CURRENT SCIENCE—50 YEARS AGO

Vol. II MARCH 1934 p. 354

A River Physics Laboratory for India.[1]

THERE are many lines in which the Government of India as well as the provincial governments can profit immensely if they take the trouble of obtaining proper scientific guidance before launching on large-scale enterprises. As many such cases are not known to all, I would refer to only one. Year after year the Government and other public bodies spend an enormous amount in constructing bridges and water reservoirs, in opening canals, in development schemes, in hydro-electric schemes and in city drainage schemes. These schemes are certainly highly beneficial and undertaken with the best of intentions, but from time to time, very unpleasant facts leak through the columns of the news agency, which show that these schemes are mishandled at some stage or other. Every scientific man knows that before the actual working commences the plans should be scientifically studied in Hydraulic Research Laboratories, with the aid of models and the engineers in charge of constructions should have a clear-cut idea of the work before they are put in charge of it. In spite of the fact that next to the United States of America, India is the country which has undertaken such works on the most gigantic scale, and has spent hundreds of crores of rupees on these works, the Government has not yet thought fit to establish a single Hydraulic Research or River Physics Laboratory in this country while in other civilised countries no such enterprise is allowed to be undertaken unless the plans are examined in suitable laboratories attached to the Universities, Technical High Schools, or State departments with the aid of suitable models. To convey the idea of how such work is carried out in India, I have quoted the opinion of the late Sir F. Spring, an eminent engineer, who constructed a large number of railway bridges in India during the last generation and I would request my readers to read this very carefully. I should merely add that I am not against the launching of the schemes; in fact many of them, like the Punjab Canals, have done immense good to the country. But others like the Orissa and Midnapur Canals were constructed on faulty lines, and involved the State in huge financial losses; while other schemes like the laying of railway lines through major parts of Bengal without a proper examination of topography and of the river systems have plunged the country into perpetual outbreaks of malarial epidemics, and led to the sapping of the vitality of the population. I do not hold that either the engineers or the officials are responsible for these failures and disasters. In fact, I think that most of them like Sir F. Spring tried to make the best use of a bad situation. But the fault is due to lack of imagination on the part of those who have taken upon themselves the task of Government and to their failure in devising a proper system of co-ordinated work in which preliminary scientific study in suitable laboratories should form an essential part of the organisation.

The Absence of any Organisation for Recording Experience or Research in connection with the Physics of Great Rivers.—[2]

"As trustees of so fine a property as this—canals and railways—it might not unreasonably be expected that the State would see the importance of devoting a comparatively small annual appropriation to original research, on lines likely to be productive of a good return for the expenditure, in the form either of reduction in the first cost of its public works or of their safety and their economical upkeep when built. Heretofore there has been no pretence of organising any such research in connection with the engineering of the canals and railways of India. Engineers have

[1] From the Presidential Address to the Indian Science Congress (Bombay), 1934, by Professor Meghnad Saha, D SC., F R S

[2] Opinion of Sir F. Spring on the need for a River Physics Laboratory quoted by Professor Meghnad Saha, D SC., F R S

gone on blundering, benefiting, rather by chance than by design, by the experience of their predecessors, and each considering himself lucky if he escapes disaster at the hands of the tremendous forces of nature—amongst which some of the most potent for good or evil are the great rivers—with which he has to struggle. Until quite recently there has been practically no encouragement, and indeed at times there has been discouragement, to men to publish their experiences. And so, in spite of having perhaps as fine a body of scientific engineers as any country, not excluding France, has in its employment, and in spite of this body of public servants having carried out daring and extensive works of a certain character, chiefly, in connection with the great Indian rivers, on a scale unparalleled elsewhere, the State possesses the most meagre record of the history of the works carried out so successfully by its employees. In putting the chapters of this book (*River Training and Control* by Sir F. Spring) together, the author found extreme difficulty in ascertaining what had been done, what difficulties had been encountered, and how these difficulties had been surmounted, and it has needed the expenditure of nearly a year of research to enable him to offer to the Government of India the advice, contained in the foregoing chapters, in regard to one limited phase of the engineering of great rivers. Time will show the value of that advice, and doubtless further experience will modify the practice recommended. But meanwhile the author urges on the Government the importance, from a mere money point of view, of insisting on the maintenance of an intelligent record of the history of such works as those dealt with in the foregoing chapters."

The Consequences of Lack of Organisation.

