

INDIA'S MINERAL WEALTH

*A Guide to the Occurrences and Economics
of the Useful Minerals of the
Indian Empire*

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HUMPHREY MILFORD
OXFORD UNIVERSITY PRESS
LONDON NEW YORK MELBOURNE TORONTO
BOMBAY CALCUTTA MADRAS

1936

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INTRODUCTION

FIFTY years ago little systematic mining had been done on such Indian ore deposits as were known at that time, and without this, it is difficult to form any accurate judgement of their modes of occurrence, or of their potentialities. The author of the pioneer work on Indian economic geology which was published in 1881, wrote as follows: 'Hitherto mining for metallic ores by British companies has not been successful in this country, though coal and salt mining and the quarrying of building materials have been carried on by the Government or by private companies, with in many cases very great profit. It would seem, however, that, as regards the metals there is a new era about to commence, and that the capabilities of India, not only as a gold-producing country, but also in reference to other metals, will in the course of the next few years be for the first time fairly tested.' Valentine Ball read the signs of his times correctly, for the developments of the next decade or two fully justified the truth of his prediction. Mineral deposits of many kinds were discovered and opened up; the platitude that they were as a rule too lean to support large-scale treatment died a natural death, and although for a time exploitation resulted mainly in the export of raw materials to other countries, the advantages to be gained by dealing with them on the spot have been slowly realized, and India is now advancing to her proper position amongst the metallurgical nations of the world.

By 1899 the growth of prospecting necessitated the issue by the Government in that year of rules to govern the grant of prospecting licences and mining leases, and the number of concessions taken up by private individuals and companies over lands in which the mineral rights have been retained by the State, rapidly increased from an average of 370 per annum for the first decade of the century to 706, the corresponding figure for the ten years ending 1930.

To register the progress of the mineral industry, a *Review of the Mineral Production of India* was issued annually by the Reporter on Economic Products to the Government of India, for the four years 1894-97, but in 1898 it was decided to publish reviews of progress

at wider intervals, covering periods long enough to permit of the determination of any secular variations. The first of these reviews, dealing with the six years 1898-1903, appeared in the *Records of the Geological Survey of India* in 1905, and since then quinquennial reviews have been forthcoming regularly. In addition to these, a brief annual statement of the quantity and value of all the minerals raised, for which returns are available, has appeared each year in the *Records* since 1906.

Apart from the papers on mineral deposits scattered through the sixty-eight volumes of the *Records of the Geological Survey of India*, and the monographs devoted to subjects such as coal, petroleum, mica, gold, manganese, etc., which have been published from time to time as memoirs of the same department, there exists a great and growing literature on Indian geology, a list of which was assembled and made accessible through the labours of T. H. D. La Touche. His *Bibliography of Indian Geology and Physical Geography*, published in 1917, contains references to the papers of 1,989 authors. In Part II, issued in 1918, a guide to the literature on the minerals of economic importance is provided, together with a brief account of the information given by each observer. An index of localities in 1921 was followed by a subject index in 1923. The bibliography is kept up-to-date by the publication of a list of the most recent papers, as an appendix to the *Annual Reports of the Geological Survey of India*.

Sir Thomas Holland's *Sketch of the Mineral Resources of India* appeared in 1908, and the first edition of the present book, published in 1923, was written on much the same lines and aimed at presenting the main facts then known about each mineral in as condensed and popular a form as possible. In the first edition it was pointed out that an account written in 1908 was more or less obsolete then, and the last decade has again registered much progress and witnessed many further developments. Sir Thomas Holland dealt with 54 distinct mineral products, our earlier edition described 77, a number now raised to 110. About 1908 the total annual value of minerals raised, for which production returns of a fairly reliable character are available, averaged £7 million; about 1928, the corresponding figure was nearly £24 million and today, in spite of the effects of an unprecedented world depression, is in the neighbourhood of £18 million. Since that time several new coalfields have been opened; fresh oilfields drilled and the unknown depths of existing

