

SCIENCE AND TECHNOLOGY (COAL MINING) IN INDIA
IN EIGHTEENTH-NINETEENTH CENTURY

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History of coal mining in India is closely linked with the history of British Rule in India. The battle of Plassey 1757 did not give any legal authority to the British over Bengal, Bihar and Orissa. The battle of Buxar 1764 and the grant of Diwani by Emperor Shah Alam II in 1765 on the other hand, conferred some legal title and authority over Bengal, as the Emperor of Delhi, though nominal, was still the Suzerain of Bengal Subah. From 1770 onwards the East India Company's Board of Directors decided to assert its authority over Bengal when they ordered their Fort William President to "stand forth as Diwan of Bengal, Bihar and Orissa". This was the beginning of the British rule in Bengal—and also in India. Warren Hastings who was made the Governor of Fort William and Bengal was also the chief revenue collector on behalf of the Company; and many supervisors, later redesignated as collectors, were appointed for collecting rents and for exercising the criminal jurisdiction in the Subah of Bengal and Bihar*.

It was known for the first time from the application dated 11th August, 1774 made to Governor of Fort William by Mr. Sumner and Heatley,** the two covenanted servants of the East India Company, that they had discovered coal in certain areas of Beerbhum and Panchet. At that time Beerbhum, Panchet (Panchkote) and Bishnupur were in one district under a single supervisor (later on collector) and those two gentlemen were serving the E. I. Company in various capacities as supervisor, Asstt. Supervisor, etc. in these areas.⁴

Their application seeking permission to open coal mines and to sell coal from the authorities at Fort William have two important bearings in the history of coal mining in India. Firstly, it recognized the fact that the E. I. Company was the real authority in Bengal and the nawab and the emperor were only the nominal authorities. Secondly, mining operation required the approval of the authorities at Fort William which can grant permission on the conditions to be prescribed by them. This power of granting the mining leases remained with the Company till the introduction of the Permanent Settlement System of 1793, which conferred this right to the Zamindars in Bengal and continued till the abolition of the zamindari system.

*See Annex. 1.

**Annex. 2.

Many people are apt to believe that use of coal was known to the Indians from ancient times, even during the Vedic period. Some committees appointed by the Government of India have also mentioned about its ancient use.² But I agree with Dr. C. S. Fox who had held the opinion that there is no such reference in any Sanskrit text or even in folk-lore in the country mentioning the use of coal in ancient India.³ So much so, there is no Sanskrit word denoting coal. Some writers have mentioned the names of some places, rivers, like 'Angar Pathra' or Damodar and Barakar to suggest their linkage with coal. But such references do not establish the point and seem rather far-fetched. Even Kauṭilya's *Arthaśāstra*, in which the author has mentioned about the mines of different minerals, has made no mention of coal mines. The *R̥g Veda Samhitā* also mentions the use of metals (*ayas*) which may be copper, bronze or iron, to be inferred from the colours used before it, e.g. reddish metal (*lohita ayas*), black metals (*kr̥ṣṇa ayas*) and even has mentioned in detail the smelting process—"The worker in metal smelted ore in the furnace using the wing of a bird as a bellows to fan the flames", but has not mentioned the use of coal. It is a well-known fact in India that since the ancient times to this century, Indian tribes (Lohars and Agariars) were smelting iron with charcoal only, and therefore, there is Sanskrit word for charcoal (*aṅgār*) which also means sparks or embers.

Then the next question of importance arises regarding the etymology of coal or *koilā*. In European countries the word coal is derived from Latin word *caulis* and therefore, in old English it was 'cole' and more or less similar words in other old European languages like *koal* (Dutch), *kul* (Danish), *kohle* (German), *kol* (old Norse), etc. According to Oxford Dictionary, its Aryan root being *gwor-gul*—original Tunic word *kola* and Persian *zoqual*. But it is difficult to say how the word *koilā* has been derived. Some writers believe that it is derived from the Sanskrit word *kāl* which means black, but as *aṅgār* and *koilā* stand far apart our enquiries are to be directed in some other direction. From the burnt outcrops of coal in the hilly tracts of Chotanagpur, it appears that coal seams were exposed on the surface in these areas—a fact corroborated by the geologists surveying these areas. Therefore, in my opinion, the word *koilā* has a Mundari or Santhali origin being the tribal dialect of that region. Coal seams are present near the Koel river (a tributary of Sone) in Palamau district. Major G. Hunter Thompson, Supdt. Revenue Survey of Chotanagpur 1862-1866 writes,⁴ "Coal is plentiful in Palamau. I believe that an inexhaustible supply will be found in the valley of the Koel river for the entire length of its course, through the Purgunnah, some 90 miles. It is visible on the surface, at many places, on both banks of the river". Even Rennell's Map of Palamau (1779) mentions of a coal mine in the Map. It is also marked on Arrowsmith's Map of 1804. The place like Koila Pal (in Singhbhum) the Koel river of Palamau and the Santhali word *kuilā* for charcoal suggest some etymological answer to this vexed question.

