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President, 1938-1939.

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THE PUNJAB ENGINEERING CONGRESS SESSION, 1939.

By D. A. Howell. M. Inst. C. E., M. I., Mech. E.,
on March 9th, 1939.

Your Excellency and Gentlemen,

I esteem it a great privilege to extend on behalf of the Punjab Engineering Congress, a very hearty welcome to your Excellency and also to our other distinguished visitors, and to assure you of our profound appreciation of the interest you have displayed in our activities by coming here to-day to open our twenty-seventh Annual Session.

The majority of our members belong to the vast organization known as the Irrigation Branch of the Punjab Public Works Department, one of the principal activities of which during the year has been the carrying out of the Haveli Project, which was sanctioned on April 1st., 1937, at an estimated cost of 529 lakhs of rupees. This work, which includes the Emerson Barrage and a net work of irrigation canals in conjunction therewith, has been pushed forward with vigour and is expected to be formally opened on the first of next month, that is to say within nineteen months of the day when the first sod was cut. This is a remarkable achievement. The main canal connecting the Chenab and Ravi rivers is being lined and tests for watertightness in a section of the lined canal under the natural conditions obtainable after the canal has been opened, have been found to show a satisfactory degree of water-tightness. It is gratifying to learn that the project is expected to be completed at a considerable saving in cost as compared with the sanctioned amount of the estimate, in spite of the addition of watertight lining of the main canal.

The remodelling of the Western Jumna Canal headworks at Tajewala to provide for increased waterway required to deal with floods approaching the record of 1924, was in progress and the last stage is expected to be finished during the coming year.

The Thal and Bakra Dam irrigation projects, which have been under investigation for a number of years are still under consideration of the Government and negotiations with the Bilaspur State in regard to the site for storage reservoir in connection with the latter scheme, have not yet reached the final stage.

A scheme for extending canal irrigation from the tail of the Sirhind Canal into a tract of the Hissar District now dependent upon the vagaries of the scanty and unreliable rainfall, is under consideration. This tract

is part of the area now in the throes of severe famine caused by rainfall failure and the extension of the blessings of canal water supplies thereto will be a great boon to the local people.

The fall in the subsoil water level of the Bist Doab in the Jullundur and Hoshiarpur Districts is causing serious concern. It has been the subject of investigation by various experts in the past. The problem has again been taken up and preliminary data is being collected to enable detailed examination of possible remedies to be undertaken.

The training works of the Western Bein drainage, passing through Dasuya Tehsil of the Hoshiarpur District and Kapurthala State, have been completed and have resulted in the reclamation of a considerable area now brought under cultivation.

Work has been started on an experimental tubewell irrigation project near Shalimar to the east of Lahore. There will be thirty-six large tube-wells, equipped with pumps operated by electric power from the Mandi scheme.

Investigation of other tubewell schemes is being made, including the possibility of supplementing canal water supplies to enable irrigation to be extended into arid regions in need of protection against famine.

The problem of water-logging and the deterioration of considerable areas of land in this province by the rise of deleterious salts to the surface, is a grave one and the possibility of abandoning certain channels which are believed to be contributing largely to the rise in the water table in some of the Doabs and substituting lined canals, is under examination. In the meantime the construction of drains has been pressed forward. About 700 miles of new drains have been dug in the Rechna and Chaj Doab since 1920 and 90 miles of drains have been enlarged.

In the Buildings and Roads Branch the new Legislative Assembly Chamber and offices have been completed and are in use. This fine building has been equipped with modern sanitary and evaporative air conditioning equipment.

We are proud that the roads of the Punjab have long been known as the best in the country and that they still occupy the premier position. The good roads of this province have attracted so much traffic that many sections have become overloaded and require to be widened. An eight-year programme for roads estimated to cost Rs. 125 lakhs is in progress. This includes the construction of 500 miles of new metalled roads, the provincialization of 800 miles of District Board metalled roads, the widening of existing metalled roads where necessary and the improvement of 10,000 miles of unmetalled roads and of village roads.

It is a general impression that the Buildings and Roads Branch is a spending department but this is fallacy as actually if the amounts of taxes realized from road users in the form of vehicle tax and petrol tax are taken into account they will more than cover the cost of the roads.

