

GOLAK CHANDRA: INDIA'S PIONEER INNOVATOR TECHNICIAN

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More than two decades before railways was introduced in India, Golak Chandra, a blacksmith by tradition, built a steam engine in 1828 without any assistance from Europeans. The paper designates him as an 'engineer' in the same sense that James Watt is credited, one who manufactures steam engine. A small engine manufactured by Golak Chandra certainly did not change the course of material reality in India, but he did provide an example which makes plotting of Indian dependence on Britain as a function of technological incapability, even in the era of steam, a spurious fabrication. The paper also describes in brief the history of the 19th century paper-mill at Serampore leading to the employment of steam power in manufacture. An attempt has also been made to identify Golak Chandra's engine which was a prototype of the Serampore paper-mill engine commissioned in 1820.

INTRODUCTION

A cluster of innovations and employment of steam, the non-animate source of power, were the technological factors which suddenly accelerated the process of industrialization in England in the late 18th century. Termed as "Industrial Revolution", how the ruin of Indian handicrafts industry followed in its wake and the role of steamships and railways as tools of domination and exploitation have been studied by many scholars. In the post-"Industrial Revolution" era, it was technology which turned into the chief source of the sense of superiority of the West Europeans and acted as the moral justification for colonialism as well¹.

In the late 18th century, Sir William Jones and the celebrated orientalist 'discovered' ancient Indian glories at literary and philosophical planes and also recognized Indian achievements of the past in some of the areas of scientific inquiry like mathematics, astronomy and medicine. The past capabilities were slighted no doubt in view of the contemporary deficiency, but the summary dismissal of Indian achievements in science and technology was epitomized in the "*History of British India*" by James Mill published in 1817. From the second decade of the past century, a high degree of consensus gradually consolidated the myth of the inherent incapacity of Indians to come to terms with steam engine, steamboats and railways, the key symbols of European superiority².

This is the context in which the achievements of Golak Chandra, the first Indian to build a steam engine, is to be assessed. The solitary steam engine

manufactured by him in 1828³ cannot be expected to have altered the course of material reality in India, but he provides a glorious example to demolish a myth and makes plotting of Indian dependence as a function of technological incapability even in the era of steam a spurious fabrication.

A HISTORICAL PAPER MILL

Golak Chandra was inspired by a steam engine installed in the paper manufactory of Serampore⁴ in 1820 and it is necessary at the beginning to present a brief history of the Serampore paper mill itself. William Carey and his brethren, Joshua Marshman and William Ward in particular, founded the Baptist Mission on 10 January 1800 in Serampore, a Danish settlement in the vicinity of Calcutta. The role played by the Serampore Mission in promoting education and printing has gone down in the annals of India⁵. Establishment of printing presses, type foundry and even a paper manufactory had become necessary for successful execution of the infrastructural requirements. It was one of the earliest industrial complexes of India during British period and the only one at the time to make use of steam as motive power in manufacturing⁶.

An idea about the consumption of paper in the Serampore Press can be gleaned from the observation that from 1801 to 1832, 2,12,000 copies of books embracing 40 languages were turned out⁷. As regards procurement of paper, William Carey had but two options, "Patna Paper", a kind of hand-made variety produced in Sasaram, Sahabad or Muzaffarabad of Bihar or imported paper. The 'Patna paper', according to George Smith, a biographer of Carey, was "dingy, porous, rough substance" and "being sized with rice paste, attracted the book worm and white ant"⁸. On the other hand, use of imported paper was found to be prohibitive owing to its high cost and difficulty in availability. Raw materials being abundant and labour cheap, the missionaries tried to obtain a man with requisite knowledge of paper-making from England. In 1805, Carey requested the "Iron work of a paper mill... and a model", so that paper could be made both for the Baptists' own use and for sale. Manufacture began on a limited scale in 1809. Construction of a larger paper mill was completed in August 1811. A new and even larger paper-mill was built in 1814 with the aid of an excellent mill-wright from one of the English regiments stationed at Fort William, Calcutta⁹.

