

14TH MARCH, 1912.

ADDRESS BY THE PRESIDENT.

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Last year I stood up to deliver my first Presidential Address, and although received by members present with the greatest kindness, I felt that a good presidential address was beyond my capacity, and hoped that I might never have to attempt another.

I am, however, now committed to a second attempt, and trust that members present will receive it with their usual kind consideration, and overlook its many shortcomings.

First I must again express to you and to your Council my keen appreciation of the honour paid to me in again electing me to this chair, and I trust that I am not assuming too much in believing that my re-election is due to the fact that I was able to do some good work for the Association during last Session.

I did my best then, and can only assure you that I will again do my best in furthering the advancement of our Association.

Before entering upon the main subject matter of my address, it may be well to briefly outline the leading features of our last Session. At the end of the 40th Session our membership was as follows:—Members 169, Associates 3, Student Associates 2, and Students 43, a total of 217. In September, 1911, that is at the close of last Session, the total had increased to 231, and at the present date our roll is as follows:—Members 178, Associates 3, Student Associates 5, and Students 51, making a total of 237.

The steady growth of our student section is to be noted with satisfaction. During the past Session 8 General Meetings were held, at which there was an average attendance of 69 members.

Our financial position is materially improved, as may be seen by the balance sheet, apart altogether from the sum of £3,000 which the association received under the will of the late Sir P. N. Russell. The money has been deposited with the City Bank of Sydney, bearing interest at 4%, until such time as members may decide as to the manner in which it is to be utilised. It is to be hoped that good use may be made of this fund, in devoting it to some purpose in keeping with the known wishes of the Association's Benefactor, that is, in furthering the training and advancement of the young engineer.

In my last address I had unhappily to refer to the loss that the Association had sustained in the death of one of its oldest members and Hon. Secretary, Mr. H. V. Ahrebecker. Again I have the same sad duty in referring to the death of the late Mr. N. Selve.

Mr. Selve was one of the original founders of this Association in 1870, he was a member of Council for 13 years, was Vice-President for 3 years, was President for 2 years, and was elected an Honorary Member in 1909. There has been no other member so closely associated with the development and growth of this Association, nor has there in the past been any other Engineer more prominent in the determination of the many engineering problems that have had to be faced in the development of our City.

Members have had many opportunities of hearing Mr. Selve's views on questions of interest, and there have been few Inquiries and Commissions of importance on technical matters here on which Mr. Selve was not either a member of the Commission or a leading witness. The schemes de

vised by him in the public interest have been legion, and many have been adopted, as will be referred to more fully by me later.

I know that members will join with me in placing upon record our sincere respect for the life and work of the late Mr. Selve, and our appreciation of the great services he rendered to the public in various engineering works in this City, and to our Association in his loyal support and assistance for a period of over 40 years.

One other matter and one that requires some apology must yet be mentioned, namely, the publication of our annual proceedings. Members have not yet received the volume for the Session ended in September, 1910, and that for our last Session is overdue. The delay in publishing the 1910 volume was primarily due to the fact that certain papers and documents necessary to its publication could not be found amongst the effects of the late Hon. Secretary (Mr. Ahrbecker), and these papers have not yet come to light. After waiting, therefore, for several months, efforts were made to re-collect the various documents and papers in question, and these together with all but one of last Session's papers have been edited and are ready for the printer, some being already in his hands. It is to be hoped, therefore, that before long members will obtain possession of the long delayed volumes, and that our records will again be complete.

Coming now to the other side of the address, I have always thought that a brief resume of the general progress of engineering, the world over, can be of little interest to members, and that a more detailed discussion upon some matter of greater local interest would be of more value. For this reason I propose this evening to discuss briefly some of the engineering problems that have had to be faced in the past, others that are now being met, and those that have yet to be dealt with in the future, in the development of the City and Port of Sydney.

I have been influenced still further in the selection of my subject for the reason that one cannot even in the most cursory study of Sydney's past and present engineering history, fail to note the many works with which the late Mr. Selfe was closely associated, and this fact will, I know, render these few remarks of mine, of more direct interest to the members of this Association.

Many of the diagrams and maps with which I wish to deal are no doubt familiar to you all, but I think a short consideration of the past, present and future situations should, with the aid of these views and diagrams, prove of interest.

The most important of the engineering problems encountered in the development of a city such as ours are the following:—

1. Water Supply,
2. Sewerage and Drainage,
3. Transport,
4. Lighting,
5. Shipping Accommodation, wharves and jetties, etc.

