9TH MARCH, 1911.

ADDRESS BY THE PRESIDENT.

MR. G. A. JULIUS.

It is with the greatest diffidence that I stand here to-night, in accordance with the custom, to deliver an address. That Great Master Engineer, Sir Benjamin Baker, some years ago in his inaugural address to the members of the Institution of Civil Engineers, pointed out that nowadays Presidential Addresses are out of date productions which no one reads, and referred members to the mass of Technical Journals and other similar publications for useful knowledge, rather than to any matter that he could put before them in his address. To this opinion, expressed by one of the master minds of our profession, I am an humble but staunch subscriber.

I experience the greatest difficulty in delivering an address of any value or interest on Engineering matters in general, and shall therefore chiefly confine myself to certain matters which, in my opinion, are of some importance in the life of this Association, saying only what I feel should be said in these respects, and in the briefest possible way.

First.—I desire to express to you and to your Council, my sincere appreciation of the honor conferred upon me in electing me to this Chair, which has in the past been so worthily filled by older and abler men. I have felt, and still feel, that my previous experience as a member of your Council has been insufficient to fit me for the position of President, but I sincerely trust that at the close of my year in office, I shall be able to look back upon some good work done for our Association.

The best of my efforts will be given to this end, in the hope that any shortcomings will be overlooked, and that you will work with me and with your Council in furthering the interests of the Association.

As is customary, it may be well to briefly review the work and leading features of the past session, and of primary interest in this respect, and unhappily of saddest also, is the death of our late Hon. Secretary, Mr. H. V. Ahrbecker, which occurred on the 20th November, 1910.

Mr. Ahrbecker joined this Association in the year 1888, was elected a Life Member in 1908, and occupied the position of Hon. Secretary from the year 1889 until his death, a period of over 20 years. During that time he took a whole-souled interest in the affairs of the Association, undertook and carried out the editing and publication of our Annual Proceedings, a task of no small magnitude, at the same time advising and assisting successive Presidents, and throughout the whole period sparing no efforts in the advancement of the Association. By his death we have lost a loyal friend and councillor, and the gap so left will be hard to fill.

Your Council recently suggested to the members, by circular, that we, as a body, should erect a memorial stone over the late Mr. Ahrbeckers grave as an expression of esteem and remembrance, and they feel sure that you will be glad to fittingly recognise the long, useful, and loyal service so truly rendered to this Association by our late Hon. Secretary.

Your Council has not thought it at present advisable to elect any successor to this office for the balance of the Session, but have nominated a Committee to take up the editing of last year's proceedings, which work fell somewhat into arrears owing to the long period of ill-health through which Mr. Ahrbecker passed prior to his death.

During this past Session the Association has also lost, by death, two of its oldest members, Messrs. P. Hunter and J. Laing, both of whom had been members since the inception of the Association in the year 1870.

At the end of the 30th Session, that is in September 1909, the membership of the Association was as follows:—Members, 161; Associates, 3; Student Associates, 2; and Students, 36; a total of 202. At the same date in 1910, the total had increased to 217, and at the present date the roll is as follows:—Members, 178; Associates, 3; Student Associates, 5; and Students, 46; making a total of 232; a very satisfactory and promising increase. (Plate I.)

During the past Session, eight meetings were held, at which there was an average attendance of 70.

On the 27th October, 1910, a number of members visited the works of Messrs. G. and C. Hoskins, at Eskbank, and through the courtesy of that firm spent some highly instructive and enjoyable hours in inspecting the various processes in operation at their works. To those of us who had previously seen the place, the extent of the alterations and improvements either completed or in hand, was very remarkable, and bore ample testimony, if such was required, to the administrative and professional skill and energy on the part of those responsible for the change; but an enormous amount of work has yet to be done to bring the plant thoroughly up to date. The further alterations and additions to be made in the near future, as most carefully explained to us by Mr. C. Hoskins, will go a long way towards ensuring efficient operation, and under this term I include both quality of material produced and cost of production.

There can be no doubt that the people of Australia will in time come to realise their indebtedness to Messrs. G. & C. Hoskins, Ltd., for the firm establishment of the iron and steel industry in this country.

Recently a visit was paid to the Electrolytic Refining and Smelting Company's works at Port Kembla, where, by the courtesy of Mr. Magnus, the works and operations of that company were inspected. The visit was full of interest and the various processes and appliances were new to most of us, representing as they do the establishment of a large, complete, and thoroughly modern equipment for the conduct of one of the most recent and refined metallurgical processes.

It is to be hoped that during the ensuing Session similar visits will be made to other representative engineering establishments, since such trips are not only instructive, but also introduce a pleasant break in the steady routine of each man's special work.

