

other than that of 'Engineer,' by which all properly qualified men, and only such, might be known. At present there is a movement on foot, here in Sydney, amongst representative engineers, to formulate some scheme of registration, and with this movement your Council is associated. But the prospect of even partial success is, unfortunately, very remote. It was decided, however, at a recent meeting of your Council to invite the earnest thought and consideration of members on this great question, so that with engineers in other parts of the world we may do our best to forward the introduction of a very necessary reform.

I have referred previously to the Inventor and his claims to be registered as an Engineer, and in this connection I read with interest some remarks made by the Hon. Sir C. A. Parsons in his Presidential Address before the North East Coast Institute of Engineers and Ship-builders. In discussing the Inventor he made the following remarks:—

“ In all development of machinery and ship building
“ Invention bears its part, and it is interesting to recall
“ what Lord Fletcher Moulton once said when he was
“ discussing the merits of all patents. He had seldom
“ or never known of an Invention which appeared in
“ the full panoply of perfection, but it was generally
“ to be likened to a young sapling in a great forest
“ of large trees. It struggled for existence amongst
“ them, they deprived it of the sun, their roots robbed
“ it of nutriment, and its chance of growing up and
“ taking its place amongst the great trees of the forest
“ is remote, unless perhaps some unlikely circumstance
“ may assist it to gather strength. So the invention by
“ itself has generally little chance, unless it is suitable
“ to the times, and assisted by some friendly hand in
“ the shape of brains and capital. There is no doubt

“ that in these days, useful inventions come principally
“ from trained brains, and the number of brains that
“ have passed through schools, advanced schools, col-
“ leges and universities increases yearly, and concu-
“ rently every year the forest becomes denser. Con-
“ sequently, we have to dig deeper, and training and
“ specialising have become more necessary for success
“ in any line. One hundred years ago it was possible
“ for one brain to master many subjects; now the
“ range and complexity is so great it has become im-
“ perative to specialise, if more than an ordinary super-
“ ficial knowledge is required.”

From these remarks, delivered by so eminent an En-
gineer and Inventor as Sir C. A. Parsons, one must realise
that the day of the “accidental invention,” as one might
call it, is passing, and that useful inventions must become
more and more the fruit of long and continued thought
and study by trained brains. And this leads us up natu-
rally to a consideration of the supply and development
of trained brains.

In considering this question certain axioms may be
generally accepted.

(1.) All training to be complete must embrace an ap-
prenticeship in both theoretical and practical work.

(2.) All boys should have an opportunity of showing
their fitness for advanced training, such fitness to be gen-
erally determined by their aptitude and progress in the
elementary schools.

(3.) It is absurd to attempt advanced training with
the average dull boy. As one writer puts it:

“ It would be no more mad to train a dray horse for
“ the Derby than it is to attempt to cram honest dull

“ lads with the ‘high-falutin’ ’ nonsense which goes to
“ fill the average day in our elementary school.” (Re-
ferring here to English practice).

And the same writer again says:

“ For the boy whose limitations extend only to the
“ three R’s, devote the shining hours in perfecting his
“ knowledge in these subjects; but to him who knows
“ no limitations let the door be open wide. If he
“ be above the average intelligence let him take the
“ extra subjects, and let him be one of a small class
“ under the charge of the best teacher on the staff;
“ give him every facility for making himself proficient;
“ the secondary school and university be open to him,
“ give him every encouragement; let the benefits of
“ the secondary school and university be few to him
“ and don’t let the want of money stand in the way of
“ his progress. He is a paying proposition. He will
“ become a valuable asset to the State.”

Sir Trevor Dawson, Managing Director of Messrs.
Vickers Ltd., even goes further; he asks:—

“ Was it too much to expect that as there was a
“ great national need the State should extend its educa-
“ tional system so as to enable the best youths to enter
“ upon a combined practical and theoretical training
“ for the greatest of manufacturing industries without
“ requiring great sacrifices on the part of parents who
“ might be unable to support their sons throughout the
“ prolonged period of training? There were details to
“ be considered, such as the choice of the State indus-
“ trial apprentice, the provision of methods of testing
“ their earnestness, application and proficiency from
“ time to time during the course, so that any retrogres-
“ sion might be visited by the withdrawal of the State
“ support, and the assurance that State industrial ap-

“prentices would continue to serve the Empire only
“after their training had been completed. All such
“details could easily be arranged when once was ac-
“cepted the principle of selecting and nurturing the
“most promising mental talent of the nation, inde-
“pendently of the stratum of society in which it was
“discovered. The duty of fostering the mechanical
“science was one which would yield the highest reward
“to the nation.”