However, the recorded mining of coal and its modern use start only from the last quarter of the 18th century, when John Sumner and S. J. Heatley discovered coal in

the jungles of Panchet and Birbhum in between the rivers Barakar and Damodar*. This area is now a part of the Raniganj coalfield in Bengal, but Zamindari of Panchet was in the Subah of Bihar during the Mughal period, as we find a reference of Panchet in the Padishahnamah (1632-1633) where it is stated "Bir Narayan, Zamindar of Panchet, a country attached to Subah Bihar, was a commander of 300 horses and died in the sixth year" (of Shahjahan's reign⁵).

British penetration in these hilly and jungle areas started only after 1765 and with great difficulties they could subjugate these areas to establish the Company's administration. Sumner and Heatley while they were in charge of collecting revenue from this area that they came across the coal deposits and asked the Council at Fort William for a lease**. At least up to 1770 no other person had approached the E. I. Company for operating coal mines, though two similar employees of the Company, Lt. Col. Campbell and Maj. Watson had similarly petitioned (12th Nov. 1770) to Fort William for a grant of permission for mining silver, lead, copper etc. but coal was not mentioned***.

Surprisingly the required permission was not granted by the Calcutta Council and the grounds on which the petition was rejected on 21st Nov. 1770 throw some light on the industrial policies of the Company of the time, which delayed the industrialization process in India.

Firstly, it was still uncertain whether the conquered/ceded territories in India formed a part of the British territory and according to prevalent British law gold and silver mines belonged to the Crown and also had a claim on all other minerals on payment. Therefore, the council was not in a position to grant such permission.

Secondly, the East India Company, having the monopoly of trade in this area would suffer a loss from import of these articles, the annual import of lead alone to Bengal was about 20,000 maunds. Thirdly, they had the fear that these extra goods may affect the bullion position in the home country and may lead to heavy loss to Great Britain.

Fourthly, the Company was bound by an agreement with the British Parliament to pay £ 400,000 annually to Government for 5 years from 1st Feb. 1769 in lieu of the territorial acquisition and Revenues that shall remain in the possession of the Company for that period"⁶ and this amount would increase alongwith the increase in output; plus they were bound to purchase military and naval stores from England. But the most important consideration, outweighing all other considerations, was that though these mines were to be worked by British artificers and according to the British method and providing the company with articles of military stores such as brass and iron guns,

*Annexure-3.

**Annexure-2.

***Annexure-4.

mortar, shot, shell, etc. at a cheaper rate, yet, the Fort William Council was anxious to see that these metals and the European techniques of their smelting and manufacturing of military stores do not go into the hands of the native rulers.⁷ They felt "there is every reason to suppose that the countries which border on Bengal abound as much in various ores as this province itself; the natives are not absolutely ignorant of the use of iron ore and if mines of other metals were once opened in Bengal and there produced as perfect as those they see brought from Europe and sold at a far lower rate, their curiosity and their avarice would be excited."⁸ They even feared that once the natives acquired the art of smelting metals and the manner of casting them into cannon shot and shells that they would soon become masters of the latter. Thus the first attempt to open metal mines and to establish foundries during the early British rule foundered on the rocks of vested interests.

Next attempt was made by M/s. Sumner and Heatley, the revenue collectors of the region (which has already been mentioned), only after the expiry of the 5-year agreement between the E. I. Company and the British Parliament ending on 18th Feb. 1774. Most probably, the transfer of power that took place in 1858 would have taken place in 1774 itself, as the news of mismanagement, exploitation by the Company's servants, whom Burke described as "birds of prey and passage", and in consequence the terrible famine of 1770-71 had disturbed the British Parliament. But only a new measure extending the control of British Parliament and the Government was enacted in the form of Regulating Act 1774. Warren Hasting was redesignated as Governor General of Fort William in Bengal with a reconstituted Council.

This newly created authority under a Parliamentary statute had played some important role in the development of industry and technology in the country, though it was not without limitations, and this country had to wait for investment of British capital and skill until the abrogation of the East India Company's monopoly in 1813.