ones explored; the enormous iron ore fields of Bihar and Orissa have been proved and a great iron and steel industry with its attendant satellites has been established. Metallurgical centres have also arisen at Maubhandar in Bihar, where the copper ores from the Singhbhum lodes are treated and refined copper and yellow metal products are manufactured in increasing quantities, and at Nan Tu in the Federated Shan States, where the ores from the Bawdwin mine are made to yield their lead, silver, copper, antimony and nickel contents, and zinc concentrates are also prepared. The wolfram deposits of Lower Burma are now known to be the most important in the British Empire, while the associated tin ore is recovered both by underground mining and by modern dredging methods. The valuable beach sands of Travancore, the largest and the richest in monazite in the world, with the diminution in the demand for that particular mineral as a result of the replacement of gas by electricity for lighting purposes, are now also treated for their ilmenite and zircon contents. With the growth of the iron and steel industry the demand for refractory materials has resulted in the creation of works specializing in the production of such goods, while Indian cement works now satisfy most of the country's needs. India still heads the list of the world's mica producers and her manganese ore deposits continue to give her the same position from time to time. In some directions, on the other hand, progress has been disappointingly slow, and vast quantities of materials made in other lands from mineral products continue to be imported. Apart from such controversial questions as the possibilities of the successful inauguration of aluminium, zinc and tin extraction, or the production of ferro-alloys and other products in the electric furnace, the manufacture of sulphuric acid and heavy chemicals generally, of artificial fertilizers, of hardware and light iron and steel articles, of glass, earthenware and porcelain, of paints and colours and of many products used in building construction and now obtained from abroad, on a much larger scale than at present exists, from the raw materials which the country can provide in abundance, continue to demand and to merit attention. These are fundamental problems which must be solved if the progressive evolution of India's industrial life is to keep pace with its national advancement.

Indian mineral statistics are grouped officially into two classes, (1) those for which approximately trustworthy annual returns are available, and (2) those for which regular and complete particulars

are not forthcoming. In Table I the values of a series of minerals and mineral products belonging to the first class are tabulated over seven periods ranging from 1898 to the present time, and while some comparatively unimportant ones have disappeared from the list, the pronounced rise in the majority of cases is striking and the effects of the existing depression are evident in the latest figures given. Such statistics are for the most part of internal comparative value only, as an indication of the trade in the particular substance with which they deal. With reference to the absolute values of the mineral products of other countries, they are liable to mislead without further interpretation. For example, the value of coal represents an approximate pit's mouth figure, which bears little relation to the selling price in the open market; the value of petroleum previous to 1919 was greatly underestimated; the value of salt is exclusive of its duty, which is the main source of income derived by the Government from its manufacture; the export value of mica is not connected in any apparent way with the declared value of the production at the mines; or, again, the value of rubies and associated gems represents the output of a single European company, while the results of an active indigenous industry have never been tabulated. Further instances might be given but these suffice to show the necessity for a separate analysis of each case, particularly in attempts to visualize future tendencies.

In the pages which follow, each useful mineral which India produces is considered individually, the chief occurrences are briefly described, the history of its commercial exploitation is outlined, and with the exception of the commoner metals its uses are explained. Outputs and their values from the commencement of operations, or from the beginning of the present century, are presented, and comparisons made with imported articles when these are considered essential to a proper appreciation of the economic position; and finally, for the benefit of Indian students of economic geology on whom the task of searching for new mineral deposits in their own land will fall more and more in future, brief notes on the important questions of origins have been incorporated, for the author's twenty-seven years' work in connexion with these matters has taught him their value as a preparation for field work. The first edition of *India's Mineral Wealth* has been entirely rewritten and enlarged, primarily with the object of drawing attention to the commercial and industrial potentialities

