

**MINES AND
MINING
IN THE BLACK HILLS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649247042

Mines and Mining in the Black Hills by Various

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

VARIOUS

**MINES AND
MINING
IN THE BLACK HILLS**

Burlington and Missouri River railroad company

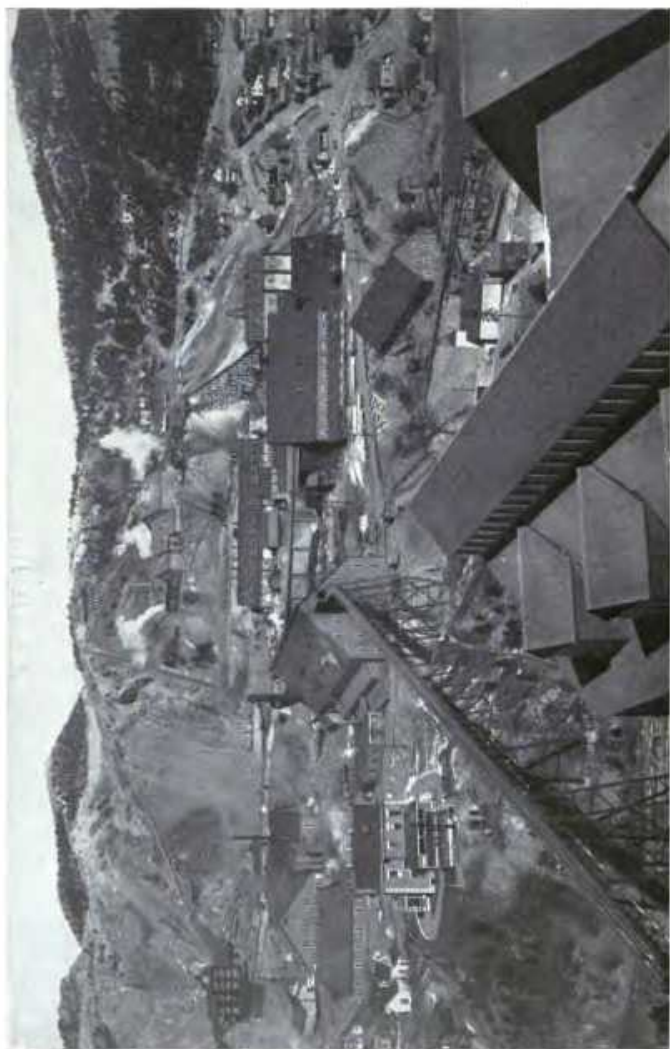
MINES AND MINING IN THE BLACK HILLS

TENTH THOUSAND



PASSENGER DEPARTMENT
BURLINGTON ROUTE

1901



HOMESTAKE MILLS, LEAD CITY, S. D.

9201222 1-8-40 21137

AN oblong stretch of country, 120 miles in length by 60 miles in width, running northwest by southeast, rising suddenly from the surface of a level prairie region and breaking into a rugged succession of hills, with here and there sharply defined cañons, is the general appearance of the famous Black Hills, now so widely known as the third greatest gold-producing district on this continent. The geologists are somewhat at a loss to account for this peculiar formation. There is no good reason for the existence of this range of hills in this particular place; nothing to the eastward to justify it, and no clearly established mountain range to the west is met until the Big Horn range is reached; there is no continuous range in the Hills, nor are they a part of any other range, and yet Harney Peak (7,400 feet) is the highest peak found east of the Rocky Mountains proper on this parallel. These are a few of the inconsistencies. The scientists are divided as to whether this curious upheaval was the result of direct volcanic action or lateral pressure.

South Dakota as a state presents some striking features. In the matter of altitude there are wide divergencies. Big Stone Lake is only 967 feet above sea level, nearly 200 feet lower than Omaha, and Harney Peak towers up 7,400 feet. There are plains as level as a floor along James river valley, and narrow cañons hundreds of feet deep in the Black Hills. There are areas where for scores of square miles one searches in vain for a stone, and there are districts which present an almost unbroken surface of rock, and barren places there are which are so saturated with acids and mineral solutions as to be utterly worthless; and again, there are a few ancient "lake beds," forever decaying, barren and desolate—Bad Lands, as they are aptly termed.

The Black Hills proper have an area of about 5,000 square miles, and their true limit is marked distinctly by a sharp ridge of sandstone 300 to 600 feet in height. This ridge is separated from the higher part of the Hills within by Red valley. The altitude of the Hills runs from 3,500 to 6,500 feet. Ten of the geologic ages are represented in the rock formation of this wonderful region and the scientists say that but two of the universal organic elements are lacking here and that this condition does not exist anywhere else in the world.