The Fort William Council after ascertaining the views of the Burdwan Provincial Council, under whose direct revenue jurisdiction that area lay (4th Oct. 1774), conferred on them a grant in the name of Messers Sumner, Heatley and Redferne (who was associated with the firm later) on the following conditions without hampering the process of revenue collections:

- (1) Nobody should be forced to work for them.
- (2) The mining operations would be under the control of the Provincial Council at Burdwan, without any right to appeal.
- (3) No market or godown should be set-up.
- (4) The Provincial Council was empowered to remove any employee, Indian or European, found undesirable without assigning any reason.

- (5) No defaulting *raiya*t should be given shelter or protection in the mining area.
- (6) Their lease was non-transferable.

As a result they obtained the exclusive right for a period of 18 years to work and sell coal in Bengal and its dependencies. In addition to paying a Government royalty of 1/5th of the total value of coal raised by them they also agreed to supply Government with 10 thousand maunds (366 tons) of coal a year for a period of five years at a price of Sikka Rs. 2-12-0 per maund or £ 8.3s. 6 d. a ton.⁹

It is of historical interest to all of us to know the places where the first coal mines were discovered and worked by M/s. Sumner and Heatley lay—as they rendered a great and valuable service to this country in excavating coal—the fuel for industrial revolution. Later on a search for the sites was conducted and it is now known that the mines worked by them were six in number—Ayturah, Chinakuri, Damulia and others further west near the Barakar*.

Though during this period industrial development did not engage the attention of the Government of much —the revenue collection remaining the uppermost in their mind, yet the matter was of such a great importance that the Council, while reporting this discovery and undertaking to the Board of Directors asked for their countenance and protection in the prosecution of it as tending to promote useful industry without prejudice to the success of their revenues".¹⁰ Thus this departure from the earlier policy of refusing to grant licences for working of mines laid the foundation of future coal mining industry in India.

Though the period under our review was the hey day of *laissez faire* and free trade theory, yet the Council at Fort William was not very liberal in granting such licences to Indian entrepreneurs as it will be revealed from the policy adopted towards an application made by an Indian to Burdwan Council for manufacturing iron on 19th Sept. 1774 —almost at the same time when Sumner and Heatley applied and received permission for working coal mines and almost on the same condition.

The applicant claimed that the area near the Mansar Pahar in the district of Birbhum was full of iron ores and asked for a lease for 7/8 years on the following terms:

- (1) That he would pay Rs. 2,000 per annum for the first three years and Rs. 3,000 per annum for the remaining years of the lease, which shall be in full of all rents and customs whatever.
- (2) He would supply Government, if his business succeeds, with what iron they may want at the Bazar price of the time of demand.

*See the Map—Annex. 3.

- (3) No raiyat would be forced out from the Malguzari land nor give protection to any who may desert with arrears of rent due to famine, nor any shelter would be given to Chuars and mountaineers who infested the Malguzari land.

Yet permission was not granted for the fear that these valuable minerals may, fall into the hands of the neighbouring Indian powers, and the knowledge of smelting iron (British method)¹¹ and the casting of cannon shots and shells should not be made known to the natives so also the British method of trade and business.

But later on license was granted to Messrs Motte and Farquhar in 1777 when they sought permission to cast shell in the Purgunnah of Jerriah "lying between the rivers Damudar and Burraker in the province of Panchete".¹² It abounds with iron ores and had the singular advantage of being contiguous to the coal mines of which Messrs Sumner and Heatley had a grant. However, this factory had to be abandoned finally in 1789.

The early history of Indian coal mining was beset with difficulties, and not very encouraging as the Government also did not take much interest in its development, until coal came to be used for generating steam which could drive machines and railway engines. Government showed lukewarm attitude to the Panchete coal supplied by Messrs Sumner and Heatley when under the agreement, the firm announced in 1775 the arrival of 2,500 maunds of (91½ tons) Panchete coal in Calcutta and asked the authorities to take over the coal. As it was inferior to English coal it was not taken over immediately. Only on their second application the Commissary of Stores was asked to examine the quality in 1777. Its report of 20 Jan. 1778 was very much discouraging. It was pointed out that the Panchete Coal was only half as good as English coal—but advised them to bring coal from a deeper depth. Despite transport difficulties (as coal could be transported to Calcutta by river—Damodar remaining navigable for 10 weeks only) their firm tried to supply coal to Calcutta as per agreements, though they suffered a great loss. Heatley had brought miners from England and they all died due to fever. Heatley and Sumner were also transferred in the mean time to other parts of the country and Lord Cornwallis, the new Governor-General, did not encourage private trade and commerce by Englishmen in India, lest they would settle down and form a colony to demand independence in course of time—as he had the fresh experience in America from where he was brought to India after the American war of Independence. Indian political developments and the increasing military involvements of E. I. Company in India increased the demand for military armaments. Increasing armament cost led the Government to think whether Indian coal could be used for manufacture of ordinance. In 1808 the Directors of the E. I. Company expressed concern at the increasing cost of armaments and suggested whether charcoal could be substituted for imported coal for manufacture of armaments, and if not, they recommended the transference of the ordinance work to England. Thus