The manufactory employed relays of 40 men in the tread-mill for making pulp. An unfortunate accident on a hot summer day robbed the life of one of the over-worked tread-mill operators out of extreme fatigue¹⁰. Carey and his associates were fully aware of the developments taking place in England, where steam had replaced not only human but water power also in manufacturing industries. The first volume of *Dig-Darshan*, the bi-lingual periodical of the Serampore missionaries published in 1818, carried articles on steam boats and coal mines¹¹. It was no streak of providence that the missionaries, after the horrible accident, came in touch with William Jones and were properly guided in the direction of employment of steam power¹².

As an expert in steam machineries, Jones was not only unequalled but perhaps was the only contemporary engineer available for consultation. An ex-employee of the proverbial firm of steam engine makers, 'Boulton & Watt'¹³, Jones arrived in India in 1800 and is primarily recognized as the 'father of Indian coal mining' in the sense that the mine of Ranigunj was first successfully worked by him, both technically and commercially, to produce higher grade coals suitable for foundry work and generation of steam¹⁴. Jones' success can be attributed among other factors to the employment of steam power in mine drainage. Jones and his achievements deserve a full-length treatise on its own. He was not only the first but the only 'private' from the fold of engineers in India in the nineteenth century, otherwise dominated by military engineers.

Under Jones' advice, a 12 h.p. steam engine was imported from England¹⁵. Carey in a letter to his son Jabez wrote that its cost including installation will not be less than twenty thousand rupees¹⁶. The original brass plaque of this historic engine, preserved in the Carey Museum, Serampore, reads like this¹⁷:

12 Horse Steam Engine
 Manufactured by
 Thwaites Hick & Rothwells
 Engineers
 Bolton
 Lancashire, England:
 For the
 Baptist Missionary Society's Establishment at
 Serampore

Smith writes that the steam engine was commissioned on 27 March 1820¹⁸. But *Samachar Darpan*, the Bengali periodical of the Serampore missionaries, on 25 March 1820 indicated that it had already been commissioned for the exclusive purpose of paper-making. Referring to the role of the steam engine in paper-making, Carey wrote, "we now make our paper by machine in which the pulp is let to run a web wire, and passing over several cylinders the last of which is heated by steam, it is dried and is fit for use in about two minutes from its having been in a liquid state"¹⁹. It is obvious that the steam engine must have been employed for conveying the 'web wire' round the cylinders and the steam from the boiler, or more probably, the exhaust from the non-condensing steam engine found additional use in process-heating.

IDENTIFICATION OF THE PAPER MILL ENGINE

The hypothetical comment about the steam engine being a non-condensing one is prompted by a number of considerations. Along with the original brass plaque, an old model of a steam engine (Fig. 2) coupled with boiler (Fig. 3) is also preserved in the Carey Museum, Serampore. The model engine is undoubtedly a non-condensing one. But there are certain difficulties in

