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THE ENGINEERING PROFESSION IN AUSTRALIA.

By Lieut.-Colonel J. Monash
(President).

In coming before you as President of this Institute at the conclusion of my year of office, I desire in the first place to record my deep appreciation of the support and assistance which I have received from the Council, the officers and the members of the Institute, in the discharge of duties, which though always pleasant, are often onerous and responsible. I have also to tender you my sincere thanks for the honour you have conferred upon me in electing me for a second term, and to assure you that it will be my earnest endeavour to serve the Institute, and to safeguard its interests in every direction to the best of my power.

If I were to follow the traditions of this Institute and of kindred societies on an occasion such as the present, I should now invite your attention either to a survey of the progress of engineering science and its applications in the recent past—the range of review being either world-wide or confined to matters of special Australian interest; or else to a discussion of one or more of the large questions of engineering policy, which happen at the moment to be occupying a prominent place in the public mind.

I venture, however, to break away from this tradition, in order to avail myself of the present opportunity to discuss the Engineering Profession itself, its present-day status, its training, and the relations of its members to each other and to the community, with particular reference to the present position of the profession in Australia. Stated in brief the purpose and aim of this address is to be a plea for a greater solidarity among our engineers; for a greater measure of mutual sympathy and support; and for a more energetic striving after higher ideals, higher standards of educational and technical efficiency, and a fuller realization of responsibility to the community.

All affirmations of a generalized character are open to the danger of being controverted by the citation of the exceptions to which every such generalization is subject. Any generalized criticisms, therefore, of apparent defects and shortcomings of our profession as it exists in Australia to-day are calculated to meet with dissent from, and possibly cause offence to those
who form, or think they form, the exceptions to the stated rule. It is undoubtedly true that among the leaders of our profession, and also among the subordinate ranks, there are many men of the highest calibre, who, by their temperament, character, industry, conscientiousness and enterprise, stand out as models for their professional colleagues. But, unfortunately, such men are but the hilltops and eminences in the general level plain of mediocrity; and a profession such as ours has to be judged, and is in fact judged by the lay public, upon the criterion of its average quality and performance.

Now, in Australia there are two important factors which differentiate the position of the engineering profession from that which it occupies in most older communities, and both of which operate to subject it to difficulties in the working out of its destiny which are largely exceptional. The first is that a considerable majority of the engineers of Australia are in the direct employment of State departments or of public and semi-public corporations, while only a comparatively small minority are in private practice or in the service of privately-owned and operated commercial or industrial enterprises. The second is that there exists among us as a condition precedent to admission to the ranks of the profession no well-defined general standard of training and competence.

A little reflection will show that both these causes operate in the same direction of lowered efficiency. It is proverbial, and quite understandable, that governmental or municipal service, lacking as it does the constant stimulus of private competition, tends to sap the initiative and curb the zeal of the official practitioner. Rightly or wrongly, the engineering practice of many public and municipal departments is on strictly conservative and stereotyped lines, so that there is little room for personal initiative or enterprise on the part especially of the engineer of the rank and file, who becomes automatically largely a copyist of applications and methods, without much need for the recognition of the underlying scientific principles, or for the pursuit of fresh knowledge of the advancement of the scientific side of his work. Moreover, to most men, their calling is but a means to an end, and the tenure of most official appointments is reasonably secure apart from any effort on the part of the holder to attain and maintain the highest standard of efficiency; and thus it follows that, as a general rule, there is a notable absence, in the environment, of any powerful stimulus to intellectual enterprise such as is ever present in private employment, where competition calls for constantly sustained effort in that direction. The immediate
consequence of such a state of things is that, in all but exceptional cases, the man's purely scientific training is arrested at the exact point at which his past efforts have helped him to achieve his appointment, and from that time onward his further training is purely practical and limited rather strictly to those branches of practice within his immediate and daily purview. It is a trite saying that a man's education only begins after his schooldays are over, and so also it is to be recognised that, in these days of extraordinarily rapid progress in engineering achievement, the education of the engineer, however comprehensive has been his training during his period of tutelage, must be pursued by himself with ever-increasing energy to the very end of his professional career. That which I specially desire to emphasize in the present context is that in the great majority of cases our engineers live and work in an environment which helps them not at all in this direction, so that the appeal for a continuance of self-educational effort is one that makes all the greater demands upon the industry and enterprise of the individual.