“neglect and apathy” writes Coupland “characterised the first few years of coal mining in India”.¹³

The turn of the century heralded a new era for the coal mining in India. Major developments in this direction took place only with the approach of the 19th century. Lord Minto ordered for the tests of Indian coal in 1808; the report of the tests made by Col Hardwicke was unfavourable and the matter was dropped. But in 1814 Lord Hastings once more urged the Military Board to ascertain “whether the coal of India was of a quality calculated for the purpose of the forge”. He further ordered that the mines should be examined by a fully qualified person who would procure supply of coal from deep strata with the help of boring equipment. Previous experiments were fully discredited owing to the samples being taken from the shallow mines. The expert appointed was Rupert Jones, from England on 16th April 1814 (according to some he was William Jones and not Rupert Jones)¹⁴ “on an allowance of Rs. 600/- per month. He rediscovered Heatley’s mines. On June 20, 1814 Jones reported that he did not think that there was any coal in Burdwan district and that the place where he found coal is called by the local people Jurwah.¹⁵ He reported about the transport difficulties and the means of communication also”. Boats of about 300 maunds could be taken up as far as Chinacoory ghat four miles below the confluence of the Damodar and the Barakar rivers and make 4 or 5 trips annually from there to Omtah without danger or difficulty. From Omtah to Calcutta the river is always open”. He bore a shaft at Mudgeah, up the Nooneahjor and at the depth of 39 ft. met the first bed of coal— This coal “it was asserted”, suits every purpose and was superior to most English coal. The shaft was 9’ in diameter and between 80-90 ft. deep. The place was in Shergarh Purgunah, zilla Jungle Mahal¹⁶ and Zamindari of the Rani of Burdwan.

But this was a very expensive venture and Jones’s monthly stipend of Rs. 600/- was not sufficient. He was given a loan of Rs. 4,000/- by the Government on the security of Messrs. Alexander & Co. of Calcutta. Jones however, failed in his venture and died in 1822. Despite his failure, Jones made a lasting contribution to the coal industry by giving a favourable report regarding the quality of Indian coal and suggesting it to be better and more economical fuel for burning the Sylhet limestone than the fire wood, apparently little knowing that coal was to be used for generating steam which was to cause the great Industrial Revolution.

These mines ultimately passed on in 1820 to Messrs. Alexander and Co. who held security for Jones and started the first regularly constituted Indian mines under European supervision and worked with European capital. In 1823 Chinakuri was opened by Mr. Betts upon the site of Heatley’s working. Messrs Alexander and Co. also failed in 1835 and the mines were purchased by Dwarkanath Tagore and subsequently was worked by the combined firm Carr Tagore and Co. Mr. Homfray of Messrs. Jessop and Co. opened the Chanch and Luchibad mines in 1820 west of Barakar river and also Damulia and Narayankuri. In 1837 these mines alongwith others passed on to M/s. Gilmore, Humfray and Co. and 6 years later in 1843 this firm and Carr Tagore and

Co. were amalgamated to form Bengal Coal Co.—the first joint stock company to run coal industry in India.

According to Humfray the coal imports into Calcutta from these mines amounted to 1,000,000 maunds or 36,000 tons in 1839 and 25,000,000 maunds or 91,500 tons in 1846. According to Hunter “coal was being carried to Calcutta by river Damodar. Three descriptions of boats known as *Pautas*, *Padis*, *Ulakhs* are employed in this trade. Navigation can only go on below the junction of Barakar and Damodar rivers. It is estimated that 200 to 300 boats are engaged in this trade between the months of June and October, and that from 30 to 40 thousands tons of coal are thus sent to Calcutta. The boatmen are paid Rs. 3/- or Rs. 3-8-0 per ton for each trip and deliver the coal at depots near Amta on the Damodar or at Uluberee on the Hughli.”¹⁷