Far reaching as these propositions admittedly are, it is to be noticed that State endowments are proposed for the training of only such youths who display mental capacity and aptitude for an engineering career, and that their retention of such State aid throughout their period of training is conditional upon the maintenance of interest and progress in their studies.

To my mind there is much to recommend such a proposition. There can be no doubt that a certain percentage of lads are not sufficiently endowed with brains to warrant any attempt to cram them with anything but the most elementary subjects. In such cases it must surely be better to devote the whole of one's efforts to perfecting the lad's knowledge in the most elementary work, so as to fit him to take up a trade requiring only a certain amount of intelligence, beyond which step he could probably never hope to advance. Again, there is another percentage, and unhappily in Australia it is a very large one, of lads who, whilst undoubtedly possessing good average ability and intelligence, and whose brains are capable of being trained to greater knowledge, at the same time are entirely lacking in application and whose only idea is to get through the day's "work" somehow, or anyhow, to spend the rest of the 24 hours in idleness or amusement. The blame for so high a percentage of this type of lad

must largely be laid at the doors of the parents, but, it is practically useless to expend money and energy in an endeavour to assist such lads as will make no effort to assist themselves. To this class unfortunately, a large proportion of the apprentices one sees in the workshops belongs. They are without ambition, and without any wish or anxiety to rise to higher things if it involves additional work. Their chief aim is to get through their day's work, to do as little work as possible during the day, and to get paid as much for it as they possibly can. From this source the bulk of our mechanics are drawn, and it is, I think, because of this failure on the lads' part that, to-day, the supply of really competent and skilled tradesmen is so short. There is, however, a fair percentage of lads possessing quite average intelligence, and in many cases considerably more than average intelligence, who are ready and willing to make some effort to advance their knowledge and rise in the world if given a little encouragement and the necessary opportunity, and there can be no doubt that it is the duty of the State, backed by the engineers, to encourage such boys and to afford them every possible means for the training of their brains, and this conclusion leads us directly to such a proposition as that put forward by Sir Trevor Dawson.

The question is one which is at present greatly agitating the minds of employers and engineers at Home, and the consensus of opinion amongst such men at present is to the effect that existing systems in England are hopelessly extravagant when compared with the results attained. Here in Australia the average lad is, I think, more self-reliant, and more quick-witted than his British brother, but the obvious lack of control exercised by parents again handicaps our boys, unfitting them for steady and self-sacrificing work in the subsequent training of their brains. The whole future of the engineering

industry problem in Australia must largely depend upon the supply of efficient men, both of those more highly trained to take leading positions, and those thoroughly skilled in the various trades. Without such a supply, our industries cannot long hope to compete with those of other parts of the world where possibly the supply of trained brains and skilled labour is greater. A high protection can only afford an artificial life to our industries. To ensure continued success we must be able to draw upon a good supply of the best mental material, just as we cannot hope to build a good machine without good "metals."

What are we doing to ensure a supply of mental material? How are we training our engineering tradesmen and our engineers? We wish to teach a boy a trade. We apprentice him in what we consider to be a suitable workshop, and, speaking generally, what a farce his training is!

Practically the only real tradesmen produced are those who as boys and young men possessed such a natural aptitude for their work, and such a determination to succeed that no matter how poor a training they may have been given they have found the rest for themselves. Such boys are relatively rare, and, as a result, the real tradesman is just as rare.

And what becomes of the average boy when apprenticed to a trade, the boy without special mental ability, the boy who has been allowed by his parents to run wild, to exercise no self-control in the way of giving up pleasure for work; in other words, the average Sydney City boy?

The employer has generally been forced by competition and rising wages to make use of boy labour, that is, cheap labour, wherever possible, and to use the boy solely

to enable him to compete against other local manufacturers and against imported goods. The boy is probably put to that job on which he achieves the best results. The idea that the lad is apprenticed to learn a trade and to become thoroughly proficient in all its branches is lost sight of. It no longer forms the governing factor in the determination of the lad's work during his apprenticeship. What is the result? What must be the result of such a method of training? The boy can never become an efficient tradesman. He loses all interest in his work. He may perhaps become skilled in some small special class of work, or the use of some special class of machine, but there is not one chance in a thousand for him to become a really good tradesman.

It must be admitted that the above is by no means an exaggerated picture of the usual apprenticeship as it rules to-day, and it is apparent that such a system is first grossly unfair to the boy, and, further, it must have a far-reaching effect on the well-being of the community in that our work in the future will be carried on with practically unskilled labour.