The Jhang—Lyallpur Road, about fifty miles long, also the Khaur —Dholian and Chandigarh—Rupar—Narainghar roads were completed during the year. The Delhi—Multan Road via Rohtak and Hissar is now metalled in all sections except for a short length between Dabwali and Sirsa.

In the Electricity Branch steady progress has been made with extension of local distribution to Kangra and to some of the suburbs of Jullundur.

The first stage of the Malakand Hydro-electric Scheme of the North West Frontier Province was opened by H. E. The Viceroy on April 23rd, 1938. The Adozai Bridge over the Kabul River and the Jalala Bridge on the Nowshera—Chahdara—Chitral Road are under construction, while the New Legislative Assembly Hall at Peshawar, was practically finished during the year. In this building locally quarried marble and shisham wood grown in the Province have been extensively used.

The North Western Railway, during the past year, took in hand the construction of the Sind Right Bank Feeder Railway and continued with its extensive programme of reconstruction work at Quetta, necessitated by the earth-quake of 1935.

Electric welding of members of bridge girders and trusses is now being carried out on a fairly large scale. An experiment of welding together a number of rail lengths is being made on the railway near Jullundur Cantonments. The track consists of 90lb. flat bottom rails, 42 feet long on steel sleepers and every three rails have been welded together to form continuous lengths of 126 feet. The work has been completed and the results will be watched with interest.

In the course of the past two years first class air conditioned carriages have been run on the mail trains between Kalka, Delhi and Bombay and it is believed they were successful in reducing greatly the discomforts of hot weather railway travelling.

The introduction of similar facilities in connection with first and second class carriages on the Lahore—Karachi railway service would be welcomed by the hardiest traveller.

In 1881 the population of the Punjab was 16,939,312 of which 2,042,883 resided in urban areas.

Forty years later in 1921, the population had increased to 20,685,478 of which 2,212,191 were living in towns.

The average increase per decade for this period of 40 years was 4½ per cent for the total population and only 2 per cent for the urban inhabitants. By 1931, the total population had risen to 23,580,852 of which 3,067,464 was that of urban areas. This represented a rise of 14 per cent on the total and 39 per cent on the urban population. These figures clearly illustrate the fact that the towns which for more than 40 years prior to 1921 had remained nearly stationary, thereafter suddenly began to develop and expand at an astonishing rate.

The feverish building activities still proceeding in many towns, especially in the central and northern Punjab, is a clear indication that this abnormal process of development of urban growth is unabated and it seems certain that the urban population of this province will exceed 3,500,000 in the next census year (1941).

The machinery and municipal organization in force in these towns, while it sufficed, as long as the inhabitants consisted of communities with a stationary population and in a somewhat backward state of civic development, became inadequate for the effective control and direction of the wider municipal activities devolved upon the local authorities as soon as their towns began to expand. In consequence, growth of the towns has been allowed to proceed in a haphazard and formless manner, without proper planning, lay-out or control and without the provision of municipal and public health necessities in the shape of suitable roads, drains and water supply.

Even plinth and floor levels of buildings in newly developed areas, in many towns, were not controlled, with the result that their drainage problems have become unnecessarily complicated and expensive.

The formation of the Lahore Improvement Trust some three years ago has led to a much stronger measure of control over town development and expansion in Lahore and its environments and the appointment last year of a Provincial Town Planner whose functions consist in advising and assisting local authorities in town planning activities, will undoubtedly lead to considerable improvements. At the same time the existing law and administrative machinery relating to public health and municipal aetivities is in need of amplification on a more comprehensive basis following the lines of the various public health measures brought into force in England in the course of the past 60 or 70 years, in order to secure in the future not only that the mistakes of the past do not repeat themselves but also to enable the damage which has already occurred, to be rectified and made good to the utmost extent possible.

Before 1900, there were only six towns in the area now covered by the province, which were equipped with protected water supply systems.

These consisted of Lahore, Ambala and Rawalpindi together with the hill stations of Simla, Murree and Dalhousie.