From now on most of the coal mines were opened by British industrialists with British capital as the importance of coal in the new industrial age was already well established in England; and the nineteenth century witnessed a series of important inventions in England making this industry more efficient and less hazardous. Problems of ventilation, control of gas, hazards of explosion and dust, dangers of inundation etc. of mines were tackled in England and so also the method of working. British capitalists realised the potential importance of coal mining industry in India, even before the establishment of other industries using steam power. Their far-sighted policies and prospects of good return permitted the flow of British capital and technical knowledge into this field. Now a systematic geological investigation for coal was very much needed and it was started by a geologist, D. H. Williams of Geological Survey of Britain in 1845 as per recommendations of the Coal Committee which had noted a list of coal exposures in this area in 1837. More and more coalfields came to the knowledge of the people. Ramgarh field was discovered by D. H. Williams in 1848. Palamau coalfield was already known and in 1847 Bengal Coal Company had opened a mine at Rajhara (Palamau). Williams fell ill and died while exploring the Karanpura coalfield. Thus the premature death of Williams left his work incomplete and the mineral industry in India had definitely suffered a set back. But his work was very useful, though he could not submit the final report. The Secretary of the Coal Committee Dr. McClelland succeeded him and submitted (the first) Report on the Geological Survey of India for 1848-49 and thus the stage was set for the establishment of a geological survey on modern scientific lines. The Geological Survey of India was formally established in 1851 with the appointment of Dr. Thomas Oldham, a Professor of Geology in Dublin, and geological survey for searching coal and other minerals in the country was started in a systematic way.

Once the availability of a good quality of coal in abundance was assured, many other industries were started by the British capitalists in India. Thus first cotton mill was started in Calcutta in 1818; steam navigation in 1828; jute mill in Rishra (Bengal) in 1855; power loom in 1859; (by 1881 there were 5,000 power looms in Bengal). Simultaneously iron and steel manufacturing industries and refractories also started.

Jessop and Co. started a steel factory near Barakar in 1839 and Bengal Iron Company (Martin and Co.) in 1875 in Kulti; Raniganj Pottery Works (Burn and Co.) in 1859.

Development and improvement in the means of communication was also another essential feature of the Industrial age. Cheap and efficient transport network help in the increase in production, and the increased production in turn help the development of communication system for proper distribution and marketing. This was the characteristic feature of the industrialisation of nineteenth century England and India was no exception. The Coal Committee had already suggested that the most important question before the Government was to discover coal in sufficient quantity and to find means of transport for supply of coal to steam vessels on the opening of cheap means of communication, and railways, in India. Intensive search for coal went on unabated, as India provided a profitable areas for investment in industrial enterprise. Raniganj field was surveyed in greater details during this period by the famous geologists like Thomas Oldham, Blanford and Wilson. River being the only line of communications, most of the collieries were on the banks of Damodar river as coal could be easily carried to Calcutta by boats.

Coal industry got a new fillup with the opening of railway line in this area. Railway line from Calcutta to Raniganj was opened in 1854. It helped the growth and development of coal industry in two ways. Firstly, it provided cheap and convenient transportation system; railway lines could be taken up to the heart of the coal mines, situated not necessarily on the river banks. Secondly, Railways became the greatest consumer of coal for running its locomotives. The first railway line was in Bombay in 1853, which of course depended on imported coal, being cheaper in Bombay than the Bengal coal. In some other places railways still continued to use charcoal instead of coal as comparatively charcoal was found to be a cheaper fuel; nevertheless, coal consumption increased with the expansion of railways. New collieries and other industries were opened in various parts of Raniganj as transport capacities were provided by the opening of railway lines up to Raniganj by E. I. Railways and Raniganj area became the centre of new industrial activities.

There were large number of coal mines in Burdwan district of Bengal working in 1832 producing coal to the extent of 14,000 or 15,000 tons annually. The workings of the mines first began in about 1814 but extensive operations began in 1825. The seam was 9 feet deep and about 90 feet from the surface, and two or three thousand people were employed, receiving 6s. or 8s. a month. The coal was principally used for steam engines, and was sent to Singapore for that purpose, and was also used for the burning of bricks. Coal had also been found in Bundelkhand, and was found in abundance in Cutch¹⁸. By 1858-1860 fifty collieries were established in Raniganj field and produced according to Blanford 78,02,566 maunds or 281,994 tons of coal, while in 1830 only 10,00,000 maunds was produced.¹⁹ In 1868 in Raniganj produced 11,921,065 maunds*.

*See Annex. 5.