My immediate predecessor in office, Mr. E. J. Erskine, in his Inaugural Address at the opening of last Session, drew attention to the somewhat weak financial position of this Association, and stated his intention of watching this matter closely during his year of office. You will note from the Annual Report, as at the 30th September, 1910, that is at

the close of Mr. Erskine's term, that the position had improved, being considerably better than at the opening of the Session. This improvement in being maintained, and we trust will continue.

I come now to the matter which I feel to be of primary importance, and in which I hope to be able to interest you, i.e.—The Status of the "Engineer."

What is an Engineer? We call ourselves the "Engineering Association"—that is presumedly an Association of Engineers. To determine therefore the fitness of a candidate for membership in our Association, we must have a clear definition of the term Engineer, and that definition must be applicable to present day practice.

Our profession has made such gigantic strides during the past 30 years, and particularly in the Mechanical and Electrical Branch, that a definition laid down 30 years ago, or even 10 years ago is not applicable to-day.

I know that some of our old members who were trained as Engineers a quarter of a century ago, or more, would not, if starting their careers afresh to-day, be satisfied with the training with which, perforce, they had to be satisfied in past years. They were men who took every available means of acquiring information and training, and who would do the same again now with greatly increased opportunities.

I know that all senior professional men look with envy at the opportunities surrounding the rising generation, for efficient training in whatever profession they may feel inclined to adopt.

It must be apparent, therefore, that in our profession, as in every other, the determination as to the qualifications for full membership must be brought into line from time to time with the advance of the science.

To be a full member of our Association should be looked upon as an honor, and a guarantee of a certain standard of efficiency in one or more of the numerous branches of our profession. We should not have to seek for men to join us. They should come to us, and would do so if we

rigidly maintained a high standard as to eligibility for full membership.

There is no profession so prostituted as this of ours. Any fitter's laborer can, without other qualifications, set up his plate as an Engineer, and can, and does, practice as such without let or hindrance, frequently with disastrous results, as can only be expected. This is not so in the great Sister Professions of Law and Medicine, and it should not be tolerated in our science, which, I am conceited enough to believe is of equal or even greater importance in the life of the community. But this is not recognised by the public, and it will never be so recognised until we, by continued effort, force it upon them. The public will always rate us at something lower than we rate ourselves. We, as members of the senior engineering body in the Commonwealth, claim to be representative "Engineers," and if our claims are to be recognised, we must show to the public that engineering is an exact science, that it calls for special training both practical and theoretical, and that the unqualified man has no more right to call himself an Engineer than he has to practice medicine or law or as an architect. We cannot stop any man calling himself an Engineer if he so thinks fit, but we, as a body, can and should absolutely decline to accept him to membership of this Association, thereby guaranteeing his fitness, until we have thoroughly satisfied ourselves as to his qualifications.

Do not think for a moment that I am presuming to suggest that this or that course of training is essential. There are many ways of becoming a qualified Engineer; and numbers of our ablest men have started their career as unskilled laborers. We have, if I may be permitted to say so, amongst our oldest members, numbers of men who had relatively few opportunities in their young days for obtaining a sound engineering training, but who have, as years have gone by, made themselves masters of their own particular branch of the profession, by a close application to their work. What I wish to urge upon you is that it is essential for us to guard our ranks against the unqualified man, if we are ever to expect to receive that recognition for our Profession, which is the ambition of every true Engineer. By so doing we shall not only raise the whole status of the

Association and make "membership" a much sought honour amongst Engineers, but will also encourage the younger and rising Engineer to perfect his training, in order that he may rise from the lower to the upper ranks, to the benefit of himself, that of the Association, and of the engineering world as a whole.

Again we are faced with the question—What is an Engineer? That is to say, what qualifications should we expect to be possessed by the young man of to-day, training for our profession before admitting him to full membership or even associate membership in this Institution. The question is an extremely difficult one, and whatever laws or regulations may be laid down on the matter in this community, must be of an elastic nature.

Some years ago, as you are all aware, the greatest of the Engineering Associations in the mother country—I refer, of course, to the Institution of Civil Engineers—introduced the examination system, to assist in the determination of the fitness of applicants for associate membership in that body. Such a course is out of the question here, but, in general, we should, I think, expect some degree of both theoretical and practical training.