2. "With regard to the physics of long reaches of the great rivers, the author is not in so good a position to speak. His special experience has been gained rather on short lengths of such rivers in contiguity to his works. In view of his practical inability to regulate the flow of great lengths of such rivers he has viewed the inimical consequences of the irregularities of their flow, in the form of deep and dangerous scour, as requiring to be fought by sheer irresistible force rather than by coaxing. This necessarily must be the attitude of the engineer in charge of great bridges, and perhaps to a lesser extent of those in charge of great irrigation weirs. But they ought not, for that reason, nor ought the State, to lose sight of the importance of endeavouring, by consistent, logical and well-organised research, to learn something more definite than is now known about the physics of long reaches of rivers. A perusal of Chapters III and XXI, as well as of Mr. R. A. Molloy's Technical Section paper No. 118, will suffice to show how blindly, heretofore, in the interests of the residents on their banks, men have been fighting against the ill-will of some of the great rivers; whether on behalf of the maintenance of levees[3] whereby devastating floods are excluded from great inhabited areas; or for the conservation of the lands of inundation canals on whose integrity the welfare of many thousands of people is dependent; or in the interests of riparian cities whose obliteration would be a blot on the administration of civilised and intelligent rulers. It is difficult to avoid the conclusion, after perusal of Chapter XXI, that for lack of adequate knowledge, the engineers concerned with the interests of the inhabitants of the valley of the Indus have been obliged to work more or less in the dark in their fight with that river, and to make matters worse it has constantly happened that owing to the climate, to the exigencies of public service, no sooner does one engineer get some small inkling of the tricks than he is replaced by one with all his experience to gain; and in six months he, in turn, is replaced by somebody else whose experience of the river has perhaps been limited to crossing it. How under so haphazard a system, anything gets done at all is a marvel; and instead of being surprised at £100,000 worth of work having been wiped out, the State may congratulate itself if the loss is not double. However, there is always the satisfaction, in the case of such expenditure as that dealt with in Chapter XXI, that the whole of the money has remained in the country, and that if the taxpayer takes money out of his coat pocket only to put it into his waistcoat pocket he can always pick it out again, or its equivalent."

Suggestion for the appointment of a River Commission.

3. "The appointment for say 10 years of a River Commission not merely for the Indus, but for the organised study of the physics of great alluvial rivers generally, would be a service to civilisation and an act worthy of a great State. The Mississippi Commission have done a great deal, but their experience is not to any great extent applicable to Indian conditions. The experience of the engineers of the Rhone and the Danube and other European rivers, though valuable in its way, is even less applicable to India than that

[3] This a word of French origin, which is used in the U.S.A. to denote embankments.

gained on the Mississippi. Mr. R. A. Molloy's attempt at a theory, as summarised very inadequately in Chapter III, is the first that can be characterised as a scientific generalisation of the river problem that the author has heard of in India. And even this is based on inadequate data, picked up anyhow amidst the multifarious duties falling to the engineer to a system of inundation canals. There is need for a thoroughly scientific location, and for the automatic reading, of gauges at hundreds of places, for several years, along great lengths, selected with care and knowledge, of several of the great Indian rivers, also of some systematisation of the surveys which usually are undertaken on these rivers, and of the making of fresh surveys specially designed to elucidate facts also of an organised system of soundings and sections. The engineers in charge of the work must steadily keep in view the ultimate object of it, and must not make a survey merely for the sake of a section. The object in view will be: To present to the scientific world, and especially to the engineering world, and more particularly to the engineers of structures in India that are subject to fury at the hands of the great alluvial rivers, under various circumstances, as will allow of such action being anticipated; and especially to enable the engineer to utilise fully his knowledge of the rivers, so that he may make a servant of it, instead of being as it is now very often the case, his master. There can be no doubt at least from the author's point of view that more money has been wasted, for want of just such knowledge as a River Commission might provide, than would have sufficed to pay the entire cost of it many times over. Certainly, so far as training works in connection with bridges are concerned, in rivers of the class with which the author has chiefly concerned himself, most engineers responsible for such works would probably admit that whether they spent money unnecessarily as an insurance against their inevitable lack of scientific data, or that they were unduly economical with either disaster, or heavy annual recurring expenditure in after years, as the result. Thus looked on from the lowest or merely commercial standpoint, the establishment of such a Commission ought to be highly remunerative."

NEWS

ROLLS-ROYCE'S ROLE IN INDIAN AVIATION

One of the major areas of successful Indo-British technological co-operation is the one of civil and military aviation.

British Aerospace and Rolls-Royce have for long been associated with the expansion of the Indian aircraft industry as part of their worldwide international collaborative programs. Whereas British Aerospace has been responsible for bringing the Avro HS748, the Jaguar and the Sea King to India, and for building the wings of Airbus used by Indian Airlines, Rolls-Royce, as Britain's only major aero-engine manufacturer, has been a prominent supplier of engines for aircraft used in India, as well as a partner in the manufacture of aero-engines.

Rolls-Royce has just announced a major milestone in its 535E4 engine program – the engine (which powers the new 200 seat Boeing 757 competing for Indian Airlines' short-haul/medium capacity requirements) has been awarded its full engine type certificate for passenger-carrying operations by the British Civil Aviation Authority a month earlier than planned by Rolls-Royce and 13 months sooner than originally scheduled – (*British Industrial News, No. 144, January 1984, p. 37*).