Most important consumer of coal was the railways (about 30-35%) and the next consumer was the iron and steel industry. Consequently, coal trade in India also had undergone enormous changes. Earlier India was importing coal mainly from England (about 77%) and Japan and Australia, but from 1881 onwards there was a fall in import reaching 154,670 tons in 1900 and export trade developed towards the end of the 19th century from 1884 onwards mainly to Ceylon and Singapore.

Coal trade; from *Memoirs G S I XII* Part 1 page 118.

Year	Imports (tons)	Production	Export
1881	806,924	997,730	..
1882	597,334	1,130,242	..
1883	672,151	1,315,976	..
1884	754,641	1,397,818	100

At first Raniganj field was leading in coal production. Knowledge of coal in Jharia came to be known later. Occurrence of coal in Jharia was first mentioned by Lt. Harrington in 1839, but this claim is doubtful. It was during the revenue survey operation (1861-67) that Maj. Sherwell discovered the existence of coal in Pargannahs Jharia, Katras and Nawagarh. On enquiry the report was found to be correct and the Board of Revenue sent the sample of coal to Geological Museum, where the curator Mr. A. Tween, declared it to be of poor quality and fit for only burning lime.²⁰ But according to C. S. Fox the exact discovery of coal in the Jharia field must be regarded as uncertain. In 1858 Messrs. Borrodaile and Co. had applied for a lease for the whole of Jharia estate.

The area was first surveyed and mapped by T.W.H. Hughes in 1866, and in 1890 by T. H. Ward who estimated 804 million tons of good coal reserve. Jharia field contained such a good reserve of coal that though this field did not start production until 1894, about 80 years later than Raniganj field, yet its growth became rapid, especially after the extension of railway line upto Katrasgarh in 1895 and a branch line upto Pathardih. Because of its good quality of coal (coking), various companies took up mining leases and by the end of the nineteenth century Jharia field became the most important coalfield in India.

*Output figures of Jharia field given below*²¹

Output in tons	
1896	..
1897	333,436
1898	749,988
1899	1,007,236
1900	1,710,757

I must conclude this article with the technology and methods of working used to raise coal in the eighteenth and the nineteenth centuries. Though various technological changes and innovations were made in England during the nineteenth century, yet it is doubtful if all these improved technologies and appliances were introduced by the British mine owners in India. Early mining methods must have been crude and medieval like the methods prevalent in thirteenth century England. The mines of the period under discussion must have been shallow. The 'bell pit' system and the "pillar and stall" methods must have been the common system in India during this period. The tools also were of old and conventional type, like—slightly curved pick, the wedges, the hammer, the crow-bar, shovel etc. In some collieries, the mine owners had brought miners and workers from England, where they had already some experiences in working in mines, but this appeared to be expensive. Shaft mining was not common in the beginning, open pit or quarries were rather common. Different types of collieries that sprang up in this region have been recorded in Hunter's *Statistical Account of Bengal*.

Haulage was unknown; coal was brought to the pit bottom in baskets by men and women and then stacked. The raising of coal from the pit was first through ladder, or on stairs and as the mine became deeper 'gin' was used. Buckets were tied to a gin over the opening with a horizontal bar, rotated by a number of men and women. By the early nineteenth century a number of British mines used the steam winding engines but the Indian mines introduced them much later.

Important changes, in the use of techniques, scientific appliances as known during that period, were introduced in Indian mines by the last quarter of the nineteenth century. The use of pumping set for drawing out water from the mines in Raniganj was considered as a novel and wonderful thing, not seen by the local people ever before and it has found a place in the folk-lore (Tusu songs) of this region. As described by W. Miller, deeper mines with cages, winding and pumping plants of modern type, well built chimney stalks and boilers were introduced in Indian mines by the end of the nineteenth century.

In conclusion, it is evident now that coal mining industry in India was established on a sound footing economically and technologically—not by Indians but by the nationals of a conquering country—may be for their own benefit. Nevertheless, their capital and technology was invested for the development of coal mining industry which put India on the industrial map of the world. Without coal, prior to the discovery of other sources of energy, industrial progress in India, (whatever progress it had made) would not have been possible. As Chesterton had rightly said, at that time, "Our civilization is founded on coal, more completely than one realises until one stops to think about it", and this statement holds good even now in this age of energy crisis.

