

Mines Library
University of Nevada
Reno, Nevada 89502

DUM
Thesis
To
Sm6431
1908
C.2

UNIVERSITY OF NEVADA

✓
COMPARATIVE MINING AND MILLING OPERATIONS
IN COSTA RICA AND NEVADA

A THESIS

Submitted to the faculty of the Mackay School of Mines
in candidacy for the Degree of
Mining Engineer

Mackay School of Mines

By

Alfred Merritt Smith
" "
Reno, Nevada
20489
1908.



UNIVERSITY OF NEVADA
LIBRARY

P. Smith
20
1931

SUBMITTED BY Alfred Merritt Smith
Candidate for the Degree of Mining Engineer.

Approved by *Geo. J. Young*
Professor of Mining and Metallurgy.

Accepted by *Romanzo Adams*
Chairman of Committee on Theses.

COMPARATIVE MINING AND MILLING OPERATIONS:

COSTA RICA AND NEVADA.

It may be of interest to those who follow the mining and milling of gold-silver ores in Nevada, to read an outline touching on the conditions of this industry as carried on in one of our little sister Republics south of Mexico, from the standpoint of one who has had four years of diversified experience in Costa Rica and Nicaragua.

The seasons of Costa Rica may be divided into two; the wet and the dry. The dry season, which corresponds to our spring and summer seasons, is a period during which little or no rain falls, and even the dense evergreen jungles become dry and parched; frequently fires rage in the forests, and are a menace to small interior villages, also to mine settlements, if they are not protected by means of large clearings. The rainy season, which takes up the remaining months, reaches the other extreme, raining nearly every afternoon, but rarely in the forenoon, except during the "temporals", which are continued rainstorms, lasting from two to ten days. These continued rains swell all rivulets to torrents, wash out roads and bridges, and as a rule, render the avenues of travel impassable for a time.

In Costa Rica, the expense of keeping up railways is excessive. The company controlling the "Ferrocarril Atlantico" practically rebuild from 10 to 30 miles of their 80 mile road every year. I have seen 8 miles of this railroad washed out during a temporal lasting only one week.

The climate, while warm, is favorable to mining and milling operations. For cyanide treatment, especially, is the even, warm temperature beneficial. There is no danger of valves or pipes freezing. A good roof is necessary over the plant, as protection against heavy rain and torrid sun. The temperatures of underground mine workings do not

appear to be warmer than those of mines in the temperate zone.

Climatic effect on labor depends altogether on the kind of work being done. Working in the sunshine, an able bodied native will accomplish more than any foreigner; but working in the rain, the foreigner will do more work, as the natives shrink from the wet, although they suffer but little from such exposure.

The interior of Central America, where the elevation varies from 1000 to 6000 feet above sea level, is probably as healthful as any locality in the world. At these altitudes, enteric and yellow fevers are unknown. Evenings, mornings and nights are cool throughout the year: the air is balmy and delightful. In small interior hamlets, far away from the lines of foreign travel, the simple, contented inhabitants live in unsanitary abandonment, thrive and multiply. In Nevada, disease would probably decimate us, if we should so disregard all rules of health and correct living. It is no doubt due to the climate alone that these natives maintain such uniformly good health, as they are not rugged and strong by nature. In Nevada, pneumonia and exposure to a rigorous climate, takes an alarming annual death toll, while only old age and dissipation seems to dispose of the Central American native of the interior.

The low-lying, swampy river deltas and the flat banana lands of the tropical Atlantic coast are both unhealthy and fever infested. These however, are not within the mining zone. Few natives live in the banana lands. These are farmed, cultivated and harvested mainly by imported Jamaican and Martinique negroes, who are not affected by the heat to such a degree as the natives of Spanish-Indian origin. Attempts to cultivate bananas, with natives, in the lowlands have failed, as they quickly succumb to fever.

The only detrimental influences of the tropical climate of the interior are those brought on by improper habits of living and of diet. The digestion is the key to health there; sickness among foreigners is largely caused by lack of attention to diet, and too often by alcoholic and other excesses which injure the health in any climate. Before being acclimated to the tropics, excesses of any kind, exact a prompt and often fatal penalty upon the foreigner.

Mining failures in Costa Rica are usually attributed to one or all of three causes, which are bad climate, poor labor, and the poor government of the republic. The first and second of these reasons given for failure are rarely, perhaps never, true; and nine times in ten, the third reason may be a very small factor of failure either in Costa Rica, or any other of the Central American states, if the mine manager has experience and tact. Certainly not so in Costa Rica, whose republican form of government is, in respect to national laws, quite as good as our own, although it must be conceded that these laws are not so efficiently enforced as in the United States.

