PRESIDENTIAL ADDRESS.

Delivered on Wednesday, 30th April, 1913.

By J. Haydon Cardew, M. Inst. C.E.

This evening brings to a close the annual session of our Society and my occupancy of the Presidential Chair, and before I proceed to a survey of the doings of the past year, I deem it to be my duty to thank you for the great honour you conferred upon me when you elected me as your President, a compliment which I appreciate greatly as being the choicest gift in your possession, and the bestowal of which has been a crowning event in the last year of my career as a lecturer in the Engineering School of this University.

I shall always look back upon my year of office with feelings of undiluted pleasure, and, indeed, the whole of my six years of work in the University will always afford me a pleasant retrospect.

I look upon the experience of the past six years as an invaluable one, as I feel that I have been influenced greatly to my advantage by the social surroundings, the scientific atmosphere, and the corporate communion of this great University. I came here nominally to teach, but I have learnt a great deal more than I taught, which perhaps you will consider as acting under false pretences, but when I tell you that this result was attained by friendly intercourse with the many eminent teachers in this University, by close association with yourselves, in your studies and various works, by witnessing the prevailing enthusiasm and zeal of both teachers and students, you will come to the conclusion that unless I am formed of very dense material, I could scarcely fail to assimilate some very valuable knowledge, and you will exonerate me for doing unto myself what perhaps I mave failed to do unto others.

Of all the world's happenings since our last General Meeting, there is one that stands out vividly, and I think it is due to this Society that has taken such a keen and practical interest in Antarctic Exploration that I should make reference to the tragic event that occurred on 25th March, 1912, just prior to our last Annual Meeting, in which the heroic Captain Scott and his intrepid companions —Captain Oakes, Lieutenant Bowers, Dr. Wilson, and Seaman Evans—met their deaths in the very moment of victory, the

long delayed news of which caused a shock to the whole civilised world, and also to the news of the sad loss of Dr. Mawson's companions, Dr. Mertz and Lieutenant Ninnis, which followed so hard on the heels of the other sad event. The simple unvarnished tale of how these immortal heroes did the work entrusted to them, and then in the full flush of their fine achievement bowed to the Divine decree of an all-wise Providence, is the finest tribute that can be paid to their memory.

More eloquent lips than mine have already sung their requiem, but we may profitably pause a while, and I will ask you to stand out of respect to their memory, and in silence contemplate the example once more set by our own countrymen of duty nobly done.

The race that can furnish such exemplars of endurance, unselfishness and hardihood is not yet played out, and is still fit to hold its position as the pioneers of the world's civilisation. Our heartfelt sympathies go out to the wives and families of the lost explorers in their terrible bereavement, and our first duty should be to help them in the hour of need.

We offer our hearty congratulations to those who have returned safely from the tomb-like silence of this great lone white continent, and we welcome our friend F. Debenham on his return to our midst.

The session we have just completed has not been such a busy one as I should have liked, but some useful interesting papers have been read and two inspections of public works have been made.

The Presidential Address given by Dr. Madsen deservedly attracted considerable attention from members, and a committee was appointed to deal with various matters of importance arising therefrom to the school, the Society, and the profession; the result of its labours were duly presented to you in a report, and although we were unable to arrive at a complete solution of the questions submitted to us, their ventilation and discussion may yet bring forth fruit and rebound to the credit of your late President.

Mr. T. P. Strickland read a valuable paper, "On the Loss of Head Due to Bend in Pipes," thereby placing on record in our proceedings some of his original experiments at McGill University.

We are indebted to Mr. R. H. Cambage, President of the Royal Society and Chief Mining Surveyor, for a very interesting address, "On the Transferring of the Surface Meridian to Deep Underground Surveys at Balmain Colliery," which was received with much appreciation, and evoked an interesting discussion.

Mr. G. B. Boydell contributed a paper on "System of Assay," plans in use at the Hercules Mine, Mt. Read, Tasmania.