Let me examine, shortly, the other factor which makes for a low average quality, that of the absence of a general and uniform standard of competency. I do not propose to enter upon the recently much-trodden domain in which the essentials of a modern engineering education have been so comprehensively debated; but I shall in passing proclaim myself an adherent to that school of thought which demands a broad general education as the basis of the specialized training of the engineer. It is sufficient for my purpose to point out the widely differing avenues by which our profession can be entered in this community. At one end of the scale we have the full University curriculum, aiming at a grounding in all the important natural and applied sciences which are the handmaidens of the engineer, followed by specialized training in the principles and practice of the several main branches of engineering science, the whole course of study being designed to produce not so much a man competent at once to enter the commercial or industrial arena—but rather one with a well-trained and well-stored mind, and with his faculties sharpened to serve his needs in a professional career covering the widest range of practice. At the other end of the scale we have the engineer who is practically wholly self-taught, graduating entirely in the school of experience while serving in a subordinate capacity in a private engineering office or in a department, whose training is almost entirely practical, aided by a little, though a very little, desultory, undirected and unsystematic study, and entering upon his professional career without having, and often without the
need of having any hall-mark or stamp of approval from University, technical school or State Examination Board. I am not to be understood to disparage an engineer of such a class. There are many instances on record of able and eminent engineers who have had just such a training. But I do think that the concurrent existence of the diverse methods of entering the engineering profession which I have thus contrasted, together with the many intermediate methods which also prevail, have the undoubted general tendency of lowering the average of educational qualification and the average of professional efficiency.

I am rather apprehensive lest in discussing some of the standards of competency required by usage and by statute in this community I may cause offence to a body of estimable and competent practitioners working under those very standards; but it will be readily conceded that such a consequence would merely be the result of confusing cause and effect. Take, as an example, the standard of professional knowledge required by our Local Government Act or the Water Act. It is quite true that the professed purpose of these Acts is not to establish a criterion as to what shall constitute an engineer, but merely to demand of certain municipal and trust officers evidence of the possession of at least a minimum of expert knowledge for the purposes of a particular and comparatively narrow sphere of professional activity. But the practical effect is, nevertheless, to establish a definite avenue and portal by which a man may enter the ranks of the engineering profession, and to prescribe the maximum requisite for such an entry. Those who are familiar with these requirements are aware of their very limited scope, that they call for no knowledge, even the most elementary, of the kindred sciences, such as Chemistry, Geology, Petrology or Botany, and the sparsest modicum of Mathematics and Natural Philosophy, while such essentially engineering sciences as Thermodynamics, Electricity, and Architecture may remain wholly beyond the ken of a man otherwise fully qualified, under such an enactment, to practise as an engineer.

The several standards, therefore, which exist are so diverse that in effect there is no standard at all; and this is an evil of no small degree, both for the profession and for the public. For, on the one hand, so long as it remains a characteristic of human nature to follow the line of least resistance, large numbers of our engineers of the future will pursue a course of training just sufficient to give admission to the profession, yet wholly inadequate to meet the present-day strenuous demands, thereby perpetuating a low average standing; and, on the other hand, the
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The public, unable to discriminate between the numerous methods of qualification which exist, is confused by the disparity of result, is denied the guarantee of high efficiency, and, as a consequence, forms an estimation of the capabilities of the profession as a whole, even lower than the circumstances warrant.

The disparaging tendency of these observations will doubtless lay me open to the criticism that I have no justification, in fact, for the implied assertion that the average status and competency of our profession in Australia is lower than that of older countries, as, for example, England, Germany, and the United States. I nevertheless believe this to be the case, and that the reasons already stated have contributed to that result. And to test the accuracy of my conclusion, let any one ask himself what would be the result if, in this community, there were in the future to arise conditions greatly raising the accepted standards for admission into the profession, such as exist in the countries named, and which would also offer a largely increased field for the employment of the engineer in private industrial, manufacturing, and transportation enterprises, such as also exist in the countries named. None can doubt that the profession would thereby be greatly raised in average efficiency and standing.

Apart from such reasoning, there is abundant evidence of shortcomings in the Australian engineering profession. There is a lamentable want of cohesion, and a general indifference to corporate action and purpose—as evidenced upon the one hand by the number of different Societies and Institutes of Engineers professing almost identical objects, and on the other hand by the small percentage of engineers who display a worthy or sufficient concern in such attempts to consolidate the profession in the interests of itself and of the community. There is an unhappy tendency towards the formation of cliques in the ranks of the profession such as between men with University training, and men trained otherwise, or as between men in the public or municipal service, and men practising otherwise. These are all symptoms of a regrettable want of sympathy, and the absence of a spirit of co-operation, which can, while they continue, operate only to its disadvantage, and so indirectly to the disadvantage of every member of it.