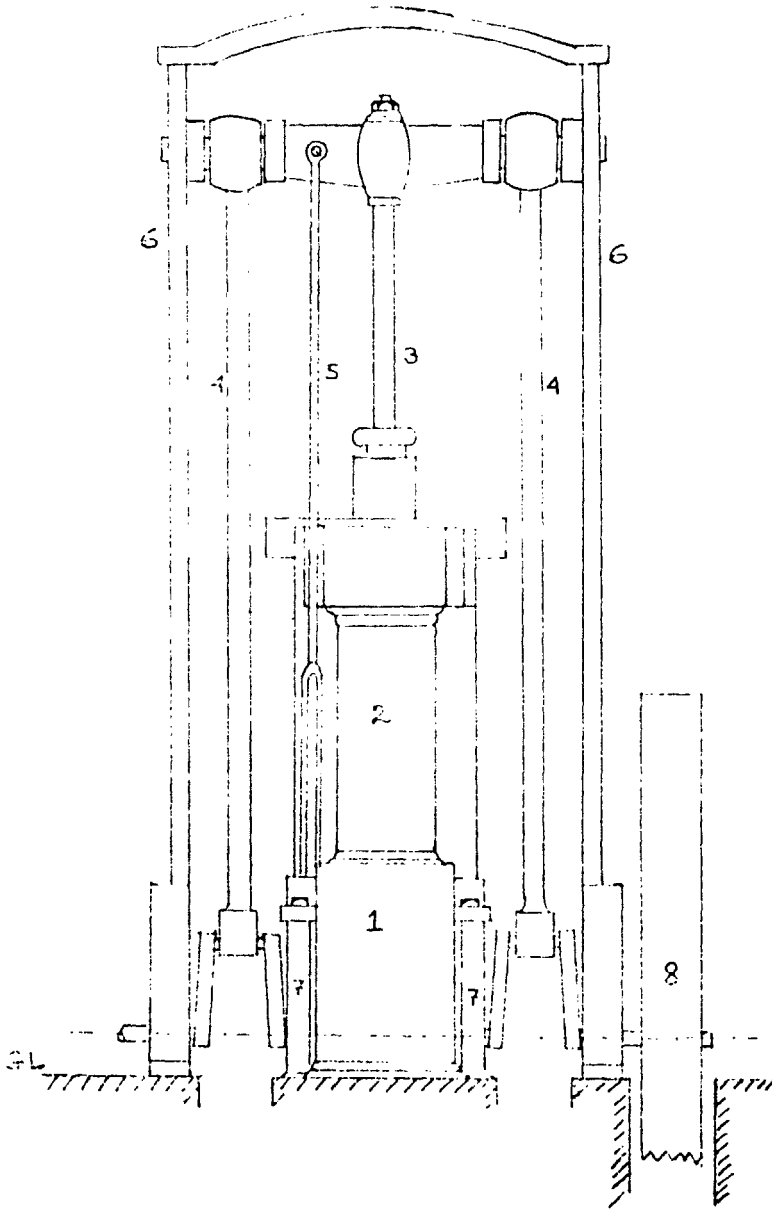


Fig. 1. Schematic drawing (not to scale) of the model of the steam engine preserved at Carey Library, Serampore. [1. Steam chest; 2. Cylinder; 3. Piston rod; 4. Connecting rod; 5. Valve actuating rod; 6. Frame with slot for guidance; 7. Columns (4 Nos); and 8. Flywheel.]

