amongst our young workers; but how many of these students were really students, and not merely imbued with an idea that the college was a royal road to learning, and if they could get a certificate they were necessarily all that the certificate implied? This faith in examinations and certificates was an almost pathetic feature of modern life. The Swiss apprenticeship laws seemed to make almost everything depend on an examination held in the chief town of the Canton, in the proficiency of the apprentice, but seemed to ignore the vast difficulty of holding such an examination. The examination here for certificates of competency as marine engineers referred to a very specialised branch of the profession, took three or four days to complete, and then only covered a small part of the whole ground; the examiners had all years of experience ashore and afloat, and had a very clear syllabus in hand directing them as to what was required, yet the absolute nonsense of the answers often written was very disheartening; and one was only consoled by knowing that the writers were not, could not be, such fools as they would seem. It would be the same in an examination for a certificate of completion of apprenticeship; and the fault really was not in technical education nor the want of it, but in the defective primary and secondary education of the candidates. They had never been taught to read intelligently, nor to express their ideas (supposing them to have any) in writing; so they try to commit to memory something or other, and give a garbled and inconsequent version of it at the examination.

In a leading article on the Mosely Commission in 1904, "Engineering" remarks: "It is not the lack of well-equipped educational establishments from which this country (Great Britain) suffers, but rather of students capable of profiting by them; and here the fault is largely, if not chiefly, with our defective methods of

secondary education. One constantly hears the same thing from the instructors at our technical colleges. 'Many of the young men who come to us,' they say, 'are unfitted to take advantage of the instruction we are supposed to give. They can read and write, although that imperfectly; and can add up, multiply, and subtract, slowly and with difficulty; but beyond these things we have to teach them the very elements of education. The other things they have learnt, or which have occupied their time in the attempt to learn, are useless for our purpose.' Some technical colleges have an entrance examination, but it is well known how lenient the authorities have to be, trusting to the students picking up knowledge as they go along, otherwise there would be many rows of empty benches. This, however, would be preferable to the conditions that at present too largely exist. It would be better to have a small capable class than a larger collection composed largely of half-interested students."

He would repeat here Macfarlane Gray's words, quoted in his opening address this session: "It is desirable that engineers should be guided into preparing themselves to be able to read and understand all that is so well written for them." Notice, not taught theories or even practical science, but guided into being able to read and understand books. All technical college students should pass an entrance examination in elementary knowledge of common things, English composition and writing, and arithmetic, such as any moderately well-educated boy of twelve ought to be able to do; or be made to attend continuation schools for these subjects until they can pass the examination, before taking up specifically technical subjects.

Then when they are really able to read they should be guided into what books to read. The reference

libraries of the colleges should have copies of all books likely to be useful to students, so that inquirers might see them before buying them for private study. By seeing them in the library he will know if they will suit his stage of development; and he will not buy a book on the mathematical theory of electricity before he knows the rudiments of algebra.

Class study is a good thing because it is social, the students can talk "shop" amongst themselves without any false shame, and sharpen each other as iron sharpeneth iron; but there must be private study too, and the expense of good books never be grudged.

He referred in these remarks to evening class students; day classes were only for those who could afford to study for the sake of research, or who had won scholarships after some years' practical work at a trade. He did not see how employees or apprentices could attend day classes, and yet work for their employers; there would be constant clashing and dissatisfaction. It would be very nice if everybody had six months' holiday per annum, either for study or recreation; but it would be unfair to make an employer pay wages for such a holiday, or to guarantee re-engagement at the end of it.

In the Horological Department of the Northampton Institute, in Clerkenwell, London, an admirable technical college described in "Engineering" of 19th February, 1904, an attempt has been made (he quoted from the article) to meet the special requirements of this historic industry of the district, but it is to be regretted that the employers in the watchmaking trade have not given greater support to the Institute by encouraging their apprentices and employees to attend the day courses. The evening classes have, however, been extremely successful, the applications last session exceeding the accommodation, so that a number of candidates

had to be refused admission. The evening courses consist of practical instruction in the workshop, drawing-office, and laboratory, together with lectures on the principles underlying the various branches of the subject. The practical workshop classes in the evening are only open to those who are engaged in the trades affected, as the accommodation is limited.