Even though active disunions are but passing phases, the ineptitude of Victorian Engineers in effective corporate action has in the past militated not merely against their own material interests, but has operated to hold in abeyance or entirely suppress many useful activities which the community has a right to look
to the profession to initiate, foster, and mature. Thus there is the important question, already suggested, of a recognized engineering training, followed by registration and a consequential guaranteed status, such as prevails in most of our sister professions. In the realm of Engineering research, particularly having regard to our special problems, our special engineering material, and our geographical location, the efforts of the past have been spasmodic and ill-directed. We have neither Department or Committee of Engineering Standards, nor any public Research or Testing Laboratory. We have no public Institution for the education of the people in Engineering Technology—nor any corporate means to stimulate invention or encourage and assist our native-born inventors. Our record in the modern field of aeronautics is bare—our contributions to the sum of scientific knowledge in the field of Engineering are negligible. In all these and many other directions, the public has a right to look to the Engineering profession to inspire and prosecute such corporate action as will ensure the fostering of its prosperity as an advanced and up-to-date democracy.

The Australian nation has been blessed by an immunity from war and bloodshed of the kind which has shaken Europe and America for the last hundred years, and this immunity it owes chiefly to its geographical position, far removed from the centre of the world's stress and storm. But this very removal has brought about a partial, but serious, severance from other and beneficial activities of the old world; and in spite of our vaunted development and progress, I venture to assert that Australia is gradually but surely losing ground, and is falling steadily behind in national fitness—by reason chiefly of the growing tendency to insularity, and the mistaken patriotism which regards as an impairment of Australian interests the bringing into Australia not merely the material products but even the thought and brain power of older lands. This is meant in no political sense; allusion being made merely to the prevailing prejudices against things foreign. I do not think that such stupid prejudices are very common among Engineers, but I do think that Engineers seldom, if ever, put themselves to any pains to educate the lay mind so as to predispose it in favour of the adoption of the best that Engineering Science can offer, regardless of the country of its origin. In other words, I believe that the profession in Australia is, as a whole, with a few notable exceptions, passively, if not actively, insular. Nothing could be more striking than the contrast
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which the intelligent observer when abroad will note between the mental attitude of the Australian Engineer to the work of his confereres in Europe and America and that of the Engineers in England, or Germany, or France, or America towards each other. To begin with, the majority of English practitioners possess a sufficient smattering of French and German to enable them to intelligently skim the foreign technical press—while in Germany, in particular, every professional man of any standing at all, can read, write, and speak English fluently. The result in Europe is a community of knowledge and experience, and a rapid dissemination of engineering data and concepts regardless of their source, to the great and beneficial uplifting of the whole profession.

But what is the position in Australia? Our medical friends have already learned the lesson, and many Australian medical men regularly draw their knowledge of current developments abroad in the many branches of their science from the technical literature of the day, in the original French or German. But what about the Engineer? I venture to say that the instances are rare indeed of engineers, in our midst, who even realize the losses to which they are subjected by being cut off from the best of contemporary foreign engineering thought—and who much less trouble to qualify themselves for a systematic perusal of current foreign journals. Are there current foreign journals on the shelves of this Institute, such as “La Genie Civil” or “Beton und Eisen”? There are none, because there is no demand here for such literature. And the case is even worse in regard to the current technical literature in the English language, where there can be no excuse except sheer indifference to the contemporary progress of engineering science. While I shall admit that there is a sprinkling of our Australian Engineers who regularly practice the habit of carefully reading, digesting, and card-indexing current engineering literature, I venture to assert that these form only a small minority, and that the great majority of our engineers become acquainted with the progress of engineering science only through the meagre and often inaccurate channels of the daily press. How many of our engineers have any close detailed technical knowledge of the great contemporary works such as the Panama Canal, or the Jungfrau Railway, or the Manhattan or Queensboro' Bridges, or have even heard of, much less mastered, the modern methods of the statical design
of unbraced frame structures? In short, the mental horizon of
the majority of Australian Engineers appears to be bounded by the
Australian coast line; their interest in the art they practise is
confined to their favourite pocket book, not always in its latest
edition. I feel that I have not overstated the case, but even if
I have, a plea, such as this is, for the realization of the duty
which every engineer among us owes to himself and to the com-
community he serves to keep abreast of the latest thought and
practice should not, on that account, pass unheeded.