The combined supply of these works in 1900 did not exceed about 2,300,000 gallons per diem and they served a population of about 260,000. To-day, there are forty-five municipal watersupply undertakings in operation or under construction, with a capacity of over 26,000,000 gallons per diem and serving a population of about 1,600,000.

During more recent years, attention has been paid to the water-supply problems of rural areas and seven schemes are in operation, while two are under construction and two more will be started shortly. These will deal with about 80,000 people. In addition, numerous small schemes consisting of protected wells and springs, Abyssinian tube wells, percolation wells, tanks and similar works are under construction or projected for the benefit of the rural population, with funds largely provided by Government.

In the course of the last ten or twelve years steps have been taken to provide protected water-supplies for fairs of provincial importance in order to prevent, so far as practicable, the spread of water-borne epidemics. Six of these schemes are already in operation and two are under construction. These will deal with a fair population of nearly a million people. The most important of these schemes is that appertaining to the Thanesar Sun Eclipse Fair in the Karnal District, which is attended by a pilgrim population of from 300,000 to 700,000.

The necessity of protected water supplies for important fair areas cannot be over-emphasized as a means of preventing calamitous epidemics.

The watersupply works of this province are of various types and those of more recent construction are of modern and efficient design and built as cheaply as practicable. A number of the older works however have outlived their utility and are in need of heavy renewals and in some cases of complete reconstruction.

Inclusive of numerous independent protected watersupply schemes for Government institutions, the waterworks are equipped with pumping machinery driven by various forms of power of between 9,000 and 10,000 horse power in the aggregate. The Guma pumping station of the Simla waterworks is equipped with two horizontal rotative, ram pumps, electrically driven by 1000 horse power motors, which pump the water to a vertical lift exceeding 4200 feet, this being the greatest single lift in the world.

The introduction, more than 20 years ago, of bored tubewells for tapping deep seated, alluvial, water bearing sands has had a revolutionary

influence on watersupply problems. It has not only enabled potable and bacteriologically pure water to be made available for domestic purposes in many areas at very cheap cost, but it has also enabled older water supply schemes to be bolstered up at comparatively small expense to deliver very much larger volumes of water than they were originally designed for, by the siting of independent tubewells at convenient points in the distribution areas, which pump their quotas of water into the distribution pipelines, thus increasing the discharge and also creating better distribution pressures. The technique and practice of tubewell design and construction has been extensively developed and present day tubewells, if designed on sound lines, may be confidently expected to have a useful life of at least 12 to 15 years. They are the most economical as well as the safest sources of water for domestic and industrial purposes in alluvial areas where subsoil water conditions are favourable.

Unfortunately, although conditions more or less favourable for tubewell development have been met with under an extensive part of the alluvial plains of the province, nevertheless there are large areas, notably the south eastern districts of Hissar, Gurgaon and Rohtak, where subsoil conditions are unfavourable for tubewells and in some areas, there are no convenient sources of potable water available, as both the upper and deeper subsoil waters are very brackish while there are no rivers or canals within short distances whence water can be obtained. The provision of water supplies to the inhabitants of these tracts is likely to involve very heavy expenditure indeed both of capital and recurring charges.

One of the most important urban watersupply problems which is awaiting solution is the prevention of waste and unauthorized use of water. In this country, immediate access to houses for waste inspection cannot be enforced and no system of waste detection by inspection is effective. Uncontrolled wastage or unauthorized use of water leads to the distribution of water becoming intermittent. This, besides being inconvenient to the public and rendering the operation of water carriage, sanitation and sewerage works more complicated, also increases the risks of pollution of the water.

The only practicable remedy is to enforce compulsory metering of all private house connections, but so far this has proved an unpalatable medicine in the case of most municipalities. Very gradually however metering is being brought into force, and recently the Administrator of the Lahore Municipality has introduced byelaws for universal metering.

The system of surface drainage in use in all municipal towns except Simla, which has a sewerage scheme, is an indigenous one. There is evidence of such a system in the prehistoric cities of Sind and the Punjab which have been unearthed by archaeologists in the course of the past few years.

The old towns and cities are invariably built on mounds and consequently their surface drainage systems are simple, but more modern towns founded within the past century and recent extensions of other towns in the plains are sited in flat country which complicates the drainage problem, leading to ugly, large and deep open drains.