The ideal this Institute puts before it is not so much to prepare a student to pass examination tests as to fit him to become a competent worker and thinker in his career. Of course, this is professedly the intention of all such Institutes, but they sometimes fall from grace. One well-known school in England for the "coaching" of marine engineers admits that only such statements appear in its publications as its experience shows the examiners are willing to accept, even though such answers are directly opposed to recognised authorities—which was rather rough, both on examiners and students.

Professor Sylvanus P. Thompson, in an address given at the Northampton Institute in 1905, pointed out the dangers of this system of "coaching" which once prevailed; when he was examiner in Optics for the Spectacle Makers' Company, he found candidates could rattle off correctly the definition of the index of refraction, the ratio of the sines of the angles of incidence and refraction, without having any notion of what the sine of an angle was.

He said at our last meeting that we might get some light if our members would give their own experience of technical education, and suggest how it could have been bettered or what they think they would do if they had to start afresh.

His own education was too desultory to serve as a model, but really he did not know if it could have been much improved on in the circumstances, which were the

usual Scotch ones, "tenui musam meditanur avena." He got some rudimentary knowledge of mathematics, French, and Latin before he left school at the age of 14, and he had not forgotten any of it, he thought. He was apprenticed as fitter to an agricultural engineer in a country town, where the only evening class he could attend was one in drawing—their teacher was an artist and had not much sympathy with mechanical work, but he taught him shadow and perspective, and drawing from the round, and he fancied that was better than simply copying machine drawings as so many do. Meanwhile, he worked by himself at elementary mathematics and physics; and when he went to a marine shop in Glasgow he thought he knew all that the very elementary evening lectures in applied mechanics he began to attend could teach him; so he worked for some winters at chemistry and German, and obtained a fair acquaintance with elementary physics and practical mechanics. He began to take "Engineering" weekly in 1872, and found it a grand technical educator; there was much of it he did not understand, but this only stimulated study and research. He owed a great deal to his teachers as a schoolboy, if it was only for the rational way he was taught arithmetic—but the principal technical class he ever attended, Professor Thorpe's lectures in chemistry, was chiefly for relaxation from his home study of what more immediately concerned his daily work.

One of his schoolmates and earliest friends would be an engineer also; after a year or more with a civil engineer who was laying out new waterworks for the town, he got tired of tramping through bog and heather measuring earthwork on the moors, and went in for mechanical engineering. His parents sent him for a year or so to be a carpenter and joiner, to give him experience of manual work and of the British workman, then he entered a marine engine shop in Glasgow as

a fitter, and, after serving his time, went to sea, saw the world, and saved a few pounds, on the strength of which he matriculated at Glasgow University, and in due course took his degree as Batchelor of Science. He then got employment as a draftsman, but in those days, nearly thirty years ago, he believed his B.Ss. was rather a hindrance to his getting employment, and it was so precarious and poorly paid, that when an engineer was wanted for a mission steamer on Lake Tanganyika, in Equatorial Africa, he applied for and got the job, took his boat to the lake in sections and erected it, trained his crew, shot and boiled down hippopotami for engine oil, and devoted the best years of his life to the work of training the natives in habits of decency, sanitation, and the arts of civilisation, a much harder task than teaching them to sing hymns. He found a grave amongst the people he had done so much for, many of them slaves rescued from the Arab marauders; and though his career might seem a failure, measured by the money he had made, it was really a success we all might envy; he was one of those who has made our country honourable and honoured, who bear the white man's burden, and do not refuse to touch it with their little finger.

Of course, to enter the University he had to possess a fair general education; we expect our educators to give that to all boys, at least to put it within their reach with a little effort. And the boys must be got to take a personal interest in their own education—merely driving them to classes is no use. Hogarth's Idle Apprentice would never have reformed by being sent to evening classes; he would more likely have led astray from them his estimable colleague who went to church with his master and married his master's daughter. That excellent young man used to keep his book beside him as he worked his handloom, his modern representative can do the same.