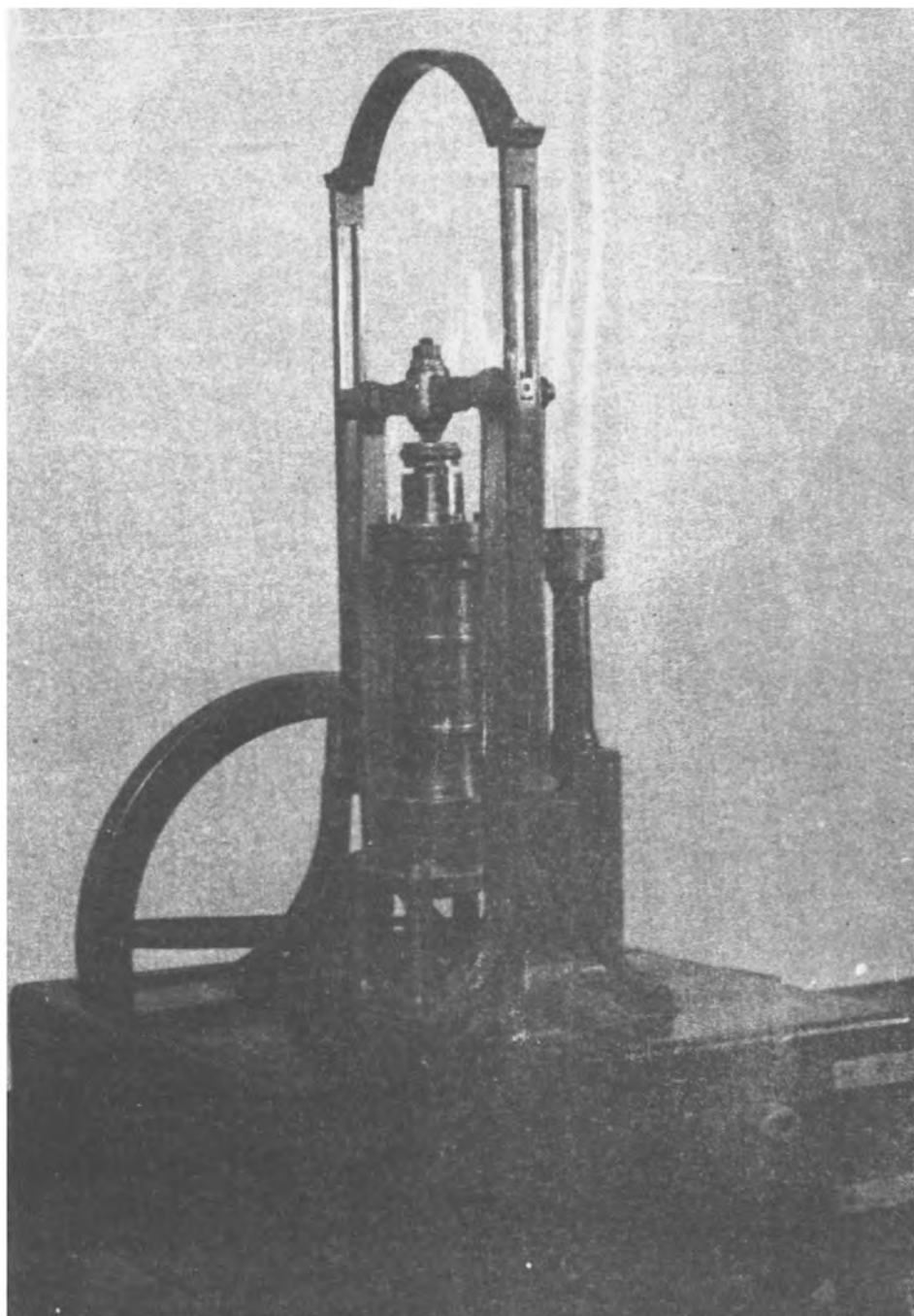


Fig 2 Photograph of the model of steam engine preserved at Serampore

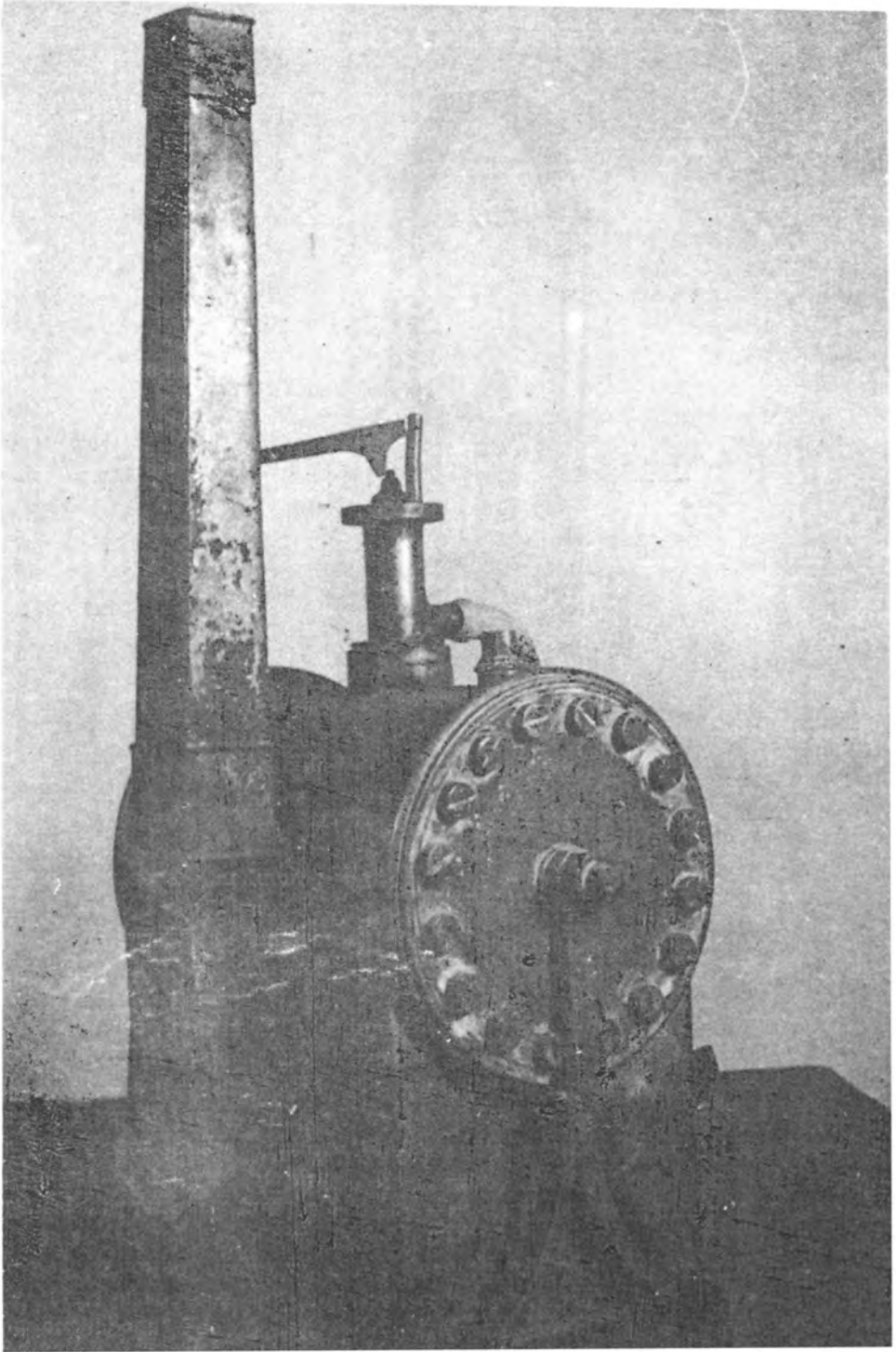


Fig. 3. Photograph of the model of boiler preserved at Serampore

identifying the model as a replica of the original engine and boiler supplied by Thwaites Hick & Rothwells. There is little doubt that some of the features of the preserved model are only to be observed in steam engines belonging to the period 1820's, viz., the use of vertical cylinder and two connecting rods instead of a cross-head for transforming the reciprocating motion of the piston into rotation. But the speculations get the first jolt when we observe that, engraved on the chest of steam in the model, is the name of 'J. Baker', in all probability the maker of the model. How do we ascertain that J. Baker fashioned it after Thwaites Hick & Rothwells'?

The case is further complicated when the following facts are taken into consideration. John Mack, who wrote the first Bengali treatise on chemistry, was a teacher at the Serampore College. Before his departure for India, one James Douglas donated five hundred pounds for the purchase of laboratory equipment for the Serampore College. Among the list of equipment purchased in 1821 is 'an elegant working model of *Watt's* steam engine with apparatus''²⁰ (emphasis deliberately added).

There are two important clues to the mystery. Firstly, the preserved model can never be designated as a Watt-type engine, all of which even with different degrees of modifications can be broadly categorized as 'beam engines'. The second and the most important argument in favour of the model being a replica of the original engine comes from the note-books of Joshua Field²¹ (Fig. 4). Field visited Thwaites