The surface drainage system is insanitary judged by modern public health standards but it does possess the advantage of cheapness and simplicity. It is only suitable for towns of comparatively small size and for inhabitants content with a very low standard of public health.

In this province, although surface drainage schemes have been carried out in about forty towns in course of the past 20 years, more than sixty per cent of all towns, including most of the smaller ones, either possess very defective surface drainage works or have no drainage systems at all, while in almost all towns, surface drainage works are badly maintained by the local authorities. The time is ripe for the introduction of sewerage in many of the larger cities and towns but apart from the paucity of funds, which is of first importance inasmuch as the capital and operation charges for sewerage works are considerably higher than for surface drainage, the almost universal evidence of inefficient management and maintenance of many existing surface drainage works leads one to the conclusion that until the capacity of the local authorities to administer and manage their municipal works is improved, the introduction of sewerage is liable to prove a failure.

Whereas there is no doubt that appreciable progress has been made in the development of public health engineering works in the province during the post-war period, nevertheless only the fringe of the problem has been touched so far and in order to provide for adequate progress the capital expenditure expended annually on these works will have to be increased considerably.

The population of urban areas which are at present in an insanitary condition is not less than 2,500,000. The cost of essential sanitary works of simple but effective type is not likely to be less than Rs. 30 per head or say seven and a half crores of rupees. Public health is a valuable commodity which is only obtainable by purchase like any other marketable commodity and money required to meet the cost of a reasonable standard of public health works will have to be met by the municipalities in any case as soon as public demand for safe watersupply and good drainage becomes sufficiently insistent.

The most important sanitary engineering works completed in Northern India last year were the new sewage disposal works at Delhi which consist of a " Simplex" bio-aeration plant designed for dealing with a dry weather flow of 18,000,000 gallons, costing about 45 lakhs of rupees.

The Lahore Sewerage and Watersupply reorganization schemes were sanctioned during the year at an estimated cost exceeding three crores and construction is being started. There will be four main sewage outfalls of which three will be equipped with bio-aeration sewage treatment plants to deal with an average dry weather flow of 19,000,000 gallons per diem.

The Lahore Watersupply re-organization scheme will consist of a decentralized distribution system based on forty-six tubewells and provides for an average daily supply of 19 million gallons.

Before I conclude, I wish to record on behalf of this Congress our deepest regrets on the deaths of the following members :—

Khan Sahib Faqir Mohamed Khan.
Khan Majid-ulla-Khan.
Lala Shakumbri Das.
Lala Chaju Ram Gupta.

I also desire on behalf of the Congress to congratulate the following members on the honours they have received during the year :—

Sir William Roberts on his Knighthood
Mr. J. H. Bedford on his C. S. I.
Mr. P. L. Dhawan on his C. I. E.,
Mr. Mohammed Fakhar-ud-Din on his title of Khan Bahadur, and Mr. C. C. M. Anderton on his O. B. E.

I will now ask His Excellency to be pleased to declare the Congress open.

Speech made by His Excellency Sir Henry Craik, Governor of the Punjab, in opening the Punjab Engineering Congress at Lahore, on Thursday, the 9th March, 1939.

MR. PRESIDENT AND GENTLEMEN :

I AM very grateful to you, Mr. President, for the kind welcome that you have extended to me on behalf of the Punjab Engineering Congress I must confess that I feel some diffidence as a layman in addressing so large and formidable a gathering of experts. It is obviously not possible for me to contribute anything to the discussion of the technical matters which will no doubt be engaging your attention. But your varied activities touch so many points of human life in this province that they must necessarily arouse a lively, if somewhat uninformed, interest in every educated person. Mr. Howell, in the course of his address, has given a comprehensive picture of present-day engineering projects in this Province, but has made an all too modest reference to his own share in them. Engaged as he mainly is in works where " houses thick and sewers annoy the air," he felt perhaps some hesitation in dwelling much on achievements in this particular sphere. But many of the towns of the Punjab have good reason to appreciate with gratitude his energy and initiative and the high standard of design which he has set for drainage works. We are certainly fortunate to have at our disposal the services of one who is a recognised authority on his subject throughout India.