We have, in this country, developed to an extreme degree the
institutions of local Government, and the management by lay
Boards, Councils, and Trusts, of undertakings involving the exec-
ution of Engineering works on a considerable scale. The late
Professor Kernot pointed out with much force what a dangerous
combination was power and ignorance, in this particular connec-
tion. By ignorance he meant no more than the uninformed,
rather than the ill-informed condition of mind of the average
councillor or commissioner upon engineering principles. This
condition of things imposes all the greater responsibility upon
the engineer in the service of such a body. His duties are educa-
tive as well as executive, yet how rarely are these functions suc-
cessfully exercised concurrently? How often are the advice and
the recommendations of the engineer disregarded, because he
either does not possess, or does not exercise, the faculty of making
plain to the lay mind the propriety and the well-grounded scientific
basis of the advice he tenders—and sometimes indeed because he
is a mere copyist and does not himself understand the underlying
principles upon which his recommendations are founded. In this
way does the prestige of the individual suffer, and, as a conse-
quence, the prestige of the profession also, with a consequent
lowering of status. I maintain that for this the profession
is itself chiefly to blame in having failed in the past to insist
upon a higher all-round standard of education and training, and
in doing so little to bring to the realization of its members the
ever-present necessity of keeping themselves up to date by the
diligent study of current literature and practice.

I have alluded before to the conservative and stereotyped
methods of some of our public and semi-public engineering de-
partments. There are of course arguments in favour of such
policies, especially in the case of our State Railway Departments
on the grounds of greater public safety, but I submit very
strongly that on broad general principles conservatism in engineer-
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ing design is an entirely out-of-date policy, and calculated to retard our progress and development in every direction. The conservatism of British engineers is proverbial, and I am convinced that no factor has contributed so much to the astonishing industrial development of Germany and the United States, which makes them such powerful rivals to the mother country, as the readiness, courage, and enterprise of their engineers to adopt new principles, new methods of construction, new materials and new policies. It may be that an attitude of over-readiness to adopt novel procedures favours the occurrence of more engineering blunders, but these are far outweighed by the benefits of an enterprising policy. To take an illustration, the practical adoption of Reinforced Concrete for Fireproof Warehouse Construction, even before the theory of the subject had been widely tested, did admittedly lead to some failures—no greater in proportion, indeed, than in older and better tried methods—but the readiness to pursue a forward policy has led immediately to the saving of many millions of pounds sterling in the first cost of industrial buildings, and to an enormous reduction in the liability to destruction and loss by fire.

In Australia we suffer from acute conservatism in engineering matters; the inertia of the many nullifying the progressive efforts of the few. Forms and principles of construction, methods of design, and labour-saving machinery which have been the vogue for a couple of decades past in Europe and America, have established but a slender foothold in Australia. We still have in Melbourne an antiquated and ponderous system of suburban passenger transportation, and a still more antiquated cable tramway service; our harbour facilities are of the crudest and most primitive character; the policy of most of our municipalities is still to regard first cost only, and to construct our roads, bridges, and culverts on non-permanent lines, leaving to future generations of taxpayers the heavy burden of repairs and renewals; we have squandered our timber resources, ignoring the practices of modern forestry in vogue elsewhere for many years. Many of our main country roads are mere moraines, rendering mechanical transport impossible. Our great provincial centres are still unsewered; some of our capital cities suffer from extraordinary congestion of street traffic; while our water power is wholly undeveloped, our methods of handling our great cereal produce are obsolete, and our principal rivers remain uncanalized and useless as commercial highways.
It may be said that these things, or some of them, are beyond the power of our purse, or that we are too young a community to have achieved them. But it requires only a glance at what has been done in these very directions in the Central and Western States of America and Canada, many of which are younger in history than ourselves, to show that those are not sufficient reasons. Want of pence and want of time may indeed with us plead a partial excuse, but there can be no doubt that lack of enterprise has had much to do with the postponement of such developments, and lack of enterprise rests largely upon the absence of a driving force from within the Engineering profession—a force which will formulate the project, and will present it to our public men and to our electors in a form convincing of the benefits and advantages to be attained. While it is true that any engineer highly placed in the public service who would propound and do battle for great schemes of engineering development lays himself open to the severe and generally ill-informed criticism of press and public, that possibility should not be a deterrent. At least I claim it to be true that the impulse should come from within the profession and not from without, and that the engineer, instead of being merely the executant, when public clamour, based on public need, calls for a betterment of engineering facilities, should himself evolve the scheme, mature it, and educate the public mind to its utility, even before the public need is realized.