RICH IN MINERALS.—There is an imposing array of minerals in these Hills interesting alike to the pursuer of wealth, the student, and the scientist. Among the best known are gold, silver, copper, iron, lead, manganese, nickel, tin, graphite, mica, antimony and a list too long to mention in detail. Tin ore has been found which runs as high as 74 and

75 per cent, which is exceptionally high, the best of the famous Cornish mines going only 72 per cent. Minerals not found elsewhere in mountain regions have been discovered here. Wolframite, for example, from which tungstic acid is extracted and used in hardening steel, has been found in limited quantities. It is very valuable, being worth about \$300 per ton, but is easily accessible and mined like common ore, and during the past year several large shipments have been made to iron works in the East. This tungsten ore occurs in considerable quantities near Lead, and also at the Etta group of mines near Kirk on the Burlington & Missouri River Railroad. The most important use of wolfram is in the manufacture of certain classes of crucible steel, where it is used as an alloy. Steel with 5 per cent tungsten is improved in hardness and toughness and has also a self-tempering quality added to it. There is always a demand for wolfram in the chemical market, and Edison used calcium tungstate in photographing with the Roentgen ray. Spodumene is a new mineral found near Hill City on the Burlington & Missouri River Railroad. It contains lithia and resembles stalactite crystals. A considerable amount of this mineral has been shipped to Germany, and there handled by the chemists. The largest spodumene crystals in the world are found in the Etta mine. They resemble great saw-logs two to three feet in diameter, standing at an angle and spangled with beautiful scales of yellow and white mica. Varicolored marble, lithographic stone and kaolin and mineral paint are all found near Custer City. This Black Hills country is very rich in handsome minerals. In addition to a large variety of quartz, there are beautiful specimens to be obtained of gypsum, massive and fibrous (satin spar), pure white and water clear, laminated (selenite), which comes from the outer rim of the Hills. The rare, four-sided, tapering, transparent, golden-brown crystals of barite that occur associated with the golden calcite from the concretions on the Cheyenne river are not repeated elsewhere, and collectors have sought them eagerly as entirely new. Unfortunately they are scarce. Some of the banded, solid stalagmite from the bottom of the caves has been sawed and polished and is almost as handsome as the Mexican onyx. Chalcedony geodes from the Cheyenne river have been pronounced the finest in the world by one of our largest mineral dealers. What is wonderful about some of them is that enclosed in the solid but hollow walls of silica are crystals of selenite and perfect tiny rhombs of calcite. The finely crystallized walls look like frost and snow sparkling in the sun.

Petrified wood, appearing natural with knots and grain and agatized wood here and there cover the slopes of the Foot Hills and the Bad Lands. Petrified moss and rushes line the warm streams of the southern Hills.

A beautiful variegated breccia or pudding-stone comes from near Buffalo Gap that polishes nicely, also a "calico," or vari-colored, striped sandstone, banded and faulted.

Pyrites of iron, marcasite, saponite, graphite, (found only here, sparingly), galena, flurite, dolomite, dendrite, azurite, malchite, autunite stream tin, blende, orthoclase crystals, andesite, several shades and textures of trachytes, rhyolites, glauconite, chalk, phonolite, hornblende and many other minerals and rocks that occur here might be noted.

EVOLUTION OF MINING.—The evolution of scientific mining has never been more perfectly demonstrated than in the Black Hills today. It is the old story of the first crude attempts up to final completeness. The first discoverers found gold in the gulch creeks; where placer mining existed there must be gold-bearing quartz somewhere, and this was found; samples of the ore were shown by the assayer to carry gold in large quantities. Then the next move was to put up one of the old-fashioned, hard-pounding stamp-mills, and for a time all went well. For the first hundred feet down the ore turned out handsomely—\$25.00, or \$30.00 or \$40.00 per ton. Going a little lower, these figures dropped with alarming rapidity until at, say 150 feet, the quartz ceased to yield. An assay would show that the quartz carried as much gold as ever, but the stamp-mill could not get the metal. Some other process is necessary. This is tried and found successful, and in turn gives way to some still newer and more scientific process, as different ore demanding different treatment is found. And human ingenuity still meets and conquers today the ever-shifting, baffling and elusive moods of nature when she secreted the precious metal in this great treasure-house among the Hills.

SCIENTIFIC MINING.—It may be fairly said that mining is now almost an exact science, at least in so far as its processes are concerned in the treatment of ores. Men with vast sums invested do not make haphazard ventures. Especially to be noted is the constant and persistent experimenting which is going on. Every company, large and small, is on the alert for any new process which will extract gold from the ore at the minimum cost. They now operate with free milling, chlorination and cyanide and a few experimental processes. Cyaniding seems destined to be the greatest of them all.

CYANIDE PROCESS.—The simple fact that twelve cyanide plants are now in operation, four in process of construction and will be in operation within a short time, with six more contemplated and practically assured, should be sufficient to demonstrate beyond a doubt that this process is adapted to a large per cent of the low-grade ore found in the Black Hills, and that they can be made to pay under this method of treatment, whereas with any other they could not. While it is true that not all of the low-grade ores of this district are amenable to this process, it is estimated by those who have made an exhaustive study of the subject that fully 80 per cent of the ores of the Hills do not contain the elements deleterious to cyanide operations.