Hick and Rothwells' manufactory on 3 September 1821. He was taken round the workshop by Hick, the engineer and managing partner of the house. Field writes. "He [Hick] showed us a method much used by them for working the feed valve.... he makes the valve like a safety valve on the top of the boiler". This is exactly the manner in which the model boiler of Serampore is constructed. Field also observed that "up to 12 horsepower he makes them upon 4 strutting columns.... standing on a place upon which the cylinder crank plummer block [...] in one are fixed.. also the crank is made to work in a groove". This also agrees with the model. The conclusive proof, however, awaits further research when a batch of drawings executed by Hick and preserved in the Science Museum, London can be subjected to scrutiny.

The question of identification of the model engine assumes further importance because Golak Chandra's engine was a prototype of the original engine of the Serampore paper mill.

GOLAK CHANDRA'S STEAM ENGINE

The steam engine at Serampore was a great novelty of the time. Steamboats had not yet appeared on the Indian rivers and even application of stationary steam engines was negligible. Referring to the Serampore engine, J.C. Marshman remarked: "This has created the same excitement as was created by the first steamboat or first locomotive this machine, has now outplayed the

deity *Viswakarma* in getting the work done''²². The same tone is revealed in a report published in the *Calcutta Gazette* on 27 May 1824. "Four years have elapsed since the installation of the steam engine, but still it is drawing large crowds of the native of every walk. Even those who are travelling on boats, anchored there on the shore and spend long hours to witness its working".

