will furnish an ample supply of subjects for description and illustration. Some of our members are connected with the Public Works in some sphere or another, and will therefore be in a position to give valuable information, not only on the works themselves, but on various points connected with the efficient and economical working and maintenance of the same, and comparing them with similar undertakings in other countries. I trust I shall not be thought presumptuous if I sketch out the line in which I think our papers should tend, premising that it will be advisable, as much as possible, to shun abstract ideas; let us treat our papers in a clear, lucid and open manner, going straight to the point and always keeping that in view, avoiding ambiguity, and then, as long as we do this, we shall be instructed. The first subject which I shall refer to is the supply of water to the goldfields and stations of the interior; this will afford material for many papers, it is of paramount importance, and, I believe, can be treated mechanically. Some of our members who have resided in the country can surely enlighten us on this topic. Then a paper on the best mode of constructing cheap and substantial tramways, either for locomotives or horse traction, with light rolling stock, especially adapted for the colony, would be invaluable at the present time, as there is some indication of tramways being carried out. Another subject well

worthy of our attention is the construction of light-draught steamers for our bar harbours; papers on the treatment of native ores, especially ironstone and copper; the results of experiments on indigenous timbers, tabulated with the strengths and other properties compared with foreign timbers; the treatment of kerosene shales, the mode of getting out the same, and the manufacture of oil therefrom would, I am convinced, be most instructive. In conclusion, I have great pleasure in being able to congratulate the members on the prospects of this new institution. Let us only work together, let good feeling and harmony prevail, let us have plenty of papers to discuss, and I have no doubt but we shall, at our annual meeting, have a good report to lay before you.

The monthly meeting of this Association was held at the Masonic Hall on 12th March, 1872. The minutes of the previous meeting were read and confirmed, and one or two new members were admitted.

MACHINERY OF THE GOLDFIELDS.

The principal business of the meeting was the resumption of the discussion on a paper read by Mr. W. G. Wilson on "The Treatment of Gold Deposits and the Machinery and Apparatus of the Goldfields."

FORMATION OF CLASSES, ETC.

The Chairman said he regretted that the report of the Sub-committee had not been submitted to the meeting. He might state, however, that that report went so far as to recommend the formation of classes in connection with the Association. Although there might be some difference of opinion as to how those classes should be formed and supported, he thought that no one would entertain a doubt as to the desirableness of forming

classes. Unless they adopted some system for the training of the rising generation and more connected with the engineering profession, the Association would fail in some of the main objects which its promoters had in view at its formation. The members were not so numerous as he expected they would have been after the Society had been formed so long, but upon turning the matter over in his mind, he was not surprised at it. He believed there were scores of young men in the city who would gladly avail themselves of opportunities for gaining instruction which would be afforded by classes under the auspices of this Association. He could not see why apprentices in the profession should not be permitted to become members, so that they could attend to classes. If they had that permission, he felt sure that scores would avail themselves of such a privilege. If the members failed to establish classes, many a bright idea might be lost. Many a youth possessed ideas which, if they could be brought forward and matured by the assistance of others, would most probably tend to some good end. But if a lad had no opportunity of putting forth his ideas and getting improvement, his talents might never become properly developed, and his usefulness as a member of society would be materially lessened. He sincerely trusted that the members would take this important question into serious consideration. Some expense, of course, would have to be incurred before the classes could be formed. But when such an important work required to be carried out, the members should work unanimously together, and, if necessary, double their subscriptions. He felt sure that, if a commencement was made, the classes would soon become self-supporting. If we could get youths to associate together two or three times a week, to study mathematics, drawing, etc., we should make far better workmen of them,

and in the future we should have far better engineers than we had had in the past.

Mr. Morell and one or two other members spoke in favour of the formation of classes, and offered to give any assistance that it lay in their power to give.

In reference to the establishment of classes, etc., in connection with the Association, the report recommended that a suitable room should be hired, that certain English and colonial publications should be taken and kept filed in this room, to be open on any evening, and also that, for two nights in each week, the room should be devoted to the use of the classes which might be formed. Mr. Laing pointed out that the expenditure was estimated at about £36 for the half-year. He moved that a special meeting be called to consider the propriety of carrying out the recommendations of the Committee. Mr. Smith thought that, before a special Committee was convened, some more definite information should be obtained as to the cost of the classes, and the expenditure which the Association would incur, for its own benefit. After some discussion, Mr. Davidson moved, as an amendment, and Mr. Smith seconded, that the discussion be postponed until the next monthly meeting. The amendment was agreed to.

