Book review

Epic Engineering: Great Canals and Barrages of Victorian India

Alan Robertson, completed and edited by Jeremy Berkoff. Beechwood Melrose Publishing, Melrose, UK, 2013, ISBN 978-0-9575539-0-3, £25.00, 254 pp.

This very readable book describes the development of four great irrigation projects in India during the nineteenth century and the lives of those who built them. We should be grateful to Catherine Hamilton for encouraging Jeremy Berkoff to edit and complete the account by Alan Robertson, who died suddenly in 2006. The seeds for this book appear to lie in Ian Stone's excellent *Canal Irrigation in British India*, and in India Office Records, but the authors have taken the lives of two distinguished military engineers, Sir Proby Cautley and Sir Arthur Cotton, and their different characters, ambitions and achievements as the central theme of their book, bringing the subject to life, widening the context and discussing their legacy.

There are too few books which manage to combine the description of complex engineering subject matter with the associated human stories of the engineers, administrators and their families. *Epic Engineering: Great Canals and Barrages of Victorian India* is one of these: a story that was waiting to be written and brought to a wider audience.

Proby Cautley (1802–1871) and Arthur Cotton (1803–1899) were from middle-class families. They were both military cadets at Addiscombe, Surrey in 1818–1819, before being sent to India, Cautley to Calcutta and Cotton to Madras. At that time, the need for their military services was limited so they soon found themselves assigned to development of irrigation projects. Cautley started by working on the improvement of existing canals near Delhi and Cotton in the Cauvery river basin in southern India.

Neither had been taught any hydraulic engineering and they took very different approaches to design and development. Cautley generally took a careful and academic approach to both technical and financial aspects of his projects, although an entertaining chapter in the book, 'A misplaced decimal place', describes his ability to fudge successfully when pressed. Cautley, however, was also interested in archaeology, palaeontology and botany and made a number of finds while excavating for the foundations of irrigation structures. Many of these studies were made in collaboration with the palaeontologist Hugh Falconer and both men were subsequently elected Fellows of the Royal Society.

Cotton, a committed Christian with missionary zeal, took a more evolutionary approach to design. His structures were built on the limit of safety and then strengthened if a failure occurred. This allowed him to submit low-cost estimates to justify his proposed projects. His works,

designed at a time before theories on building on permeable foundations had been developed, have nevertheless endured. The practical experiences of both Cotton and Cautley contributed to a body of knowledge which proved valuable to future engineers working in India and abroad and to the first engineering school in the British Empire, Roorkee College, which was established in 1847.

The projects they cut their teeth on or later directed are described by cleverly juxtaposing parallel phases of their careers in successive chapters. A story emerges of the projects developed to their designs and under their direction, the decisions made by successive government administrations and the impact of the projects on famine relief and government revenues.

The trials and tribulations over Cautley's ambitious Ganges canal project, with an irrigable area of 340 square miles, a navigable main line canal 400 miles long, and the Solani aqueduct capable of carrying 7000 ft³/s (m³/s), forms a key part of the story. This was the project over which Cotton and Cautley crossed swords both throughout and at the end of their careers, with reports to the government of India and acrimonious letters in *The Times* newspaper in 1866–1867 over remodelling the as-built scheme.

Cotton, working in the southern part of the sub-continent, gained a considerable reputation from his large anicuts (barrages) on the Cauvery and Godavari rivers and on the Tungabhadra, and his ambitious irrigation schemes with associated navigation facilities. Cotton was a great advocate of the value of linking navigable rivers and canals to provide a cheap transport system and even went so far as to propose a navigable system within and around India, which connected with the Yangtze river and the internal navigation of China.

Epic Engineering: Great Canals and Barrages of Victorian India contains good clear diagrams and photographs. The book will interest not only the general reader with an interest in the history of British India, but also civil and irrigation engineers, who may find some of the incidents related in the text resonate with their experiences today. The book has useful biographical notes on those mentioned in the text, including those working in government, although there is room for a little more about the Indian engineers who were employed on these grand projects. The authors can be forgiven for one or two very minor textual errors, as the story is written in a style that drives the reader along through a period of development in India, which had and continues to have an extensive and vital impact on the livelihood of tens of millions of people.

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