I have animadverted upon the false and injurious policy of shutting our doors to the infusion of fresh engineering thought and inspiration from abroad. At the same time one can heartily sympathise with the desire to conserve to our native born and locally trained engineers preferment to the higher and highest offices in the gift of the community. It must nevertheless be clear that an undiscriminating and long-sustained fulfilment of such a desire will lead to a condition of stagnation and atrophy in our professional development; and it must be realised that, after all, diligent study of text books and professional journals alone, are not enough to successfully transplant the best that the example of older countries can offer us. There is fortunately available a middle course, serving both ends; a course which has been but rarely adopted by our Governments or public bodies, and yet never adopted without the most beneficial results; and that course is to send our responsible departmental engineers abroad, at the public expense, at regular and comparatively frequent
intervals to cull from the rich pastures of distant countries a plenteous garnering of knowledge and experience of direct service and benefit to ourselves. In this matter again does the public mind require education, so that the spectacle may not be repeated, which shocked those who realized its banality, of a public body, some little time ago, denying to its principal engineering adviser permission to extend for a short time at his own expense the term of his leave and the scope of his travels, for the sole purpose of gathering data of the utmost value in that particular sphere.

It may be safely declared that no really worthy engineering development in Victoria in the present generation has been accomplished except as the result either of bringing from abroad the special skill required to conceive and direct the undertaking or of sending abroad our own engineers, carefully selected for the purpose, to acquire or perfect the necessary skill and knowledge. My point is that the latter practice has been all too rare in the past, that experience has justified its utility, that it is one which the profession as a whole should support, and that it is the only way consistent with our doctrine of Australia for the Australians, to break down the conservatism and retarded development of our engineering policy.

It might still be urged that all the knowledge that it is really necessary for us to acquire is, and can be, sufficiently conveyed by current technical journals and by text books. The answer to this objection is threefold. Much that is of immediate value in contemporary practice does not get into literature until time has elapsed—often a long time—especially if the source be a foreign country, and the literature consulted be in the English language. The printed description seldom conveys a true sense of proportion or a correct picture of the environment, both of which are so necessary to the complete understanding of engineering undertakings. And, lastly, but chiefly, the mere perusal of the description of an undertaking, or process or method is at best secondary knowledge, and wholly lacks the advantage of that discrimination which a trained observer with a full knowledge of our local requirements and our local conditions is able to apply in the special enquiries which he goes abroad, of set purpose, to make.

I have been endeavouring to indicate several directions in which the general utility and competency of our profession can be greatly raised by influences from abroad. In a minor degree, but
still in a potent degree, I think that much more can be done than
has in the past been done in this same direction by influences from
within. There is, and has been among us, but a small and alto-
together inadequate amount of work in the direction of mutual help.
Most practitioners labour for their own hand alone, indifferent to
the benefits which they have the opportunity and ability to confer
upon the profession as a whole by availing themselves of the
existing channels to acquaint their professional brethren with the
results of their practice and experience. In such a country as
the United States, it is regarded as a moral obligation upon pro-
fessional men, whether engaged in the pursuit of abstract science,
or in the industrial applications of it, to communicate through the
medium of conferences, congresses, learned societies, technical
journals, pamphlets and bulletins an account of their work, both
descriptive and statistical, and such practices have proved of im-
mense service to the professions, and in quite an especial degree
to the engineering profession in America. Indeed one of the
striking characteristics of that great and advanced nation is the
aptitude and readiness to disseminate, in all departments of human
activity, knowledge of value to all, and it is this characteristic
more than any other which has helped it to achieve its wonderful
development.