At the meeting held on May 9th, 1872, it was agreed to call a special meeting for the following Thursday to consider the report of a Sub-committee, who had been appointed to devise means for forming a school of design in connection with engineering and otherwise, to promote the interests of the Association.

A special meeting of members of the Engineering Association was held at the Society's Rooms, School of Arts, on the 27th October, 1876, for the purpose of con-

sidering the following subject:—Technical classes as a branch of public education in the colony. The attendance was small. Mr. Macintosh, M.L.A., Dr. Pattison, Mr. Rogers, Mr. E. Dowling, officers or committee-men of the School of Arts, were present by invitation.

Mr. G. Davidson (the President) occupied the chair, and called upon Mr. Laing to open the subject. Mr. Laing said that the main object of their Association had been to promote technical education of the young men of the city, though they had never succeeded in carrying it out to the extent that they would have desired. He contended that there were no adequate facilities in the colony for enabling apprentices to the engineering to acquire a scientific knowledge of the business. The country had spent millions in the construction of railways, and yet no schools had been provided for the education of those who would have to work these railways. And no means had been provided for the youth of the colony to enable them to develop profitably the vast mineral resources of the colony, or to teach them the best methods of turning our raw material into manufactured goods. He read extracts from various works to show that America and Continental countries were in advance of England in the matter of providing technical instruction to the artisans of the country. However, the great exhibitions had had the good effect of awakening the attention of English people to the importance of the subject, and now in the mother country both elementary and more advanced scientific education were being given in special schools and classes formed in all the great centres of industry. He moved the following resolution:—“That the members of this Association, having seen and felt the great loss and inconvenience arising from the want of schools to supply the technical education required for carrying on successfully the various trades

and industries with which they are or have been connected, consider that the establishment of a polytechnic college school or schools for teaching the various branches of knowledge required to engineering, building, mining, manufacturing, and agricultural industries, would be advantageous for the development of the intellectual material and industrial resources of the colony. That such college, school, or schools should be conducted in such a manner as would enable boys, after leaving the primary schools and being apprenticed to any trade or profession, to continue their education at evening classes, and thereby acquire such special instruction and technical knowledge as would assist their progress in the trade, business, or profession they had adopted as their future pursuit in life. Seeing that provision has been made out of the public funds for primary education, grammar schools, and a University, we think a polytechnic college school or schools should also be provided for and established in connection with our public schools. It would render the system more complete, and, by enabling the artisans, manufacturing, mercantile, and agricultural classes to obtain technological training, would meet a want of instruction existing in practical life which none of our educational institutions, as at present constituted, can supply.

Dr. Pattison expressed his concurrence in the proposals to promote technical education, not merely in engineering, but in all branches of trade. The School of Arts was not altogether what it should be in regard to this matter; technical knowledge in several branches was already given under the auspices of the institution, but this ought to be greatly extended. There were certain rooms in the building which were available six days in the week to those who wished to obtain practical knowledge; and the Committee of the School of Arts

were fully alive to the importance of the matter. A Sub-committee (consisting of Mr. Dowling—a gentleman who had given much attention to the subject—Mr. Rogers, Mr. Oram, and himself) had waited upon the Council of the Trades and Labour Association with a view to securing their sympathy in this grand object, and he thought that that body had not listened to their proposals disagreeably. They had not yet heard what the Council intended to do with regard to the proposal, but he thought their reply would be favourable. He might say that the Committee of the School of Arts desired no extraneous aid in carrying out this object of imparting a technical instruction in all branches of trade. Of the importance of such instruction there could be no doubt, and the education of our youth would be incomplete without it. He quoted from a recent work by Mr. Twining to show what was being done in England and elsewhere in promoting technical instruction. Mr. Twining proposed that there should be Schools of Arts, Colleges, and a University; that examinations should be held and degrees should be given to stimulate the students. To follow a trade successfully, a man should have a knowledge of the science underlying it. Perhaps they could not here expect to go so far as to have a University, but they might, by means of the Schools of Arts, do much to extend technical knowledge. It was for such objects that these institutions were founded, and if they carried them out they would be much more worthy of the assistance of the State than they were at the present time.

Mr. Macintosh said he would be very happy to co-operate with the Engineering Association in the matter under discussion, and he trusted that the engineers would aim at securing the co-operation of other branches of

trade, for all were interested in technical education, or what he called practical education.