The words of Sir Jonn Wolfe Barry, a Past President of the Institute of Civil Engineers, are worthy of note on this subject. After strongly advocating the necessity for examination to determine a candidates theoretical knowledge, he made the following remarks:—"While being, as you know, an advocate of examinations for the purpose of ensuring that a man possesses the qualification of theoretical knowledge before he be classed as an engineer belonging to us, I should like to say that I do not wish, for one moment, to be understood as claiming for such knowledge one whit more that it is really worth in the equipment of an engineer for his career. It is one side only, however important that side may be, of our education. Practical knowledge is at least as necessary as theory, and while advocating the cultivation of the latter, I feel very strongly the immense importance of the former. Such practical training as will make a true engineer can only be secured in the old-fashioned way, by a young man seeing work done and learning

from it the lessons of experience. I remember the title of a popular medical book was, 'What to Eat, Drink and Avoid,' an appeal to the personal and individual experiences and idiosyncrasies of the human digestion. In the same way, in an engineer's office, in the workshop, and on works of construction, and there only, can the young engineer learn by experience what he can usefully assimilate, and what he ought to reject, and will be brought face to face with the demonstration of how largely the conclusions of theory have to be modified and discounted by practical considerations and the limits of the attainable. We do not desire to make our successors mere theorists, but good engineers, and we want them, under the pressure of foreign rivalry to be in the future, as they have been in the past, second to none in the world. I think we shall ensure the possession of such a class of men in the world-wide competition which lies before us by insisting, in the first instance, that they have had thorough scientific instruction in the great foundations of engineering knowledge, combined with the help of the most modern science, and by taking at least equal care that it be associated with that practical knowledge and training which are required by our by-laws, and which are to be gained only in the drawing office, in the workshops, and on works of construction."

We here cannot hope to enforce the same degree of "fitness" as is expected in the older institutions at home, but we should and must do all we can in that direction if we are ever to gain a true and proper recognition of the Association's worth, and make it a real power in the community. And before leaving this question of theoretical training, there is another matter which I should like to mention briefly.

Throughout Australia and New Zealand I have noticed a distinct tendency for the University trained engineer and the so-called practical man to hold aloof from one another. The young engineering graduate, when he leaves the University, is, I think, apt to look down upon the less fortunate man who has had little opportunity of acquiring a sound theoretical training, and on the other hand, the workshop trained man is quick to find fault with the almost invariable lack of practical knowledge shown by the Uni-

versity trained man when he first goes out into the world. This feeling is in some States very marked, and has led to considerable differences. Every practical engineer knows nowadays that at least a certain amount of theoretical knowledge is required, and if the Engineering Schools at the various centres are to provide a sound training, they must keep in close touch with the outside engineering world.

Professor Warren is, I know, in sympathy with us, and Professors Barraclough and Gibson, of the Sydney and Brisbane University Engineering Schools respectively, have recently joined our Association, as have also others of the staff at the Sydney school. All are prepared to work with us in bringing their advanced students into closer touch with the student associates and students' section of this Association, a course which I think cannot fail to result in good.

Before leaving the matter of engineering qualifications, I should like first to refer to our Students' Section. The importance of this branch of our Association cannot be over estimated, and it is pleasing to note that it is growing in strength, and that Student Members are taking an active interest in the meetings and other business of their section. Let me take this opportunity of urging upon students to take every advantage of the benefits that can be derived from their meetings. It is of the greatest utility to them to attend these meetings and to hear and criticise the papers and data put before them by those of their own age and standing.

Such criticism and discussion not only brings forward new matter, thereby adding to their knowledge, but also develops readiness in apprehension, quickness of thought, and the power of lucidly addressing others ,all of which matters are of vital importance in after life to an engineer.

I think one with justice might also apply these words to the discussions at our general meetings. They are not what they might and should be, and the want of discussion materially lessens the value to be derived from the papers. I think also I might, without comment, quote a few remarks recently made by the President of the Institution of Mechanical Engineers in England when throwing a paper open

to discussion:—"The President, before calling upon Mr. Davey to open the discussion, said he would venture to make a suggestion which he would ask the members to support. It had been the practice for a long time for most of the speakers, when they dealt with the papers under discussion to make some complimentary reference to them. For instance, they said how excellent the papers were, and how much they congratulated the authors upon them. On the present occasion every one present knew that the paper was a good paper, the author knew it was a good paper, and each speaker reiterating that fact did not make it a better paper. It only occupied time and prevented that fullness of discussion which all the members desired. He, therefore, asked each of the speakers to discuss the paper to get to business at once."

I think we might bear these words in mind.