The problem under the heading of Transport may be subdivided in our case into the following:—

- (a) Roads and thoroughfares.
- (b) City and suburban railways and tramways.
- (c) Harbour passenger and vehicular transport, which latter may include ferry systems on, bridges over, and tunnels and subways under the various waterways. Under these headings I propose very briefly to discuss the various works.

WATER SUPPLY.

Undoubtedly the item of greatest importance in any large community is the continuity and adequacy of its Fresh Water Supply, and in this respect Sydney's demands are enormous, at present reaching an average of 29 million gallons per day. This supply is drawn from a catchment area

situated on the inland side of the coastal ranges about 45 miles down the South Coast from Sydney. This catchment area for the Cataract Dam is 347 square miles in extent, exclusive of an area of approximately 50 sq. miles over the surface of the impounded water. The total height of the retaining wall in the reservoir itself is 160 feet, and when full it impounds over 21 thousand million gallons. The water flows from this reservoir through an open aqueduct to the Prospect Reservoir, situated not far from Parramatta. This special reservoir has a catchment area of about 4 sq. miles, and a storage capacity of a little over 11 thousand million gallons, about half of which amount is available by gravitation for Sydney. The total amount of water impounded in the two reservoirs is thus $32\frac{1}{2}$ thousand million gallons, of which about $26\frac{1}{2}$ thousand millions is available by gravitation to Sydney.

In June, 1908, Cataract Reservoir was handed over to the Water and Sewerage Board, and at that date the population served by Cataract and Prospect was 610,000, with an average daily consumption per head of approximately 40 gallons, and with both the reservoirs full, and allowing for losses by evaporation, etc., the supply would last for 1040 days.

To-day the population served by these reservoirs is nearly 700,000, and the water consumption per head has gone up from 40 to 42 gallons daily, bringing the number of days storage capacity down to 880. At the present rate of increase in population served, and in daily consumption per head, the total number of days storage capacity in 1915 would be reduced to 715 days, a figure that for this climate is too low. By the end of 1915 therefore as things are now going, the total storage capacity expressed in number of days' storage will have been reduced to an extent of 31% below the capacity when the dam was put into service in 1908.

Cataract Dam was started by day labour in October, 1902, and was completed partly by day labour, partly by contract, in 4 years and 11 months working day and night, i.e., practically in 5 years.

Assuming that a start now made with another dam, as proposed, and that such start was made within 12 months, it might be assumed that it would be completed by the end of the year 1917. By that date the days storage capacity of the present system would have fallen at least to 650 days, and possibly still lower, and it is obvious therefore that the matter of extension is one for early consideration.

Proposals for further supplies from the Cordeaux River are now under consideration, which if carried out would greatly increase the reserve. The chart shown in Plate IV. shows clearly the relationship between population, daily consumption, storage and capacity over a number of years, as estimated by the Water and Sewerage Board.

As a matter of interest to those members who may not have seen the Cataract Dam, it may be said that the body of the dam is composed of cyclopean rubble masonry, consisting of blocks of sandstone, weighing from 2 to 4½ tons each, built to break joint both vertically and horizontally. The up stream face consists of concrete blocks 5 feet by 2 feet 6 inches by 2 feet, specially jointed and backed by 3 feet of basaltic concrete. The down stream face is of concrete 6 feet thick. The total length of wall is 811 feet, and the maximum height above river bed 157 feet.

Since its completion in 1908, on one occasion only has the dam been full, and therefore in one's estimate for "days storage," allowance should be made for the fact that for years the dam may never be full again. A large section of Sydney is supplied by gravitation direct from Cataract through Prospect, the remaining high levels being served by pump fed reservoirs, located at various points in the suburbs, as shown in Plate V.

A high pressure scheme for water supplied direct in pipes from Cataract is possible, but such would involve a very considerable expenditure, and any funds available would be better expended in increasing the storage capacity rather than any "high pressure scheme," until the amount stored is sufficient without question for Sydney's requirements after many years' growth. The diagram illustrated on Plate VI., is taken from the last report of the Water and Sewerage Board, and is of interest, showing the capital cost, and the figures in connection with water supply for many years past.

SEWERAGE AND DRAINAGE.

Whilst this department is of vital importance in the life of a city, little can be said concerning it in a short address. Many well known authorities urge the utilisation of sewage matters for the fertilisation of soils, as applied to the development of sewerage farms.

Such has been tried to a considerable extent here in Sydney, but the tendency now is to follow the more general practice in discharging the whole of the sewage matter into the ocean.

Originally all surface drainage and sewage was discharged into the harbour, but a Commission appointed to consider the effect of such a practice, in polluting the waters of the harbour, reported strongly against a continuance of the practice, with the results that the present system was installed. All sewage from what is known as the gravitation zone, i.e., from levels exceeding 40 feet above high water mark, is intercepted and gravitated to one of the three main outfalls.