The evidences of the lack of such a dissemination of knowledge
are very plain among us by the extraordinary divergences of
practice and wide disparities in the results, in the most ordinary
and everyday branches of engineering practice, such as road-
making, town street construction, storm water drainage, the
selection and use of our natural timbers and building stones,
distribution of water and the like; or even in workshop organisa-
tion, equipment, and management. And there is no doubt that
many failures or indifferent successes could have been obviated
by a fuller community of thought, a better exchange of views,
and a greater sense of the obligation upon each to communicate
to all the knowledge of the factors which have made for failure
or success. In this particular aspect of the day-to-day education
of the engineer, I am led naturally to the reflection that the pro-
fession has a right to look for instruction and enlightenment more
to the great public construction departments than to any other
home source. These departments have an immense advantage
over the individual, of a certain measure of continuity of thought
and continuity of experience independent of a changing personnel;
they have also the means and opportunity, as well as the scope.
for a considerable amount of research work, which indeed a few of our departments have practised to a most commendable degree. In this way there has become accumulated a considerable store of knowledge, of great local, as well as general interest, relating to climatic conditions and influences, materials and methods; and this knowledge has to a large extent found expression in the works actually carried out by the several departments. But all this accumulated knowledge is to the general ranks of the profession a closed book, and even a knowledge of the works themselves reaches the great bulk of the profession only through lay channels. My purpose is here to deliberately suggest that it should be regarded as the duty of engineers highly placed in the public service to make regular communications, or to authorise them to be made by subordinates, of the results of all valuable exploratory and research work, and of the preliminary data, elements of design and experience of execution of all important public works—such communications being in the form either of papers to learned societies such as ours, or as brochures, and bulletins which can be made available to the profession either free or at very low cost. Such procedures would powerfully stimulate interest in current engineering enquiries and undertakings, would tend to expand the knowledge and breadth of view of our engineers, and would create a greater measure of sympathy between them. With the creation of a well-informed professional sentiment, the public departments have more to gain by the collective support of the profession on occasions of ill-conceived newspaper or political criticism than they would lose by the apprehended danger of furnishing material to their critics. It will, of course, be said that the policy of public departments forbids freedom to disclose their affairs; but that is a generalization which does not reach to matters of general scientific value and interest, and I do not suggest that there should be no discrimination shown in cases where premature disclosures of the details of engineering projects would possibly be against public policy. But such cases are the exceptions and not the rule; and it is not necessary to do more than point to the liberality of the public departments of the United States in their voluminous publications of the results of their surveys, researches, testing, and experimental functions, and of descriptions and statistics regarding the works carried out by them. In the absence among us of technical journals of high quality devoted expressly to Australian engineering affairs I know of no other channels which can carry into the hands of Australian engineers an adequate knowledge of the Engineering practice which prevails at our very doors. It is therefore a matter of no
surprise that so little is known among us of the most notable of contemporary engineering works of Australia such as the Burrinjoik Dam, the projected weirs on the River Murray in South Australia, the Harbour Works at Fremantle and Port Adelaide, the State ship-building yards in Port Jackson, or the regrading of the Western Railway at Penrith, to say nothing of purely local schemes in process of construction such as the O'Shannassy Creek Water Supply, or the duplication of the Flinders-street viaduct, or the proposed physical laboratory of the Railway Department; the ignorance or indifference as to such works and projects being by no means confined to engineers dissociated from the public service, but prevailing equally among departmental engineers not serving the particular department concerned. That this is no overstatement can be verified by an appeal to our corporate conscience; that it is an evil by which the engineering profession is disadvantaged must be conceded, and that the remedy depends upon the profession itself is the point that it is my particular purpose to urge upon your notice.

I have precluded these observations by saying that they formulate an appeal for a betterment of status, for more effective and useful corporate action, and for a continual striving after increased efficiency. I do not pretend either that the recital of observable shortcomings is exhaustive, or that the remedial measures suggested are the best or the only ones. But the reflections which I have ventured to place before you have been conceived in the earnest hope that good may result in the particular sphere which is the chief justification for the existence of this Institute.

Mr. Clements, senior Vice-President, who occupied the chair during the reading, said they would all agree they had heard a well-thought-out and able paper. The choice of the subject for the Presidential address was usually a very difficult one, but he thought upon this occasion the President had been very happy in his choice. The President had touched upon some very important aspects of engineering conditions in Australia, but he could not help thinking that a good deal of the handicap that the engineering profession was labouring under in Australia was due to the fact that they lived in a huge continent, whereas in Europe they were surrounded by large engineering works of all kinds. He rather thought the President had not given sufficient importance to that point of view. However, they could not discuss a Presidential address.
The President had referred to the fact that they were specially handicapped in not being able to see all those large works, and that therefore as much as possible they should go abroad and see what was to be seen. He thought that more particularly applied to civil engineering, such as large hydraulic works and the like, for there they obtained a better idea of the difficulties than when they saw them plotted to one-sixteenth inch to the mile. He rather thought, however, that other branches were not so severely handicapped as would be the civil engineer. When he went home about two years ago he went over a large number of electric supply works, and all he saw, say as regards turbine sets, was a certain number of cases in which certain parts were revolving. But he could not see what was inside. When he returned to Australia he found a most magnificent description of those plants, in the technical journals, together with full working drawings. Therefore he learned a great deal more from the magazines than from his visit to the spot. There might be a great deal of difference due to the circumstances dependent upon the branch of the profession engineers were connected with.