In conclusion, he was pleased to see that in the Arbitration Court's award in the Iron Trades there was no mention of the "trade" of engineer. Many boys were now apprenticed to learn "the engineering," or the trade of an "engineer," and in the Statistical Register of New South Wales (Part XII., Industrial Wages, 1908), he found among the list of operatives in the Engineering, Boilermaking, and such section no less than nineteen classes of engineer distinguished between, and not a fitter or turner in the lot! The railway shops employed these, though, at wages equal to the highest-paid "engineer." There were surely some engine-fitters and iron-turners in outside establishments also. The old generic name for the worker in iron and metal was Hammerman—since we were returning to mediaeval guilds and trade restraints, why not return to the old names also?

"Engine-wright" was the old English name for a steam-engine maker; we never call a shipwright a skipper or a shipmaster. The history of the early days of George Stephenson, to whom no one would deny the title of engineer, and whose position was established when he got the job of colliery engine-wright, had some bearing on these subjects of apprenticeship and technical colleges. While showing how much Stephenson felt the want of such advantages, it showed us that a man of character and perseverance might reach the highest point of the profession without either.

Mr. J. W. Turner, in reply to the discussion, said that the fact that two nights had been spent on this matter showed that it was an important one.

Dealing with the various gentlemen who had spoken in the order in which they spoke, he would first reply briefly in each case.

Mr. Russell Sinclair advocated the second method of teaching apprentices, as shown on page 108 of his address—at least, he understood that that was the case.

dress—at least, he understood that that was the case. He was present, not as an engineer, but to get advice, and it was men like ourselves that he looked to for some inspiration on this question. He desired to put himself straight on the matter before he went further.

The whole of the three methods are spoken of as good by professors and others. Mr. Sinclair had expressed himself as being in favour of the lad being sent to the Technical College for two or three years, thence to the workshop for a shortened period of three years. It would appear that the first method was more in operation in our own country, possibly because we took our operations from Great Britain. That was the point where he should think he would be enlightened by men like ourselves, who knew the practical work. It was to us he looked for advice as to how far and in what way the theoretical should be dealt with. He agreed with Mr. Sinclair that there must be some extension of opportunities in connection with the technical education of this State. We must always contrast between the evening student and the day student. He did not altogether approve of the system of scholarships; he approved of them so far as they went, but he thought the amount and number were not at all sufficient for the requirements of this State. He would like to see some more liberal allowance. But as this is the first step in getting the scheme of scholarships in connection with the Technical College, he looked upon it as a very splendid step, as one given to the boys under the new bursary system—that was, our able boys. Now, he was going to plead guilty, as one who had been before the public as a schoolmaster in Sydney for twenty-five years, to the want on his part—to give the boys under his notice for correction of industrial work, he laboured largely to get those boys into the business and the literary side. Now he saw that Sydney was to be a great industrial emporium—one of the greatest in the Southern Hemisphere.

Something more should be done to equip our boys. That was why he advocated industrial scholarships. They were fought out by a committee at the Technical College and recommended to the Minister, and by him approved. He thought himself that a number were making good tradesmen and good citizens. There was no reason why we should not extend the scheme if it was successful. He might be anticipating a little criticism of one gentleman, who thought we should go right away to the University. Such was his intention; but he did not get the scheme as complete. He would go further than the University. Those picked boys in Australia should have their opportunity to go to the best in the world by means of travelling and research scholarships.

Mr. Sinclair asked a question as to the Trade Schools in Germany. Were the lads compelled to attend Technical College School before Trade School? He believed this was the case.

As to whether it was compulsory in America for attendance at Continuation Schools, there was nothing compulsory in America any more than in Great Britain or in our own State. But the facilities were so manifold, they were so widespread in every State in America, and the encouragement was so great, that he thought it was only the poor boys that were unable to get the advantage of the splendid technical work.