Mr. Howell has referred to the feverish building activities at present in progress in many towns. " Feverish" is the word which might almost be applied to the activities of engineers in the Punjab at the present time. Perhaps never before have so many engineering plans and projects been in preparation or in course of execution as to-day. Of works in execution I must make a special reference to the important Haveli project, which will be opened in a few week's time. This is likely to stand out as a landmark in the history of our irrigation development, on account of both the exceptional speed and the remarkable economy with which it has been completed. It is anticipated that there will be a saving of nearly 2 crores on the estimates of rather more than 5¼ crores. This is a striking achievement and if the cost of lining the main channel, which was not included in the original estimate, were to be excluded, the saving would be even greater.

Mr. Howell has referred to the Thal and Bhakra Dam projects, which have been under investigation for a number of years. There is now reason to hope that work on the Thal project will be started very shortly, but as regards the Bhakra Dam project, the prospects are perhaps not quite so bright as they have been painted. Many interests besides the Punjab

are concerned and it will not be an easy task to adjust the many conflicting claims to the satisfaction of all. It cannot at present be said with any certainty when the project will be undertaken, though we do hope that it some day materialize. All that can be said is that the present Ministry are carrying on the necessary negotiations with patience and determination.

If the Bhakra Dam project does materialize, the engineers of the Punjab will be breaking what is to them fresh ground; for we have not yet had in this Province any large irrigation scheme dependent on a dam. Another novel undertaking already in process of execution is the project for irrigation in the Lahore district by means of tube-wells driven by electric power. Now that most of the available water in the rivers has been utilized, we shall have to depend for further development more and more on schemes based on the use of water drawn from wells or conserved by means of dams. I hope that in designing and executing such schemes Punjab engineers will live up to their reputation and in this new field show the same skill as has in the past given us a system of canals and a network of roads which are the envy of the rest of India.

It is the misfortune or perhaps the good fortune of engineers to remain for the most part anonymous. Their achievements are corporate rather than individual. Save for a few who have distinguished themselves as designers of military fortifications, there are perhaps not more than a dozen engineers whose names are famous throughout the world. Though the works of the engineer defy (or should defy) the ravages of time and stand often as the most indestructible monuments of human achievement, yet the men whose genius reared them leave little trace of their identity. We do not know whose mind conceived the geometrical exactitude of the Pyramids, nor whose skill and knowledge perfected the Roman roads and aqueducts. And this lack of any record of the individual engineer may perhaps make us forget that in engineering, as in other fields of human endeavour, progress, or indeed the avoidance of retrogression, depends on a continuous supply of individual genius. For the Punjab, whose present prosperity was founded by engineers and whose future progress depends no less upon them, it is a matter of vital concern that there should be not only a plentiful stream of qualified engineers of solid and respectable ability, but also in every generation one or two men with a spark of engineering genius distinguishing them from the rest.

It might perhaps be assumed as axiomatic that these few men of outstanding capacity will in the ordinary course of nature make the appearance. I am not certain that such facile optimism is justified. Nature has not broadcast all her gifts amidst all the families of the human race. The gift of poetry or music, scientific, religious or philosophic genius are not to be found evenly distributed in every nook and corner of the globe. So too, I fancy, the genius of the engineer is a specialized gift and not necessarily diffused evenly throughout all the populations of the world; and we cannot as yet assume with certainty that the Punjab will prove to be fertile in the talent that is so necessary for its welfare.

These reflections you may consider to be tinged with a rather far-fetched pessimism and in any case to be of no practical significance at the moment. But it is important that the people of this Province should be fully alive to the requirements of their own well-being and should be aware of possible dangers which are all the more insidious in that they are not particularly obvious. And to you, gentlemen, as engineers, it must necessarily be a matter of some moment that there should be no lack of men of the right quality to carry on the high tradition which you and your predecessors have established in this Province. The reflections, therefore, which I have suggested must, I think, claim from time to time your anxious thought. And it lies perhaps mainly with you to see that, so far as may be, that environment is created and those standards unalterably established which will be most conducive to the flowering of engineering genius.

With these remarks I have pleasure in opening the Congress.