Mr. E. Dowling also addressed the meeting on the advantages of a technical education, and showed how its importance had been enforced by a Royal Commission appointed in England, and how practical demonstration of its benefits had resulted in the working of technological museums and institutions in England and Victoria. If rich persons in the community would only provide scholarships, an immense impetus would be given to young men to seek to make themselves efficient in technical knowledge. The Committee of the School of Arts hoped to establish a Technological Museum; and he thought that, under the auspices of that institution, classes might be formed and education given more advantageously than in connection with the primary schools. Mr. Laing maintained that if the scheme were merely carried out in Schools of Arts it would have only a local interest. It should be part and parcel of the public school system. Mr. Dowling said that no feeling of localism need be engendered by the carrying out of the system in Schools of Arts: any person could join the classes at the Sydney School of Arts without being a member of the institution, and it was proposed that there should be affiliation with all the Schools of Arts throughout the country. The Committee of the School of Arts proposed to form classes without any outside aid, although he thought the youths of the country were as much entitled to have an institution for the technical education as were comparatively few to have a University.

Mr. Cruickshank commented on the want of models and other appliances for the impartation of practical knowledge of the engineering profession. The deputation from the School of Arts then withdrew, when Mr.

Laing's resolution was seconded by Mr. H. Davies and passed; and the future consideration of the subject, on the motion of Mr. Cruickshank, was deferred until the next monthly meeting of the Association.

The monthly meeting of the Engineering Association was held on the 19th November, 1876, at the Association's Rooms, School of Arts. Mr. N. Selve presided. The minutes of two previous meetings were read and confirmed.

The Chairman read a letter from the Secretary of the School of Arts, stating that the subject of a Technical College had been under the consideration of the Committee for several years, and its consummation had only been delayed for the want of accommodation. It also stated that it was now proposed to build temporary premises for the purpose with the funds at their disposal, and they would be glad to receive any suggestions from the Engineering Association on the matter. The Committee of the School of Arts had further communicated with the Trades and Labour Council, asking their co-operation, and that body had replied, expressing their willingness to co-operate after they had communicated with the various trades affiliated with the main Society. The Chairman said that he entered into this question of technical education most heartily. At the same time, he thought, if they attempted to establish technical schools like those in England they would fail. But they might do something in a more humble way. They did not, for instance, want a school for instruction in the finer description of pottery or ceramic ware. Our pottery production here was of the very crudest description, and we were not likely to introduce new patterns. His idea was that what was wanted was in-

struction in the scientific principles involved in the practice of trades and professions carried on in the colony, so that tradesmen might have that thorough knowledge which would command success. If the Government would only grant money, they might get a laboratory properly furnished, and get a thoroughly experienced chemist to give lectures, and also get lectures in engineering and practical carpentry, and on the scientific principles involved in other trades. The Hon. John Sutherland expressed his gratification at this movement in favour of technical instruction, with the view to the better development of the resources of the colony. This was the only Society that imparted technical instruction, and he had therefore felt it to be his duty to join it, such was his estimate of the value of scientific knowledge as applied to the mechanical trades. A conversational discussion then took place as to the best mode of imparting technical instruction—whether through the agency of the public schools or by such institutions as Schools of Arts. On the motion of Mr. John Laing, the consideration of the subject was postponed until the next meeting.

At the meeting held on December 19th, 1876, Mr. J. Laing read the following paper:—

In accordance with my promise at our last meeting, I have sketched out a rough plan of the manner in which I think technical education should be carried on in connection with our public school system. But, before laying it before you, I wish to remark that it does not embody all which I think ought to be done in that direction, but merely what I believe to be practically within our reach at the present time if we set ourselves earnestly to try and get it. The proposition is not a new