NOTES AND REFERENCES

Acknowledgements and Explanations

- ¹Heatley was collector of Pachet from Jan., 1773, and Sumner was the collector of joint district of Birbhum Bishnupur and Pachet from May, 1772.
- ²*Report of the Indian Coalfield's Committee* 1946, pp. 22.
- ³*Memoirs, G.S.I.*, Vol. 57, pp. 2.
- ⁴Roychowdhury, *Palamau Gazetteer* 1961, pp. 217.
- ⁵Coupland, *Manbhum Gazetteer* 1911, pp. 53.
- ⁶*Indian National Archives Records*, 1770.
- ⁷*Ibid.*
- ⁸*Ibid.*
- ⁹Hunter, *Statistical Account of Bengal*, Vol. IV, pp. 122.
- ¹⁰*West Bengal Archives Records* Vol. 12, letter from Council at Fortwilliam to Board of Directors—18th Oct. 1774, para 29.
- ¹¹In 1730 Abraham Darby used Coal (coke) for smelting iron.
- ¹²Panchete was created a separate district in 1776.
- ¹³Coupland, *Manbhum Gazetteer* 1911.
- ¹⁴Ghosh A.B. *Coal Mining in India*, Chapter III
- ¹⁵*Ibid.*
- ¹⁶This district was created in 1805 comprising of Manbhum, some portion of Burdwan and Bankura with hq. at Bankura, and was broken up in 1832.
- ¹⁷Hunter, *Statistical Account of Bengal* Vol. IV.
- ¹⁸Dutta, R. C., *Economic History of India*, Vol. 1, pp. 197.
- ¹⁹*Memoirs, G. S. I.* Vol. LXI.
- ²⁰P. C. Roychowdhury, *Dhanbad Gazetteer*
- ²¹*Memoirs G. S. I.*—Vol. LIX, pp. 111.

ANNEXURE I

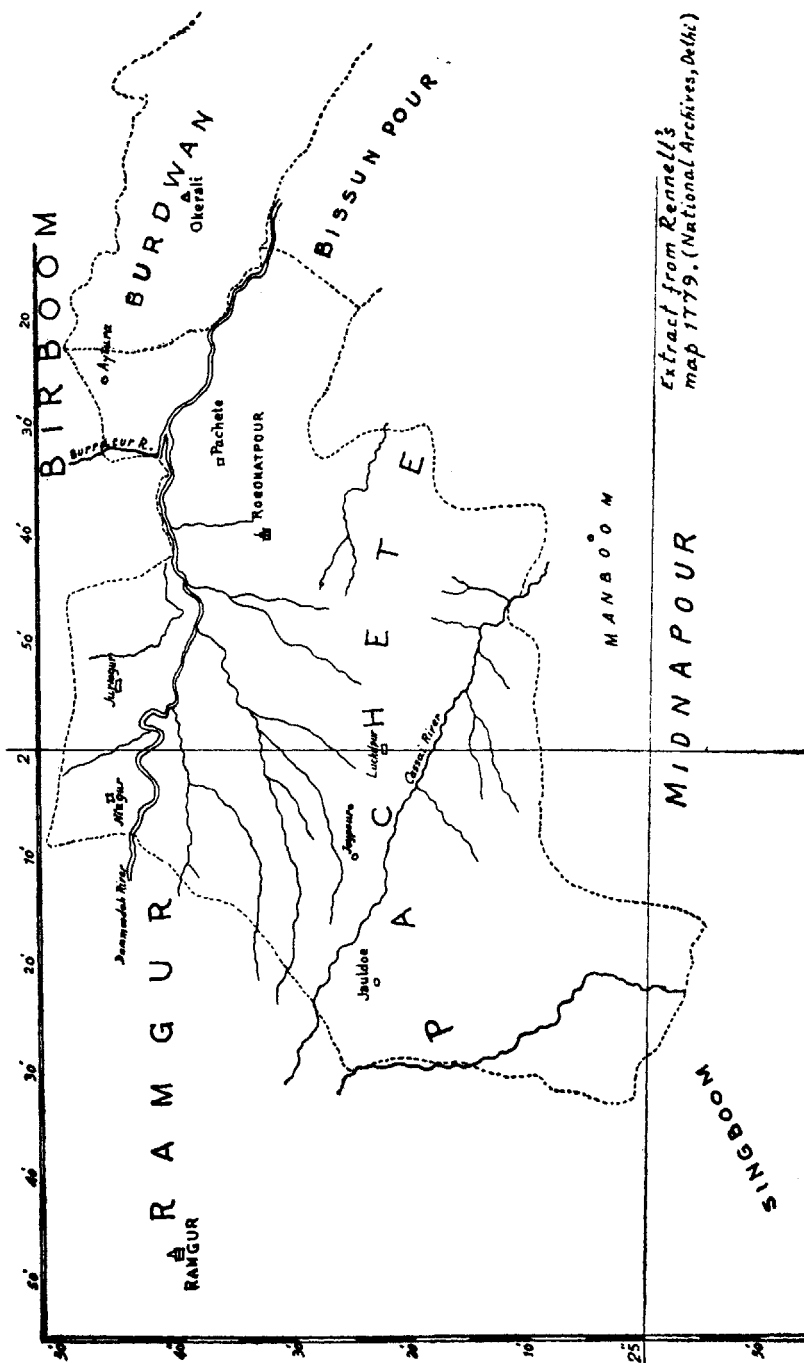
Rennell J. in *Memoirs of a Map of Hindoostan 1788* writes—

