

HISTORY OF MINING IN INDIA—CIRCA 1400—1800 AND TECHNOLOGY STATUS*

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The mining in India has a respectable antiquity. This is evident from the extensive workings for gold and base metals in Hutti Gold Mines in Raichur and at Rajpura—Dariba. The task of tracing the status of technology or for that matter the chronological evolution of mining in India between 1400-1800 A.D. is beset with formidable difficulties. Recourse has therefore to be made to gleanings from the writings of Tavernier, Alberuni, Buchanan—Hamilton and from works such as *Ain-i-Akbari* to fit the pieces of a jig-saw puzzle and reconstruct the level of industrial activity and technology during the period. The period is conceivably a gray area in the annals of mining; the lack of well-documented works lends support to such a contention. In what follows, the authors have sought to present a not-so-well referenced perspective to the mining activities between 1400-1800 A.D. in respect of major minerals and precious stones.

INTRODUCTION

Although mining in India has a very respectable antiquity, of pre-Harappan period, as the extensive workings for gold and base metals in Hutti Gold Mines in Raichur and at Rajpura-Dariba make evident, the task of tracing the status of technology or for that matter the chronological evolution of mining in India between 1400—1800 A. D. is beset with formidable difficulties. For one thing, we have had no Georgius Agricola (Georg Bauer) to document the technology of this period. Recourse has therefore to be made to gleanings from the writings of Tavernier, Alberuni, Buchanan-Hamilton and from works such as *Ain-i-Akbari* to fit the pieces of a jig-saw puzzle and reconstruct the level of industrial activity and technology during the period. The period is conceivably a gray area in the annals of mining; the lack of well-documented works lends support to such a contention.

In what follows, the authors have sought to present a not-so-well referenced perspective to the mining activities between 1400—1800 A. D. in respect of major minerals and precious stones.

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PRECIOUS STONES

There is much evidence that diamond mining activity was pre-eminent during this period. The French jeweller, Jean Baptiste Tavernier, in his account of travels (1665—69), gave details of three diamondiferous regions of India. Diamond mining was active in the alluvials along the bank of river Krishna. Tavernier found workings some 4 m deep in the alluvials in the districts of Krishna and Guntur. The famous Hope diamond (67 carats), acquired and sold by Tavernier to Louis XIV in 1642 and the Kohinoor, the Great Moghul Diamond (78 $\frac{1}{4}$ carats) presented by Mir Jamla in 1656 to Shah Jehan were mined at Kollur on the right bank of the Krishna in Guntur district during this period.

This period also saw considerable digging for diamond in the Vindhyan tract near Panna, which is still an active mining centre. As can be gauged from the remains of old workings, from the surface, shafts upto a depth of 15 m were sunk to reach the diamondiferous conglomerate beds, the 'mudda', which was heated up with fire for easy extraction. The alluvial deposits were worked with pits upto a depth of about 8 m; the workings perforce had to be seasonal and necessarily somewhat haphazard. *Ain-i-Akbari* makes reference to the Wairagarh diamond mines in the sixteenth century. From the Mahanadi alluvium in Orissa also, some diggings for diamond were conducted. This was reported by Motte, who was deputed there by Lord Clive in 1766.

No systematic record seems to be available for the working of other gemstones, but it is possible that some mining activity had been going on. Garnets (of the almandite variety) had been worked in Rajasthan, especially in Keshengarh State. Till the beginning of the seventeenth century, Limodia in Rajpipla continued to be the principal centre for agate cutting.

MINING FOR GOLD

Underground mining for gold has hoary traditions in India, perhaps to some 2000 years old, as evidenced by the dating of charred timber logs from Hutti Gold Mines. During the period under review, some of the gold mining activities were continued in different parts of South India, and perhaps also in Chotanagpur. The auriferous regions in Karnataka State appear to have been systematically explored by the ancient miners, and the workings had been worked to considerable depths. At Hutti, for example, a narrow reef had been worked by ancients to a length of some 1500 m and to a depth of 190 m by fire-setting alone. It is difficult to pinpoint the areas worked during 1400—1800, but there is ample evidence that active mining for reef gold was going in many of the gold fields of southern India, such as Bellara, Kabligatti, Wynad and elsewhere, during the reign of Vijayanagar Kings (1336—1560) and later during the regime of Tipu Sultan.

COPPER ORES

Although ample indications exist of the mining and smelting of copper in the Singbhum district of Bihar by *seraks* or lay Jains some 2000 years ago, it is probable

that the ancient workings continued upto the third and sixth century only, as suggested by some old copper coins of the later Kushan type found at Rakha mines. Some of the workings however are later and according to Stoehr (1857), the mines of Roam in Singhbhum are of the eleventh century when the kingdom of Orissa flourished. Some of the workings, in all likelihood, were continued till the eighteenth century.

As recorded by Ball in his *Economic Geology of India*, mining of copper ores in Khetri and other districts of Rajasthan especially at Dariba and Singhania had been carried out on a large scale right till the end of the nineteenth century. The precise level of mining activity, during 1400—1800 would however be a matter of conjecture as no detailed records are available.