The oblique references to the effectiveness of *Viswakarma*, the god of the Hindu artisans, and only 'natives' being amazed and enthralled indicate that the steam engine was identified as a key symbol of the modern technology to signify European superiority. There is an echo of the same voice but with a little modification when Smith observed: "The 'machine of fire', as they called it, brought crowds of natives to the mission, whose curiosity tried the patience of the engineman imported to work it: while many a European who had never seen machinery driven by steam came to study and copy it"²³. It was, however, none from the fold of Europeans, as Smith himself had to admit, but a 'native' blacksmith who ultimately did produce a prototype of the steam engine. Smith writes: "In the Society's Proceedings for 9th January 1828 we find this significant record: 'Resolved at the suggestion of the Rev. Dr. Carey that permission be given to Goluk Chundra, a blacksmith of Titigur, to exhibit a steam engine made by himself without the aid of any European artist'. At the next meeting, when 109 *malees* or native gardeners competed at the annual exhibition of vegetables, the Steam engine was submitted and pronounced 'useful for irrigating lands, made upon the model of a large steam engine belonging to the missionaries at Serampore'²⁴.

A contemporary report about the above annual exhibition, the second of its kind organized by the Agricultural and Horticultural Society, which took place on 16 January 1828 at the Town Hall of Calcutta, also took note of Golak Chandra's achievement, "A curious model of a steam-engine, made by Golak Chander, Blacksmith of Tittaghur, near Barrackpore, without any assistance whatever from European artists, was likewise exhibited; and although not coming within the immediate sphere of the Society's exertions was considered so striking an instance of native ingenuity, and imitative skill, as to deserve encouragement. A donation of fifty rupees was, therefore, presented to the ingenious Blacksmith"²⁵.

A steam engine by itself cannot be declared 'useful for irrigating lands'. It appears Golak Chandra demonstrated pumping by the steam engine. Did he fabricate the pump after the one used for feeding the boiler of the Serampore? The question, I believe, will remain unanswered, as old records in the Carey Library, Serampore have not yielded any further information about Golak Chandra. We know that Panchanan, Manohar and Krishna Chandra, the proverbial punch-cutters and type-casters of Serampore all came from the fold of traditional blacksmiths, which is also borne by their surname *Karmakar*. Did Golak Chandra belong to this *Karmakar* family? We can only pose the question, but it will be a futile exercise to dwell at length on its possibility. It is,