He would move a very hearty vote of thanks to the President for his most able paper.

Mr. J. A. Smith had much pleasure in supporting the motion. They had listened to an exceedingly lucid and powerful address. There was no doubt it would form a valuable addition to their own Proceedings and the literature of Australian engineering. They could not discuss a Presidential address. That was somewhat unfortunate, for he felt sure that the President would have welcomed a discussion that would elucidate other points of view, for everyone must admit that in dealing with engineering there must necessarily be different points of view. There might be differences of opinion; there might be more than one solution; yet they might all be sound. He thought that in some directions Australian engineering was apparently cruder than that of the old country; but it had to be remembered that it was pioneering engineering; a handful of people were developing a country as large as Europe. Necessarily their methods must be less complete than the methods of those countries which had the traditions of centuries behind them, and the accumulated work of generations behind them, and, above all, an immense accumulated capital seeking lucrative investment. Those nations were
lending nations. Australia was largely a borrowing country. There was unlimited capital if the scheme was sound. Here, usually, the engineer must do for 10s. what he should have £1 to do. The work must be done within the interest-meeting power of the revenue.

As to the education of the engineer, the late Prof. Kernot dealt in the light of 40 years' experience on the education of the engineer, and it would be interesting to note points of accordance and points of divergence between his views and those of Col. Monash. A comparison of two such addresses would give them a very valuable insight indeed into the question of the education of the engineer in Australia.

Mr. J. H. D. Brearley said he was very pleased to have an opportunity of saying a few words in appreciation of the President's address. He would like to express on behalf of the Victorian Institute of Electrical Engineers their appreciation of the invitation to attend. He regretted that was the first occasion on which he had been present since he became a member. But the President had gained one convert, and he felt the appeal to engineers to do something. After all, they were like sheep in one respect. They wanted leaders. Men like the President were born leaders and there was much in the address that would appeal to all of them, and stimulate them to nobler effort. He agreed with the President's remarks in many respects, both as to the engineer in Government service, and in private practice, and being somewhat of an enthusiast in the direction of educational matters he could say that Col. Monash had his sympathy in his remarks, and he felt that they needed someone who would throw energy into coordinating all the elements which were now very much disconcerted. There was a movement on foot amongst the electrical engineers to bring together the electrical men of Australia into an Australasian Institute, and there seemed to be some prospect of success. He saw no reason why other branches of the profession should not be brought together. He sympathised with that feature of the address which indicated that the engineer should be the pioneer of development. The engineer should formulate the scheme Mr. Smith had referred to in preceding addresses, and he thought the means would always be forthcoming. If they looked at the great developments of history, they would
find that the engineer had been one of the noblest pioneers, and there was no reason why in Australia they should not seize their advantages and go forward. He took the opportunity of again thanking the President for his address.

Prof. H. Payne said it gave him much pleasure to support the vote of thanks to Col. Monash. He had brought forward a subject which he hoped the Institute would see its way to circulate widely. The printing of this paper should be one of the early duties of the Publication Committee. He was very glad that the President had distinctly tackled the point of view that the Australian engineer was not in the forefront of the profession. He had drawn a line between the public and the private engineer, and in drawing that line he thought the President had distinctly hit the nail on the head when he said that the public engineer, directly he was appointed, in nine cases out of ten, goes to sleep, and he had also at the same time suggested a remedy which, if this Institute could persuade the Government to carry through, would be a very effective remedy for some who were tempted to sleep, viz., that all public departments should publish in pamphlet or bulletin form the material which they were dealing with. In that way the flood of public criticism would come upon the men of the public service.