TABLE I
AVERAGE ANNUAL VALUES OF CERTAIN INDIAN MINERALS AND THEIR PRODUCTS
METALS AND ORES

	1898-1903	1904-08	1909-13	1914-18	1919-23	1924-28	1929-32
	£	£	£	£	£	£	£
Antimonial Lead ...	...	...	...	...	...	20,532 ³	18,215
Chromite ...	...	9,110	4,282	20,164	53,764	47,224	42,784
Copper Ore and Matte ...	...	...	...	12,418	29,053	294,801	437,597
Gold ...	1,904,719	2,266,307	2,241,844	2,258,653	2,094,323	1,668,067	1,593,302
Ilmenite ...	...	...	...	...	...	16,892	40,430
Iron Ore ...	13,584	13,769	29,519	34,819	114,956	351,971	362,031
Lead and Lead Ore ...	...	...	128,782	358,970	881,710	1,653,569	1,237,926
Manganese Ore ¹ ...	79,443	631,760	822,876	1,052,403	1,995,341	2,018,835	909,560
Nickel Speiss ...	...	...	...	...	...	10,620 ⁴	57,163
Silver ...	...	...	9,341	135,929	642,450	756,148	558,161
Tin and Tin Ore ...	6,875	10,992	30,100	73,376	214,500	352,846 ⁵	345,943
Wolfram ...	...	...	76,481	461,698	135,845	36,192	91,372
Zinc Concentrates... ..	...	...	...	...	...	376,345	210,181

FUELS

Coal	1,225,677	2,139,249	2,969,305	4,419,174	9,252,649	8,305,764	6,193,893
Petroleum	185,810	592,887	928,072	1,073,604	7,036,298	6,268,229	4,222,109

GEMS AND SEMI-PRECIOUS STONES

Amber	362	648	182	280	874	1,267	163
Diamonds ... ..	...	2,799	872	1,216	7,262	2,691	5,714
Jadeite ¹	44,770	61,353	55,373	74,498	114,329	32,843	26,730
Ruby, Sapphire and Spinel ...	89,345	84,406	63,272	41,817	60,660	26,228	6,613

OTHER MINERALS

Graphite	11,981	12,879	16,363	641	265	...	...
Magnesite	519	689	2,403	7,568	16,334	21,559	5,904
Mica	80,120	170,126	230,747	373,370	633,331	737,930	476,315
Monazite... ..	...	...	35,825	45,334	29,294	3,060	2,244
Salt ²	347,897	451,339	507,294	902,623	948,245	741,468	924,350
Saltpetre ¹	262,603	268,012	240,289	473,188	355,118	127,221	72,713
Zircon ... ..	...	...	...	...	...	4,542	6,893
Total £	4,253,705	6,716,325	8,393,222	11,822,743	24,616,601	23,876,844	17,848,306

¹ Export values.

² Prices without duty.

³ Includes antimony ore.

⁴ Production commenced 1927.

⁵ Tin ore exclusively in and after this period.

which the mineral deposits possess and in the hope that capital and enterprise will be forthcoming for their further development, with all that it means for the lasting benefit of India and the Indian peoples.

In a conspectus of this kind information has to be drawn from many sources and in case of an unintentional omission of acknowledgment in the proper place, thanks are tendered here to all the past and present officers of the Geological Survey of India and others whose work has been made use of. I am particularly indebted to the Government of India for permission kindly granted to produce this book; to the writers of the *Annual and Quinquennial Reviews of Mineral Production in India*, Sir Thomas Holland, the late Sir Henry Hayden, Sir Edwin Pascoe and Dr L. L. Fermor; to Sir Thomas Holland again for his *Sketch of the Mineral Resources of India* and to Mr T. H. D. La Touche for his *Bibliography of Indian Geology*; to the Director of the Geological Survey of India for permission to use various graphs, maps and photographs; to the various firms mentioned later for their courtesy in supplying photographs, some of which were taken specially for this book, and to various authorities who have in some cases read and criticized my notes.

In an appendix a few references to papers are given in the hope that they may prove useful to the reader desirous of following the subject further than the limited space here permits. In this connexion attention is invited to my notes on Indian minerals published as *Bulletins of Indian Industries and Labour* in 1921 and 1922. These deal with the ores of manganese, lead, zinc, tin, chromium, tungsten, molybdenum, antimony, arsenic and bismuth; with bauxite, mica, asbestos, magnesite, monazite, corundum, garnet, barytes and the mineral colours. They were followed by others on sulphur and sulphuric acid and on glass-making materials by Dr C. S. Fox. Their chief object was to explain to the Indian producer the manner in which manufacturers generally obtain their supplies, the systems of buying and selling, the regulations of the mineral trade associations, the standard specifications and contract forms of metallurgical firms and dealers, the recognized market grades and the units of sale.

The appendix also contains statistical information relating to periods later than those considered in the text.

Finally, I alone accept responsibility for statements regarding the future development of any particular mineral industry, unless the opinions of others are quoted.