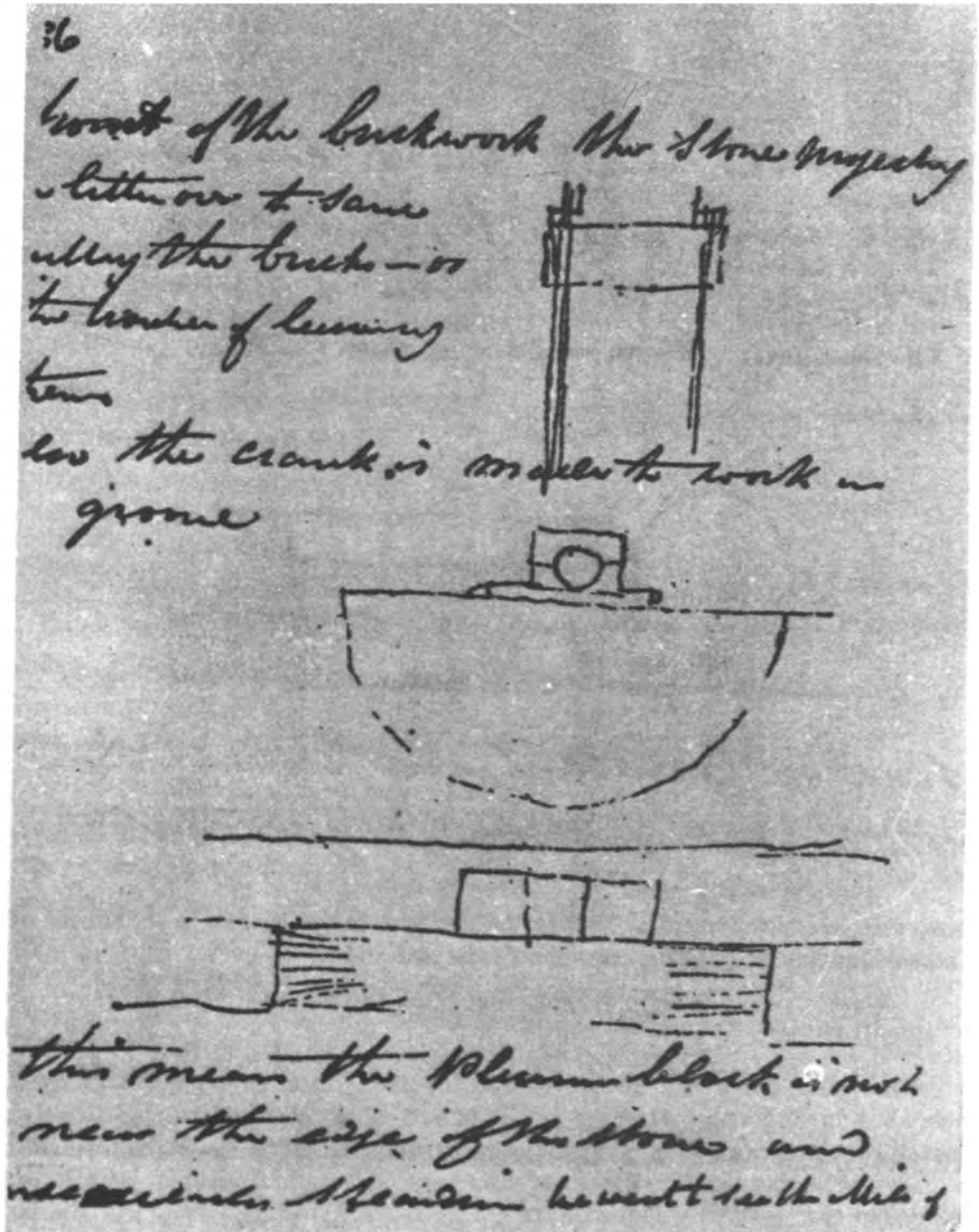


Fig. 4. A relevant page from the diary of Joshua Field (By courtesy of Science Museum, London)



Fig. 5. A portion of Col. J. Gastrell's map of Serampore (1863) indicating Serampore Press, Paper Mill and College on the bank of river Hooghly. 'Kamarpara' or the settlement of the blacksmiths is also indicated.

however, worth documenting that in the mid-nineteenth century a settlement of Indian blacksmiths grew up near the Serampore industrial complex²⁶ (Fig. 5).

CONCLUSION

The news about the commissioning of the steam engine at Serampore published in *Samachar Darpan* on 25 March 1820, already referred to, also contained information regarding the various uses to which steam engines had already been put in English industries and navigation. Hopes were also expressed that gradually industrialization of India would also follow a similar course. By the time Golak Chandra manufactured his engine, regular steam navigation had started on the Indian rivers, the new Mint at Calcutta had already been raising a lot of steam on a very big scale²⁷, but it would be sheer optimism to hope that future enquiry may salvage from oblivion further achievements of

Golak Chandra as a manufacturer of steam engines. A brief narration about the fate of the Serampore Paper Mill itself can bring home the message, the incongenial atmosphere of the time.

The Serampore Paper Mill continued to flourish and "in 1845, there were three steam engines in operation and the mill, the only one of its kind even then, produced at capacity 50 reams of demy daily"²⁸. Up to 1865, Serampore is supposed to have been the only source of local paper in India other than the hand-made variety²⁹. Smith writes, "It [the Paper Mill] stopped only when the Secretary of State for a short time ordered the official indents for stationery to be supplied from London, an unjust policy.... unfair to the native and local industries and to the tax-paying public"³⁰. Elsewhere, Smith is even more specific when he observes: "The Serampore mills were gradually crushed by the expensive and unsatisfactory contract made at home by the India Office"³¹. In 1867, the machineries of Serampore Mill were transferred to the 'Royal Paper Mill' at Bally, Howrah. After another 38 years, the ownership of the Royal was purchased by Tittagur Paper Mills and the machineries were shifted to Tittagur³². In the premises of the Tittagur Paper Mills, however, there is no relic of industrial archaeology.

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