The British nation possesses in full sovereignty, the whole Soubah of Bengal, and the greatest part of Bahar, I say the greatest part, because it appears that there are several purgunahs on the south west of little Nagpur that were formerly classed as belonging to Bahar, but are now in the possession of the Maharattas. (This circumstance was ascertained by colonel Camac). In Orissa they possess only the district of Midnapour, the rest being entirely in the hands of the Mahrattas and their tributaries.

Br. possession—Bengal, Bahar and part of Orissa—147,217 sq miles.

(By courtesy Central Secretariat Library, New Delhi)

ANNEXURE 3



ANNEXURE 2

Hon'ble Sir and Sirs,

I have the honour to present to you in the name of Mr. Suetonious Grant Heatley and myself, proposals for working coal mines and selling coal in Bengal in consequence of our having discovered certain coal mines in Panchete and Birbhoom and I assure you, Gentlemen, that in case you will be pleased to grant us the indulgence we request that we will endeavour to present all disputes with the country people, and in general to render the execution of what we undertake, subservient to every good purpose, the nature of the work will admit.

I am, etc.

John Sumner
for Sumner and Heatley

Dated, Calcutta
11th August, 1774.

ANNEXURE 4

Fort William the 21st Nov. 1770
Petition of Lt. Col Campbell and Maj. Watson
to the President and Governor of Fort William
Council

Hon'ble Sirs and Gentlemen

The desire of rendering useful in the most important services to the Hon'ble Company has again induced us to lay below the Hon'ble Board the following proposals and which if they are honoured with your approbation and support may be production of the most beneficial consequences to the Hon'ble Company.

From the strictest enquiries we have made in the country as well as from the best information of others who have traversed these provinces and examined them with the most minute circumspection, we are of opinion that there are mines of silver, lead, copper, and other valuable ores within the Hon'ble Company's territories under this Presidency which if properly ascertained and worked may not only increase in a very considerable degree their revenues in this part of the world but may enable them in the future to make their own remittances in bullion to the mother country.

And prayed for "permission" to search after those mines at our own risk and expense in case we may be happy enough to succeed that you will in consideration of our labour and hazard be pleased to grant us a full and exclusive right to work the ore and prosecute the business of mining and smelting in the most ample manner

on our own accounts. That nothing may be wanting on our parts to render those proposals reasonable to you and beneficial to the Company, We will engage to bind and oblige ourselves, our heirs and executors to allot and appropriate to the Hon'ble Company such a proportion of the nett produce of our labours as you may think consistent with their interests and adequate to the risk of so great an undertaking.

We are your...

Signed/ Archd' Campbell
Henry Watson

Fort William
The 12th Nov. 1770

(By courtesy
(National Archives, Delhi—Records 1770
page 332)

ANNEXURE 5

TABLE 1

*Coal mines worked in 1836-38**

No.	Area	Place	Discoverer's Name
(1)	(2)	(3)	(4)
1.	Rajmahal Hills	Patsandeh (Bhagalpur)	Captain Tanner
2.	„	Sakrigali (Santhal Parganas)	„
3.	„	Hura (Santhal Parganas)	„
4.	Palamau	Two principal beds near Palamau town	Mr. A. Princep
5.	„	Amarath	Mr. J. Homfray
6.	Burdwan Jungle Manals	Raniganj	Mr. Jones
7.	„	Chinakoori (Best quality coal)	Mr. Betts
8.	„	Ajoy Seedpuri	Mr. Erskine
9.	„	Pariharpur	Mr. Erskine
10.	„	Dar-Badanaghat	Mr. Jones
11.	„	Benaras Road, 149th mile stone	Mr. Everest
12.	„	Hazaribagh	Colonel Shelton

*List compiled from the text of the Reports of a Committee for investigating the Coal and Mineral Resources of India, Calcutta 1838 and 1846, as appearing on pp. 30 in *Development of the Mineral Industries in Bihar (1833-1918)* by P. B. Sinha.