The departments did not like the publication. They had to his personal knowledge refused to allow students working under him and past graduates to publish any work, although it was of research nature, unless first of all the work was submitted to the heads of the department, and received their sanction for publication. In matters of research work he thought there should be no restriction, no matter whether it happened to hit any particular problem on the one side or the other side, and that every officer of the public service should have the absolute right, without fear of losing his status, of having his work published if he carried out any research work. He thought it would be a great point if Col. Monash, as President, could move in the matter, and bring it before the State Government, and get an order sent out authorising every member of the profession to send forward matter for publication, if necessary, to a publication committee.

The private profession naturally asks, Why should they publish for the sake of the Government? All our work will be snapped up by the Government, and they will give nothing back.
Undoubtedly the Government were there to serve the people, and the first step should come from them. Private practitioners would be very quick to see that those who did the publication got the kudos, and they in their turn would come forward after a brief trial to show that they were in no way behind those who were able to carry out the publication. In that way he thought they would be advancing somewhat towards the American standard which the President had intimated existed. It was only when they got absolute freedom of interchange of ideas that the profession as a whole could advance, because, after all, advance was by the individuals, and they could only advance when they had the collective matter before them.

He would like to say in relation to the testing laboratories, he would welcome the establishment of as many as possible in the city. The physical laboratory of the railways was no longer a proposal, but an accomplished fact, and they were doing most of their testing themselves, and doing it very effectively and very well. He had much pleasure in supporting the vote of thanks.

Mr. H. L. Wilkinson (a visitor) said he would like to say a few words as a visitor. He had just returned from a journey through Europe and America, and a considerable part of China and Japan, and so he felt he was competent to say a few words comparing the status of the engineer in Australia with those of other countries. He was sorry to say he had to agree with what Col. Monash had stated, that engineering in Australia was of a relatively low standard. And it was disastrous not only to themselves, but to the country. He would deal with the disastrous effects it had upon the country. Notwithstanding their isolation, notwithstanding the fact that they had a large amount of the work taken away from private enterprise and placed in Government departments, notwithstanding the relatively poor nature of our land compared with America, from the point of view of engineering enterprise Australia was one of the most backward places of the world. Was not the Australian engineer, individually and collectively, to blame for the condition of affairs here?

He may blame the Government or Parliament, but primarily the engineer was to blame for not bringing those matters before the general public. If the engineers in Australia had realised their responsibility, and had followed the high standards that
their profession ought to have, did they think if the engineers had continuously brought this matter before the public that it would be in its present state? He referred to the fact that they had in Australia half a dozen different railway gauges. He felt confident that the lack of engineers feeling the responsibility of their position had had a disastrous effect on Australia.

Mr. J. A. Smith said the engineers of Australia had placed their opinion on this matter most emphatically and prominently before the public.

Continuing, Mr. Wilkinson said, regarding the disastrous effects on the engineer himself, he thought they all agreed that the engineer of Australia did not get sufficient remuneration, and the feeling had grown to ask whether, being a better man would bring the reward which would justify the additional work. If the Government departments appreciated the necessity of paying their engineers well, that would have the effect of instilling the feeling that it was worth while to be a better man. He felt that in both those directions the engineer to a large extent had the matter in his own hands. They should bring before the public what ought to be done. If they showed that they appreciated large things, he was sure that the public would appreciate that and reward them accordingly by increasing their standard.

It had given him much pleasure to be present.

Mr. Wm. Chas. Rowe supported the vote of thanks to the President. Over and above all that had been said there was one thing that was necessary—they must have confidence in the country. The trouble was there was not sufficient confidence in the country to allow of large works being pushed forward. Works should be done for posterity, and the present generation could not see their way clear to make large expenditures and launch out into large ventures. Look at it from the point of view of the commencement of large factories. Tangye's, for example, started in premises 10 feet square; to-day they were employing 4,000 to 5,000 men. They had been building up because they had always been looking forward to larger operations. But in Australia engineers were confined by so many difficulties that men were doubtful about making large expansions. He had been particularly impressed by one point in the President's address, and that was the collating of data from the technical journals and magazines, and recording them. He had done so for the
past five or six years, and had found it one of the most valuable aids in everyday practice. It was one of the best pieces of advice that the President had placed before the younger engineers.

The President thanked members for their appreciation. He had approached the task with much fear and trembling. He held strong convictions, and believed it was a time for plain speaking, and was very pleased that his remarks had met with appreciation. They were looking forward with hopeful feelings to the future, and hoped they were entering upon a successful year. He appealed to members to regard it as a duty to support the Council in making the ensuing year worthy of all its predecessors.
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