Mr. J. L. Wright, Student Member, read a paper on "Steam Steering Engines and Gears," which traced the evolution of steering engines during the past century and proved of great educative value; the excellence of this paper should be an incentive to other Student Members to go and do likewise.

Mr. Eastaugh stepped into the breach when we were short of papers with a very valuable demonstration of Separation by Flotation, which gave us an unusually interesting evening.

Mr. Walsh, M. Inst., C.E., Engineer to the Sydney Harbour Trust, gave us a very enjoyable outing in his steam launch inspecting the new wharves in Woolloomooloo Bay and the various improvements in wharves and cargo sheds at Darling Harbour.

Mr. Peake, Assoc. M. Inst., C.E., Deputy Engineer in Charge of Sewerage Works, acting on behalf of Mr. Dare, M.E., M. Inst., C.E., Engineer for Sewerage, took us through the works of the Southern and Western Suburbs Ocean Outfall Sewer, which, in spite of a hot day and a long tramp over sandy ground, proved to be interesting from start to finish.

An account of this work, which was compiled for our information, and which may prove interesting to those who were unable to take the trip, is appended to this address with the sanction of Mr. Dare. (See Appendix).

I wish, on behalf of the members of this Society, to offer congratulations to our member, Dr. Bradfield, on his appointment to the important position of Engineer to the Sydney Metropolitan Railways and Harbour Bridge, and also to our member, Mr. Dare, on his appointment as Engineer for Water Conservation and Irrigation, and to wish these gentlemen prosperity in their new positions.

Having briefly reviewed the proceedings of the past year, I now come to the subject matter of my address, which I may say has given me some anxiety.

My late predecessor in office, when vacating the chair, gave me what he thought was kindly advice, to commence writing my address at the beginning of my year of office, so that I might be ready against this day of adversity, but, although I did not literally accept his advice, the subject has had my serious attention on account of its inherent difficulty, not because of the lack of material, but because of its abundance.

I do not propose to range over the world in search of matter to enlarge upon, as is frequently the practice in such an undertaking, although, no doubt, there are plenty of important occurrences and discoveries in engineering which have taken place in the world, and which would have merited our attention, if

the accounts had reached us in time; but engineering development now marches so rapidly that these accounts, when they reach us, are merely echoes of past achievements, but, speaking as an engineer to engineers who are Australians either by birth or adoption, I apprehend that the subject most likely to meet with your approval would be engineering in its practical application to some of the problems of Australian life and its consequent development.

That there are Australian problems of great difficulty to be dealt with, all thinking men and observers of the signs of the times will concede, and I make bold to assert that in the solution of them the engineer will be called upon to take a prominent part.

First and foremost we still have with us the great unsolved problem of how to settle this vast Continent in such a way as will secure it from the intrusion of alien races, and secure it for ever as an appanage of the British Crown.

The settlement of those enormous areas of tropical country in the Northern Territory and Northern Queensland present peculiar difficulties which our Federal Government is only making feeble and futile efforts to overcome.

The great fundamental need for this work is population, and at first sight it would appear as if engineers could contribute but very little to supply this great want; but a closer investigation of the subject will reveal the fact that if we are to get a grip of the great lone desert of the heart of Australia, we must have internal lines of communication of such a character as will enable the settlers in those lonely and isolated regions to keep in close touch with the great centres of civilisation. It is admitted on all sides that the great difficulty will be to get settlers who will be willing to live a life of toil and isolation from their fellowmen, or who, if willing, will be able to endure such a life without reverting to a condition of semi-barbarism, but a system of rapid communication from settlement to settlement, would go far to obviate this disadvantage.

In Australia we have too much space and not enough settlers, and our possession of the former is likely to prove more of a curse than a blessing unless we can solve the problem of its effectual settlement.

Therefore, our object should be to annihilate space as soon as possible, and that can only be done by extending and accelerating all our means of communication.

Speed is becoming the necessity of civilised countries, but it is more than a necessity in Australia—it is essential to our existence.

Therefore, we must turn our attention to the development of speed.

These thoughts bring within our purview the question of Aerial Navigation and Aviation as applied to the solution of the problem of the settlement of Tropical Australia.