Now, in regard to Mr. Erskine's criticism, who evidently considered he had been hard on the British manufacturer, and several other gentlemen who had spoken were of the same opinion. But he would like to say those words were not his own. He believed in the truth of them, all the same. He was quoting English authority of the very highest character when he said that the British manufacturer had shown an apathy and an indifference. In this matter Creasey was his authority. He would not care to judge a country in the

Old World after being in it a few months; but when his own experience, limited as it was, was backed up by writers of the stamp of Creasey, he could not doubt the truth of it. If you travelled in England, Scotland, Ireland, and through Germany, through America, a few months in each place, he did not think you could could come to any other conclusion than that Germany and America, in their system of technical education, were before the old country.

If it were not for the Continuation School in England, he did not know where education would be. The squire still ruled, and was judge of all power—you could not get away from that fact. There were splendid Board Schools, there were some good Voluntary Schools, but there were a large number of schools not up to the standard of Board Schools.

He did not think Mr. Erskine need fear there would be any cramming in the Sydney Technical College. If you went there in the evening and saw the earnest way they attacked their work, there could not be any cramming, unless it was cramming practical work. There could not be any fear of that. Neither did he think there was any fear of over-educating them. He disagreed with us when we spoke of the Technical College as a place where you should never try to emulate University work; but he agreed with us that it was not possible to carry their education so far as that. He had yet to learn where the poor boy was to stop if he had brains.

The P. N. Russell Scholarship had allowed the Technical College boy a road or gateway through which he could pass. The City Technical College for many years past had struggled for the P. N. Russell Scholarships. He knew every year the Technical College was represented in that examination, and successfully represented. The boys attended the day class and got their mathematical knowledge. When they last came up for com-

petition they were able to go successfully through the examination papers, so that by that channel they could reach the University.

Mr. Vincent would appear to question the value of drawing as a basis of instruction, but he could not agree with his statement. He had seen places where drawing was made the basis of work. Mr. Vincent was also a little irritating on this "painful apathy" that existed in Great Britain. He knew Britishers did not like it a bit, but it was well to hear the truth occasionally. He meant to speak the truth, and he meant to speak what he knew. He had come to the conclusion, after being three or four months in Germany, three months in Italy, the best part of two months in America, with his eyes wide open, if the British could show an improvement.

He knew very well that the British workman had not his equal in any part of the world. He could but say that the French were grand in science, and that Germany had a wonderful system. He knew very well that, coming from British parents, he felt that if he could say anything good for the Old Country he would say it. He considered that its Continuation Schools were its salvation. He desired to speak fairly of the Old Country, and he was putting the matter fairly before us. If we did not like to hear that apathy existed, then we have to doubt men like Creasey.

With regard to diplomas, you could not hall-mark an evening student. He went back to the workshop to be a better boy for the employer. He thought that an Institution that would do that with evening students attending a few hours every night after they came from the workshop was doing very well. With day students of three years' course, they hoped to have them hall-marked. Mr. Connie suggested a valuable scheme as that started by the North-east Coast Institution of Engineers and Shipbuilders. He would be glad to have such support, so that we could try to make a better class of workman.

In reply to Mr. Shirra's remarks, he could assure them that they were not going to turn out tradesmen by passing examinations. They would certainly have to do the practical part. The theoretical was necessary, too. He agreed that instruction in the Technical College should supplement and not supersede it. That was the position he took. The two institutions should be closely allied. He did not see how they could ever interfere with the province of the special work of the workshops.

Mr. Shirra had referred to the teachers of trades working in the day and not able to do good work at night, being tired. It was the practical man that they wanted, but where were they to get them from? The best men were fully employed, they were working in the daytime, they had their own business. In every case, whenever an appointment was made, he sought out the best man, who had to show his testimonials and certificates. A Board was appointed to examine and report whether the candidate was a fit person to teach. The Board was made up, at any rate, of one or two representatives of the best men of the calling under consideration. He could not get them from any other source. The classes in the College were crowded, but it was hoped that they would have more suitable accommodation in the fitting and turning before long. He agreed with Mr. Shirra when he valued the Continuation Schools. In fact, he thought the boys should not leave the Primary Schools as they do; if they stayed a year or two longer and got all the valuable information, such as mathematics and drawing, and received generally a better education, they would make better tradesmen. There was no such thing as coaching or cramming in the Technical College. He honestly said that effort was being made by all concerned to make the work thoroughly practical, and suitable to the needs of the students in attendance.