one. I believe some provision was made in our last Mining Act for a School of Mines, although it has never been carried out, and at the end of 1872 and beginning of 1873, Professor Liversidge wrote three excellent letters, in which he advocated an extension of the science department at the University. Had it been carried out, I have no doubt but that some of the benefits of such a course of education would have been already seen, and might have assisted in giving direction to some of the changes advocated in our public schools, but which all would have benefited. Still, there was sound truth in a remark he (Professor Liversidge) made in one of his letters, viz., that the programme he advocated was not "sufficiently comprehensive for our present wants." I think it errs also in only building downwards from the upper departments of education, in place of building upwards from the foundation in such a manner as to place technical and scientific education within the reach of the great mass of the working classes, as well as those who are generally termed professional men. The first step towards this purpose should be the establishment of a technical or scientific school in Sydney, which would stand in the same relative position of our primary schools for scientific education which the grammar school holds for classical education. The technical school should be situated where it would be most easily accessible to the great bulk of our artisans in the evenings, and the classes and the hours of teaching arranged so as to enable apprentices and others to attend after they have left off work, and the following subjects should be taught at these classes, viz.: English, grammar and composition, arithmetic, algebra and logarithms, elementary and practical geometry, free-hand drawing, mechanical drawing and projection, architectural drawings, applied mechanics, mineralogy, elementary and practical chemis-

try, book-keeping, etc. I need not tell you the value of all these subjects in connection with engineering, but I will read over the names and numbers of a few of the manufacturing industries of this colony as enumerated in Reid's Essay, which is now being distributed over Europe and America, to spread information respecting this colony. He says that in 1874 we had:—Engineering works and foundries, 158; smelting works, 25; agricultural implement works, 45; flour mills, 172; saw mills, 152; sugar works, 67; distilleries and sugar refineries, 55; breweries, 31; wine presses, 367; vinegar and ink factories, 99; coach and waggon factories, 99; tanneries, 114; meat-preserving establishments, 23; tobacco factories, 23; gasworks, 10. These figures will show the necessity for scientific training in nearly all the subjects I have mentioned, and I have only to remind you of our gold, copper, tin, iron, and coal mines to convince you of the necessity for a class of mineralogy and also metallurgy. The school would require to have a good laboratory attached to it, for chemical lectures would be of comparatively little value if the students are not taught practically to experiment for themselves; and there ought to be a great variety of models to illustrate and show in detail the application of the geometrical and mechanical principles and powers requisite in engineering, building, and other mechanical trades. With respect to teachers for chemistry, mineralogy, and metallurgy, free-hand drawing, English grammar and composition, arithmetic, algebra, and Euclid, they should, I think, be highly trained and professional teachers; but for practical geometry, applied mechanics, projection, mechanical and architectural drawing, and book-keeping I would think it better, if possible, to get competent men who were engaged in engineering, building, and mercantile business to conduct the classes, as they, if

apt teachers, would be better able to show young students how to apply theory to the practical purposes of trade or business through having studied them from the same standpoint the scholars wished to reach and pass. There should also be half-yearly and yearly examinations, at which certificates and prizes should be given to those who passed certain points of efficiency in the various classes. Having now sketched out what I think should be the leading features of the evening classes to be provided for our young apprentices, artisans, and others, and which I certainly consider of the most pressing importance, I would remark that the same building in which these classes met could also be used during the day for a mining or high-class scientific school, with, perhaps, a different set of teachers; but the principal or headmaster could exercise supervision over the management of both day and night classes held in it. I may be asked what the building for such a school would cost. I would say that £10,000 would build and fit out (not including ground) a very good school, and if the same amount of money (£1500, I believe) voted annually to the Grammar School was also voted to a technical school, in addition to the fees, a good staff of teachers could be got, and if fortunate in the selection of a headmaster, I feel confident it would be a thorough success, and that in two or three years after it was opened more schools of the same class would be wanted. Before concluding, I only wish to make a remark respecting the examinations. Mr. Twining, in his work on technical education, recommends that a large number of questions on the various subjects should be drawn up and made public. He thinks, by having a much larger number on the list than would be used, and by selecting a few questions from various parts of the list without notice, it would be a better preventive against cram than the present plan.

and the list would also form a guide to the students in their course of study; and I think he is right. Many young students cannot afford a private tutor, and the lists could be improved and the number of questions increased every year, as found advisable.

After which Mr. Cruickshank moved, and Mr. N. Selfe seconded—"That a Sub-committee be formed from this meeting, consisting of Mr. Laing, Mr. Davidson, Mr. N. Selfe, and mover (Mr. Cruickshank), with power to add to their number, to answer a request sent in by the Sub-committee of the School of Arts asking for suggestions from this Association as to the best method of instituting technical education in this city."

Mr. Davies then moved, and Mr. Laing seconded—"That the Committee just appointed shall take into consideration what steps could be taken with the object of enlisting the sympathy and interest of the members of Parliament, and other influential persons, in obtaining the establishment of technical and scientific schools. suitable for working men and apprentices."