Zeppelin airships are now being built and operated in Europe for the conveyance of passengers and mails, and it has been realised that the larger the ship the safer and easier it is to handle, with the result that larger and more powerful airships are constantly appearing. The new Zeppelin airship, "Frederichshaffen," a German armed dirigible of the modern type, successfully underwent her trials last month in a high wind, the firing of her machine gun being accomplished with ease and precision.

The British army has also succeeded in turning out a really serviceable airship. The airship exhibited at Olympia, H.M.A. ship Delta, is a really fine vessel. She can rise to 7,000 feet or more, and she has a range of 924 miles at a speed of 33 miles an hour, or, going at her full speed of 44 miles an hour, she has a range of 616 miles. That is to say, conditions being favourable, she could reach a place as distant as the Swiss frontier in 14 hours, and return to England again without stopping.

There is nothing to prevent an Aerial Shipping Service being inaugurated at once from Sydney or Melbourne, or Adelaide to Port Darwin, that could carry mails and passengers and light cargo such as delicacies, luxuries and medicines for the use of settlers passed en route.

The journey from Sydney to Port Darwin (distance about 2000 miles) without stoppages could, in fine weather, be performed in 40 or 50 hours, the mails being dropped en route where necessary without actual landing.

Just think what a revolution this would mean!

In subduing nature, just as in subduing men, the battle is always to the swift, and I have only to appeal to history to confirm the statement; therefore it is imperative that we speed up our communications.

Another aid to settlement, and one that would have the effect of keeping settlers on the land, would be the provision of rapid postal facilities by means of an aeroplane service for carrying mails.

The organisation of such an aerial fleet would serve for policing the scattered settlements, and might well form part of the Defence Scheme, for the observation of the Northern coastline, the prevention of smuggling and of the incursion of coloured aliens.

The meteorological and atmospherical conditions in Central and Northern Australia should be generally favourable to aerial traffic, as the currents of air on the vast plains would be regular and steady with an absence of those dangerous air pockets met with in the vicinity of mountains.

suscitate it, and the University might well lead the way by establishing lectures in roadmaking, and research into the question of the most suitable materials for the purpose.

On the continent of Europe and in America chemical investigation and mechanical testing of roadmaking materials, separately and in combination, are considered a necessary prelude to the construction of roads, and one of the most important duties to be undertaken by a constructing authority.

Statistics are kept for the information of Engineers, which are invaluable for economic construction.

In this State we have an abundant supply of good roadmaking materials, but so far they have received very little scientific attention, and I do not hesitate to say that thousands of pounds are wasted annually by our Municipal and Shire Councils by the irrational methods of selection and application of road-making materials to our roads.

It has been the custom in years past for the Government to vote certain large sums of money for the construction and maintenance of roads to the Shire Councils without making adequate provision for the effective application of the money, but it is satisfactory to note that the Minister responsible for the allocation of these funds is beginning to wake up to the tremendous importance of the economy of a more expert conversion of money into roads.

The keynote of modern roadmaking is the application of science, and we cannot afford in these days of advancing costs to disregard the economies that an intelligent use of scientific methods always accomplishes.

It is customary to blame the motor vehicle for its destructive effect on roads, and the present state of disrepair into which so many have fallen, but I entirely disagree with this judgment, as it is contrary to the general consensus of Engineering opinion.

The large expansive tyres of the motor vehicle are a great deal less destructive than the narrow metal tyres of horse-drawn vehicles and the pounding of the horses' iron shod hoofs.

The real cause of the state of the roads is bad construction and worse maintenance.

The expenditure of money and muscle alone will not make good roads, but they both require to be directed by the science and skill of the qualified Engineer.

A very large field of practice in this direction is being opened, but where are the Engineers?

Where are the schools in which they may be trained, and where are the students,

All these questions require an answer.