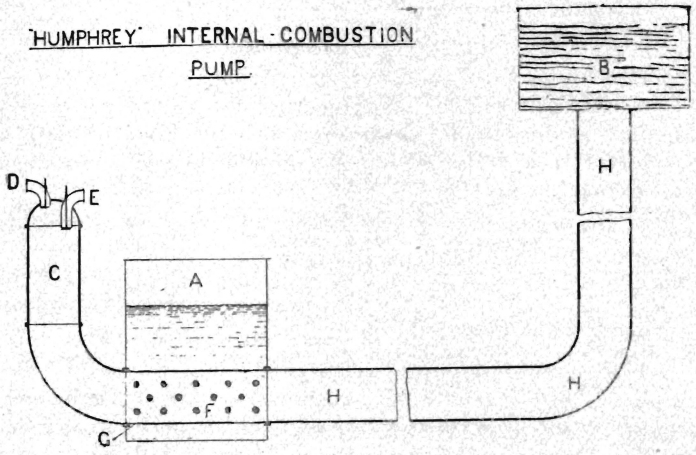
Turning now to the other and perhaps more interesting side of my address, i.e.—Engineering Developments during the past 12 months—I propose to briefly mention some of the most radical departures and advance realised during that period.

In my opinion the most revolutionary development of the year is the Humphrey Internal Combustion Pump. No doubt most of you are familiar with the principle involved in the operation of this appliance, but a brief description and resume of the results of tests, may be of interest.

The inventor's aim was to produce a pump of great simplicity and strength of construction, with a minimum number of mechanical moving parts, and one in which the explosive force of the fired gases is exerted directly upon the surface of the water. No flywheel, cranks, pistons, glands, and bearings of any sort are required in this appliance which, in the inventor's words may be briefly described as follows:—"A method of raising or forcing liquid, which consists in applying the energy of expansion of an ignited combustible mixture to one end of a column of liquid so as to propel the column along a discharge pipe, and to cause it to oscillate in the pipe under such conditions of energy of the moving liquid, that everything necessary for preparing for the next ignition is performed during one or more oscillations, and wholly or partly owing to it or them."

To make the description clear, I have prepared a diagram showing the pump in its simplest form. Water is to be raised from the low level supply tank "A" to the elevated tank "B." "C" is the combustion chamber, with inlet and exhaust valves "D" and "E" for the incoming gas and air, and the outgoing burnt gases respectively. These valves being inter-connected by a simple interlocking gear. "F" is the water valve box, with valve "G" opening inwards, and "H"-"H" is the discharge pipe to the elevated tank "B." The cycle of operation is as follows:—

A charge of gas and air compressed in the chamber "C" is fired by means of an ordinary sparking plug, and



the pressure of the expanding gases sets the whole column of water in motion in the pipe "H"-"H." This water attains a momentum so great that it continues to flow after the pressure of the gas in "C" has been reduced to that of the atmosphere. At this point the exhaust valve "E" opens by its own weight, and water at the same time flows in from the tank "A" through the valve "G" into the pipe "H," mostly to follow the moving column of water in "H," but also to fill the compression chamber "C" in an endeavour to equalise the level in the rising portion of the main "H" and the chamber "C."

As soon as the water in "H" has expended the whole of its kinetic energy, it flows backwards towards "C," gaining velocity and expelling the burnt gases until it reaches the valve "E," which it then closes by impact.

A certain volume of burnt gas is imprisoned in the chamber "C" above the level of the valve "E," and the energy of the backward moving column of water is expended in compressing this cushion of gases to a pressure above that corresponding to the head of the water in "H." The column of water again surges forward, and as it reaches the level of the valve "E," the pressure in the chamber "C" is again reduced to that of the atmosphere, and the further forward motion of the water causes the valve "A" to open against a light spring, and a fresh charge of air and gas is drawn into the combustion chamber "C." The next backward surge of the water compresses this charge, and it is then fired, and the cycle again repeated.

Various modifications of the pump have been built, of both 4 cycle and 2 cycle type, and some also with double barrels, of which, however, time will not permit of a detailed description. Coming now to the results already realised by this pump. Various tests have been made, by Prof. Unwin and others in England, and by various Continental experts.

Prof. Unwin's results were as follows:—

Pump Horse Power	16.15
Lift in Feet	32.9
Water pumped in gallons per minute	1,621
Welsh Coal per pump horse power (hour)	1.06 lbs.

This last figure is a remarkable result to be realised with only a very small pump. In this test the total expenditure of heat in the gas producer was 250 British Thermal Units per pump horse power minute. With the highest efficiency modern steam pumping plant with boilers, engines and pumps equipped with every appliances for ensuring economical operation, such a result has not yet been reached.

Professor Unwin concluded his report with the following remarks:—

"An ordinary gas engine of three times the power, and using similar gas, would use at load 72 to 84 cubic feet of