The ancient workings for copper near Agnigundala in Guntur district, Andhra Pradesh was first recorded by Dr. Heyne in 1814 in his account on "Tracts, Historical and Statistical in India". The old workings are spread over a linear belt of more than 3 Km and the ancient mining activity and treatment of ore are reflected by one or more indications like rock dumps, pounding stones, washing tanks, tailings dump, smelting furnaces, cupolas etc. It is possible that Agnigundala might also have been worked sporadically, perhaps during this period.

The copper deposits of Sikkim had also been worked during the medieval times.

As noted earlier, any definitive conclusion on the extent of mining activity for copper cannot be arrived at. There is however much circumstantial evidence to support the fact that copper was available indigenously during the period 1400—1800 as testified by the construction of guns and cannons by casting during the Moghul period. Babar, the first Moghul Emperor, has given an account of the casting of copper gun in his well-known memoirs. The great gun of Agra, the *Malik-i-Maidan* cast in 1584 at Ahmednagar or the Isa Khan's guns in Bengal of the sixteenth century also make evident the availability of indigenous copper.

LEAD, ZINC AND SILVER

Mining of lead, zinc and silver, had their heyday during 1400—1800. The deposits at Mochia Magra, Ballaria at Zawar near Udaipur were probably re-discovered in the reign of Rana Laksh Singh of Mewar (1382—97) and worked until the great famine of 1812—13. Upto 1766, the mines are said to have yielded a net annual revenue exceeding Rs. 2 lakhs. The miners were principally interested in lead and silver, although they were able to smelt rich zinc ores also. It is claimed that Rana Pratap was able to resist Emperor Akbar with the help of these strategic minerals. Largest of the ancient workings are on a ridge on Mochia Magra. The lode occurs in dolomitized limestone and the hanging walls stand quite well. The status of mining technology at this mine has been published by Captain J. C. Brooke of the Mewar Bhil Corps, who derived his information in 1850, from a very old miner.

During this period, yet another lead mining operation was at Taragarh Hill in Ajmer. The mine had been in operation for centuries and was farmed by Mah-rattas for Rs. 5000/- annually. According to Ajmer Gazetter, the mine was operative in 1818 and produced 10—1200 maunds of lead.

FUEL MINERALS

Although, mining of coal might have been carried out on a local scale during 1400—1800 in haphazard manner in different parts of India, records show that Sumner and Heatly made an attempt for mining coal at Ethora, Damalia and Chinakuri in Raniganj Coalfield around 1774. An application for mining coal was made to Warren Hastings in Pachete and Birbhum. This could be considered as a milestone in the development of coal industry in India.

IRON ORE

This appears to have been worked primarily in Alwar in Rajasthan, including the mines of Bhangarh, 3.2 km from the former capital of Rajawat Rajputs. They appear to have been worked by open workings on the west of a hill, with short irregular adits. The ore consisted of a mixture of limonite, magnetite and oxide of manganese. Likewise, irregular masses of highly feruginous material have been worked at Nimla in the Raialo limestone.

In Eastern India, the latest efforts by Motte and Farquher in the Birbhum area about 1779 to 1789, proved abortive, based on iron stone shales. Interestingly enough, the proposals by Motte and Farquher were tied with the proposals for coal mining by Sumner and Heatly.

TECHNOLOGY OVERVIEW

While kudos must be heaped on the ancient miners, who have handed down a traditional skill unmatched perhaps anywhere else in the world, technology in the relevant period does not reflect any maturing of technology or any break-through. While by and large, the old workings were in the nature of open trenches following the lodes in the direction of strike, the extension in depth have been a stupendous feat of effort. There are a profusion of old workings along a 24 km belt in Khetri where underground connections have been made to large excavations and even upto a depth of 190 m as in the case of Hutti Gold mines. The shafts, as in the case of Hutti or Zawar, were roughly oval measuring 1.5×1.2 m or smaller, with notched sides for clambering up without the aid of ladders. Much of the drivages, as visible in all old workings in Zawar, were just wide enough to crawl through.

It appears that during the period under review use of gunpowder was unknown in mining and the ancient art of fire-setting was the principal mode of rock break-age. Iron gouges, chisels and stone hammers were used to break fractured rock, while the transport was by a human conveyor in bamboo baskets. Evidence of windlasses having been used have been found at Hutti and grooves have been found

in the rock face by the wear of rope. At the bottom of old workings, as in Hutti, *chatties* (pots of crude earthenware) have been found which were used for bailing out of water. Credit is due to the miners who worked on hard siliceous quartzitic ore bodies, where drilling today calls for the use of tungsten carbide bits.

The medieval miner knew the art of ground control using timber as support medium and filling. Judicious use of natural support pillars have kept the excavations open even today. Some of the old workings had been found to be hand-filled with large boulders, rock and debris.

CONCLUDING REMARKS

Admittedly, the lack of any well-documented records of the period, makes any foray such as the one attempted here of doubtful historical accuracy. Technologically, the period did not witness any major transformations in either the use of implements or techniques, and tradition from chalcolithic age, handed down the generations, continued to be used. It is curious that although the use of gunpowder for armament had been known and used, there is no evidence to suggest that it found its way into mining.

There is clearly a need for more research into the state of the art of mining during the medieval ages for most of the important copper, lead, zinc and gold mining centres of India for unearthing the traditions of the past.

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