The British Government have appointed a Road Board for the purpose of improving the facilities for road traffic in the United Kingdom, which includes the widening of roads, the

cutting off of corners and acquiring land for that purpose, the grading of roads, the treatment of roads for the mitigation of dust and doing everything essential to placing a road in a proper state of repair, and also for the purpose of advancing money to councils and highway authorities in the construction of new roads or the improvement of old ones. If this course is necessary in Great Britain, it is ten times more necessary for a country like Australia, that depends so much upon its roads.

In all that I have said under this head, I want to impress upon you that the question of internal communication, as an aid to settlement, is of paramount importance, in fact, "It is not a vain thing for you, it is for your life." What I wish to convey to your minds may be expressed in this way. Our population is about two persons to the square mile at present, and we travel at not more than 20 miles per hour. Now, if we can increase our rate of speed to 120 miles per hour—that is, by six times—we practically increase our population to 12 persons to the effective square mile; that is to say, the area of Australia will be reduced practically to one-sixth of its former area by the speeding up of the communications.

DEVELOPMENT OF WATER CONSERVATION AND IRRIGATION.

Another aid to settlement is the question of Water Conservation and Irrigation, regarding which volumes have already been written; in fact, it may be said the subject is threadbare, and I need not detain you by talking further about such an obvious truism, but I would urge that, as the time for talking has long since passed away, the time for action has now arrived.

It is gratifying to hear of the good progress of Burrinjuck Dam and the Murrumbidgee Irrigation Works, but not one-tenth of the possible Irrigation Works, in this or any other State, has yet been attempted, and surely it is time that some energetic steps were taken to develop Water Conservation on national lines.

ELECTRICAL DEVELOPMENT.

The development of all kinds of electrical undertakings all over the world has been remarkable, but in Australia we are lagging far behind.

Unfortunately, our water powers are extremely limited, as we have so few rivers capable of being harnessed or economically developed.

But in this State, all enterprise in developing hydro-electric power has been destroyed by the selfish action of the State Government, who claim all streams, and, whilst refusing to develop them at State expense, decline to allow private capital to do so.

There is, however, a noteworthy instance in Tasmania, where the State has wisely encouraged private enterprise for utilising the Great Lake for the production of cheap electricity, by granting Parliamentary powers to a company for using the waters of the said lake, and of the Rivers Ouse and Shannon, which practically take their rise in the Lake.

The Great Lake is situated in the centre of the Island, on a tableland, at an elevation of 3,300 feet, surrounded by mountains, with an altitude of about 4,000 feet, and a rainfall of 92 inches per annum.

The catchment area is about 200 square miles, and the Lake itself has an area of 26,000 acres, with a depth in many places of 20 feet.

The scheme ambitiously proposed is to harness up the waters of the rivers to provide sufficient electrical energy to drive the industries of the whole State, which the overwhelming advantages of the natural situation should enable it to accomplish, it being only 60 or 70 miles from the extreme confines of the coast.

The works consist of building a small dam at the outlet of the Lake into the Shannon, with the object of elevating the level of the Lake eight feet, and increasing the area to 35,000 acres, for the purpose of regulating the summer and winter flow.

For a short distance from the outlet the water will be conveyed in the natural bed of the river, and thence diverted into a supply channel for a length of about three miles, whence it enters a natural lagoon on the edge of the tableland, which will be utilised as a settling pond.

The water will thence pass through a pipe line over the edge of the tableland, which has an effective fall of a 1,000 feet to the turbines in the power-house below, on the banks of the River Ouse, into which the waste water will be discharged.

It is estimated that 100,000 mechanical E.H.P. are available, and to provide the first unit of 9,000 mechanical E.H.P., the head works and the channel sufficient for 40,000 H.P., and the transmission line to Hobart, will cost £150,000.

The works had already been started at my visit to Tasmania last year.

There is no doubt the scheme, if successfully carried out, will give a tremendous impetus to the establishment of new industries, and especially those for the treatment of all kinds of ores, and will place Tasmania in a favoured position for industrial competition with the other States of Australia.

The possibilities of electrical development, as applied to irrigation, are of far-reaching importance, but nothing is being done. We hear in other countries of pumping operations being carried on by means of electricity. The transmission of