Sewage from the area at levels below the 40 feet mark is pumped up into one or other of the same three main outfalls. The first of these outfalls is known as the "Northern," which discharges direct into the Pacific Ocean near

Bondi, and takes all sewage previously discharged into the harbour. The second is the Southern, which discharges on to sewerage farms, and which deals with the balance of the city sewage and the southern suburbs; the third being the Western, which provided for the Western Suburbs.

The largest work at present on hand is the Long Bay outfall through which the sewage, at present discharged on the Botany and Rockdale Sewerage Farms, will be diverted direct to the sea. An idea may be gleaned of the immensity of this sewerage system in learning that the sewage pumped in one year through No. 1 Pumping Station alone, was approximately 2,300 million gallons.

The diagram shown on Plate VII. shows graphically the last ten years' figures in this department of the City's works.

TRANSPORT.

The first of the three divisions under this heading is "Roads and Thoroughfares," which again may be subdivided into two, first the mileage, width and disposition of roads which determine their capacity from a traffic point of view, and secondly the nature and condition of the roads.

In both these respects Sydney is in a very bad way. Her thoroughfares are narrow, crooked and congested, many in the wrong places, traffic has to traverse much greater distance than should be necessary in going from point to point, owing to the lack of proper straight main roads, and the average condition of the road surfaces is about as bad as it can be. Some few roads are of course excellent, but the majority are in a disgraceful condition. Sydney was never designed or laid out, it just "grew." Old bullock tracks along the ridges of the hills, in the gullies, and by the various waterways, ultimately developed into roads and main thoroughfares, until now we have many main avenues of traffic, and even tram lines, which almost tie knots in themselves, such, for instance, as Glenmore Road on the

Bellevue Hill line. The distance that traffic has to travel to go from suburb to suburb or city is generally speaking at least 50% longer than should be necessary. It may be "picturesque," but it certainly is not practical. Such has long been realised by the city authorities, who are now making efforts to improve matters. It must be granted that the credit for such efforts is almost entirely due to the present Lord Mayor, Sir Allan Taylor, who has consistently and strenuously for years past urged the necessity for prompt action in the matter.

In 1908 a Royal Commission was appointed to consider the whole question, of which commission Mr. Norman Selve was a member. Numerous schemes were submitted to them, and finally in 1909 their report was presented with their recommendations as to necessary improvements, and alterations in the roads and thoroughfares, in the tramway system, and in the development of a city railway system. They introduced their report with the following words:—

"Your Commissioners, at the outset of their inquiry were impressed with the fact that owing to the mistakes of the early rulers and residents of Sydney and suburbs in laying out narrow and crooked streets, the succession of hills upon which Sydney is built, and the difficulties of approach to the many bays and promontories of the harbour, the problem of evolving a symmetrical scheme for the improvement of Sydney is an extremely complex one."

Amongst their many recommendations from a traffic point of view were the following:—

1. The immediate introduction of a system of underground electric railways for city and suburban passenger traffic, serving the North Shore, the Eastern Suburbs, Balmain and the adjoining suburbs.

2. The widening throughout of the entire length of Elizabeth Street, to not less than 100 feet, and its extension on an improved grade from Hunter Street to Circular Quay.

3. The continuation of Sussex Street through the site of the Australian Gas Light Company's premises to meet a 90 feet roadway which the Harbour Trust Commissioners are constructing.

4. The removal of Pymont Bridge and the reclamation of the head of Darling Harbour up to Bathurst Street.

5. Construction of a new roadway to relieve George Street West from Sussex Street to the junction of the Newtown Road and Parramatta Road.

6. The widening and re-grading of George Street West.

7. The widening of Oxford Street to 100 feet.

8. The widening and re-grading of William Street and Bayswater Road.

9. The realignment, with a view to their ultimate widening of the important roads leading to and from the City.

In considering the "Beautification" of the City, two of the chief recommendations made were, first, the improvement of the approach to the Central Railway Station by carrying raised roads to the platform level, and secondly the remodelling of Circular Quay.

The first of these was the outcome of a scheme devised by Mr. Selfe, as is shown on Plates VIII., IX. and X. and suburban railways, two of which are shown on Plates XI., XII., XIII. and XIV. That of the Chief Railway Commissioner was ultimately recommended for adoption, the estimated cost of which was £1,670,000, and it was urged that the City Railway proper, with the North Shore connections, be undertaken first.

The completion of the broad road around the wharves by Dawes' and Miller's Points to Darling Harbour was urged, with the resumption of the Gas Co.'s works, this latter work being estimated at £300,000 to £400,000. The general