There is no doubt, of course, that the introduction of automatic machinery, and machine processes generally, have largely assisted in the above result, as many of the processes at one time carried out by efficient men, and requiring the greatest skill, are now done by machinery.

How can we improve and better the present system? There is not 5 per cent. of the apprentices to-day who have a technical training, and there is a very small percentage of men who have any real idea of the principles of workshop practice.

There can be no doubt that in the question of the training of apprentices, improvers and tradesmen the Technical College should find its chief duty. Practically the

position may be summed up as follows. As experience, an apprenticeship may be good, although there is room for great improvement, but as a scheme of systematic instruction it is hopelessly inefficient. The function of the Technical College must be to provide such instruction in every trade so far as it is capable of being systematised. Nothing is more urgently needed at the present time than a proper organisation and co-ordination of the State scheme of technical instruction in relation to first, Primary Instruction; secondly, Advanced professional education at the University; and, thirdly, and above all, in relation to the needs of the various trades and industries of the State.

To my mind the Technical College at present is not worked on the right lines. It is usurping much of the work that properly belongs to the University, and in attempting to do this work, it is neglecting the equally important duties it is obviously intended to undertake. I feel sure that the Technical College should be devoted to providing thorough sound training in the principles and practice of the various trades, and this training should be complete in range, so as to deal not only with boys and apprentices, but also to provide more advanced training for improvers and junior tradesmen, to enable them to fit themselves for foremen's and other senior positions.

Then, beyond all this, one must have the school for training men of more than average intelligence, who desire to take up the professional side of engineering work. This school should also undertake research work, as in so doing it would provide admirable practical training for its students. This part of the training must obviously belong to the University, and every lad who has shown that he possesses more than average intelligence, whether

in his primary training or in his subsequent work at the Technical College, should be given every possible opportunity to take up the University course, the State rendering such financial aid as may be required.

It is with the idea of fostering a closer association between the engineers in active service, such as the majority of members of this Association, and the lads who are being trained to the profession, that I have consistently and persistently in the past advocated a closer association between our members and the University Engineering School, and one of the most satisfactory features of our activity during the past year or two has been the increased connection between our Association and the University. Nothing but good can result to both Associations from a continued and growing intercourse between them—our own Association, the oldest-established of its kind in Australia, in which the professional interests of all branches of the Engineering are represented, and the P. N. Russell School of Engineering, the largest and best-equipped of such schools throughout the Commonwealth, where the future leaders of the profession in this State are being trained in the fundamental principles which underlie the practice of modern engineering, and without a knowledge of which the engineer of the future will be seriously hampered.

This improvement in our relationships to which I refer is not peculiar to ourselves or to this State, but is only an illustration of a general movement that has been going on for a good many years past all over the civilised world. It indicates a change of attitude both on the part of the engineering profession and of the universities. There was a time—not so very long ago, possibly not yet entirely in the past—when the universities viewed the engineer, and especially the so-called practical man, with a certain disdain as being unscientific and entirely rule-of-thumb in

his methods, while the engineer trained in the old-fashioned way, and more especially the engineer-manufacturer, viewed the engineering college at the University and its product with the greatest suspicion as embodying everything that was "theoretical" and unpractical. This day was bound to pass. The arbitrary line of distinction between the theoretical and practical, which used to be a favorite topic of discussion, is proved to be meaningless. Present-day engineering enterprise is based on scientific knowledge and investigation. If any proof of this statement were required it would be found again and again in the history of the development of the great electrical industries, in the development of the steam turbine, of the internal combustion engines, the modern warship, or the striking development of artificial materials of construction. On the other hand, the change in method adopted by a modern engineering college, with its efficiently-equipped laboratories and workshops, is a clear indication that it has come to be recognised that theoretical knowledge of scientific principles which cannot express itself in concrete terms and cannot apply itself to the range of technical problems, is not real knowledge at all. The modern idea of the university is not that it is a close preserve where a few favoured mortals pursue knowledge in an atmosphere remote from the general people, but that it is rather an institution maintained by the community for its own good and the general welfare of all. And this is equally true whether we are considering the study of the classics or the physical properties of building materials.

Members who had the pleasure of visiting the University Engineering School a week or two ago must have been interested in what they saw, and also must have more clearly realised the possibilities of this school in the training of the engineer.

I trust that the work that has been begun in bringing engineers more closely into touch with the training system, both at the Technical College and the University will bear good fruit, feeling sure that "primary training" is of first importance, will inevitably tend to the advancement of the engineer and the well-being of the profession.