The successful operation with this process is bringing about the

development of a large area of mining ground. The ore bodies of Ragged Top, Crown Hill, Squaw Creek, Garden City, Blacktail, Sheeptail, Carbonate, to the west and northwest of Deadwood; Yellow Creek, Strawberry, and other districts to the east and south, carry values from \$5.00 to \$15.00 per ton gold. The lime ores of the Ragged Top district and shale ores of the Squaw Creek district are probably the most amenable to the process, the former being found in a district several miles in length, running north and south and divided through the center by the protrusion of Ragged Top Mountain. The ore is very similar in character to that of the Mercur, Utah, ore, found in the lime formation, the depositions carrying values from the surface down to a varying depth. The ore is very porous and does not require fine crushing.

The silicious ores containing iron in the oxidized state are second in amenability to cyanide treatment, giving up their values in six or seven days. The silicious ores most amenable to this process are those of the Crown Hill quartzite type. These ores have an open texture which will admit of coarse crushing. A further variety of silicious ore is found immediately above the quartzite in the form of decomposed shale, which is likewise very amenable and requires a short time for extraction.

In dealing with individual ores in the cyanide process, we must first consider the condition in which the gold appears, together with the association. The cement ores represent a combination of silicious pyrites and free milling gold values, the gold in the free state being usually fairly fine, while in the pyritic state it is generally coarse. A working extraction is obtained on these ores in six to ten days, depending entirely upon the amount of coarse gold present.

There are two methods of crushing the ore in use in the Hills—the dry and the wet—and no two plants are exactly similar. The dry process takes the ore from the crusher through two sets of rolls, and in a dry state is immersed in a cyanide solution, while with the wet process it is pulverized with the stamps, sometimes in water and sometimes in a cyanide solution.

A SAMPLE CYANIDE PLANT.—The Spearfish Gold Mining and Reduction Company, of Colorado Springs, is located in Ragged Top district ten miles west of Deadwood on the Spearfish branch of the Burlington Route. They are now erecting the largest ore-crushing cyanide plant in the state. The great Homestake Cyanide Works, now nearing completion, are larger in every way, but will be used in working over tailings only, while the Spearfish Company's plant, when completed, will be one of the largest ore-crushing cyanide plants in the United States. The outfit of the works will be—eighty horse-power boiler; sixty horse-power engine; 10 x 20 Blake crusher; one set 16 x 36 Davis rolls; two solution storage-tanks, twenty feet in diameter by ten feet deep; ten leaching-tanks, twenty-four feet in diameter by seven feet deep; two gold-solution tanks, sixteen feet in diameter by seven feet deep; two sump tanks, sixteen

feet in diameter by seven feet deep: four zinc boxes; one each solution and vacuum pumps; ore will be crushed to one-half inch; main building, 66 x 144 feet; precipitating rooms, 44 x 72; engine room, 32 x 38; crushing room, 28 x 40. This is lime ore, and said to be the finest cyaniding ore in the Black Hills. The company's holding comprises 320 acres, and they have any amount of ore in sight.

COST OF PROCESSES.—The per cent of gold saved by the different processes will run about as follows: Free milling, about 75 per cent; smelting, practically all of the values contained in the ore; chlorination, about 92 per cent of the gold contents and none of the silver, while the cyanide process saves from 80 to 92 per cent of the gold and about 65 per cent of the silver contained in the ore.

Approximately it may be said that the cost of the treatment of ores by smelting is between \$5.00 and \$6.00 per ton; by the cyanide process, \$3.25 per ton; chlorination may be put down at \$3.75 per ton, while the free milling properties have paid millions of dollars in dividends, mining and milling ore that does not contain to exceed \$4.00 per ton, and some of the larger mills have paid dividends on \$2.00 ore.

The only flux that is not found in the Black Hills is copper ore, which at present is shipped from Butte, Mont. Present developments, however, indicate that an abundance of copper ore will be mined in this vicinity during the coming year. The cost per ton of fluxing ores delivered at the smelter is not made public by the smelting company.

The cyaniding of low-grade ores has furnished one of the best places for investing money to be found anywhere in the Hills. The first cost of a cyanide plant is less than any other process, and when economy is practiced in manipulating the mining mill, the ore can be worked into bullion for not to exceed \$4.00 per ton. Some cyanide plants in the Hills are doing it for \$2.50. On ore that averages \$10.00 per ton gold, the profits of the venture are very great. There are today a great many fine propositions scattered all over the Black Hills, both north and south, where the ore averages \$8.00 and \$10.00 per ton, that will give 90 per cent extraction values.

The successful experiments on very low-grade ores for the past year have demonstrated that millions of tons can now be treated at a profit by the cyanide process that in the past would not have paid the cost of mining and milling, and as a result of these successful experiments' capital will be liberally invested in properties that have remained idle for years for the lack of adequate methods of cheap treatment.

WORK FOR DENVER SMELTERS.—The field now open to Denver smelters, by reason of the extension of the Burlington Route, will be in handling concentrates from the southern Black Hills. The northern Hills are largely in possession of the stronger companies, and these large plants will in all probability themselves handle any ore proposition which may come before them. The absence of these larger plants in the southern