The average successful American mine manager or mining engineer, who is sent to Central America to take charge of original mine development or of extensive construction work, will in most cases, if past similar cases teach a lesson, fail, either wholly or in part, unless his mine becomes phenomenally rich. The reasons are, briefly: his ignorance of the people that he has to deal with, an egotistical belief in his own superiority, and the incompatibility of his Anglo-Saxon temperament with that of the volatile Latins. These managers come to grief in business with the Central Americans almost invariably. Their ignorance of conditions prevailing is ruthlessly taken advantage of, they are mercilessly "done" at every possible turn, and because of their unpopularity, their business

misfortunes meet with no sympathy from the people. To succeed among them it is necessary to meet them on their own level, to a certain extent, and absolutely necessary to be popular and be respected.

In our Nevada, climatic conditions vary less with the particular locality, than in Costa Rica, and the change of seasons from extreme heat to extreme cold is a factor somewhat restrictive to mining and milling in new localities. Preparation must be made for the winter season, and in the deserts, food, water and all necessities of life, must often be transported long distances remote from railways, at corresponding expense. In the majority of the newly discovered mining localities, power for milling is available only by long distance electric transmission, or gasoline installations with their expensive maintenance.

The cold winter climate, coupled with hardships and unsanitary conditions incidental to new mining camps, sometimes causes the death rate to run so high that it seems as though a deadly epidemic was extant. Eight years ago, I had occasion to visit the then new mining town of Tonopah, at which time, people were fleeing from a scourge, a disease similar to pneumonia in its symptoms. Men were seen well, walking about the streets only to die two or three days later. During the winter of 1906, I visited Goldfield. Two or three funerals of adults took place daily at the time in the small town, but without a close scrutiny of the little daily newspaper whose mission is only to "boom", the death notices could hardly be found. Such an appalling death rate in any one of six or seven Costa Rican towns of equal or greater population, would have resulted in a national panic. It seems to me that from a climatic comparison alone, the mining regions of the interior of Central America are equal to those of the desert regions of Nevada.

The mining laws of Costa Rica are similar to those of Mexico, which are well known in mining circles. A common way of acquiring title to mining property by foreigners is to obtain same by direct purchase from the native denouncer or a native titled owner. In case of a mere denouncement or location, the purchase may be made in such a manner that the native locator may complete his title and the deed to the property be transferred at that time.

Americans are now entitled to the same rights as natives or naturalized citizens of Costa Rica in making mine locations. If he discovers a lode or ledge in an unknown district, he has the first right to three claims; if in a known district, the first right to two. The size of the claims are each 600 by 300 feet.

The attitude of the Costa Rican government to foreign mining enterprises within the state is encouraging and liberal. They exact a light bullion export tax, but in return, they charge no duty on imported mining machinery and supplies. This is for the sole purpose of encouraging mining. Import duty on all other classes of machinery is quite high.

Costa Rica has for sixteen years been almost entirely free from political and revolutionary uprisings and there is but little danger of such occurring now. Other Central American states are almost constantly engaged either with petty wars among themselves or revolutionary disturbances. This is a factor to be seriously considered.

The interests of a mine operated by foreigners may be safeguarded by agreement with the government in power to consider such territory neutral and not to be invaded by armed forces. Two well known properties, the Rosario, of Honduras and the Santa Francisca, of Nicaragua, have been operating on neutral ground for years and have never been greatly inconven-

enced by revolutions or interstate wars. Delays in mail and freight delivery are the most serious results from war and revolution. Communication by telegraph and cable is sometimes delayed for months, messages being held up without explanation. Foreigners, however, need not be deterred from entering a mining enterprise by fear of revolutionary trouble. Diplomatic tact by the mine manager, providing he is familiar with people and country, will usually meet every contingency.

To one who has followed the work of opening up new mines in Central America, the same proceeding in Nevada presents a wonderful contrast. In the Tropics, the attention of an investor or traveling mining engineer is called to some prospect in the interior, which is being worked in a primitive way by the natives. The engineer visits the ground and makes his report. The investor decides to acquire the claims and begin work. With a few pack animals and peons, he goes to the place and sets up temporary headquarters. A few cheap huts, constructed of split timber, or of a species of wild bamboo, with thatched roofs of wild palm leaf, are erected in a clearing made for that purpose. Lumber is whipsawed in the forest by hand by native labor, from which the superintendent builds his humble house, usually large enough to furnish quarters for his few assistants. He also builds a store or commissary and an assay office. With 15 or 20 native miners, he pushes the development of the prospect until ore enough is shown to warrant the construction of a mill. Roads suitable for the two wheeled ox carts universally used for freighting, are out and graded through the jungles and rough broken country to the nearest town. With this, the work is fairly under way. There is an utter lack of excitement usually caused by the lure of gold. If a native, even one of the better educated class, owns a mine, he would much prefer to sell it to a foreigner, than to oper-

ate it himself.

In Nevada, the first showing by a prospector of rich gold or silver bearing ore is followed by the remarkable rush known as a "stampede". The gold seekers, flotsam and jetsam of humanity, good and bad, rich and poor, rush in mad haste to the scene of the "strike" and stake the whole neighborhood out in mining claims immediately. A town site is laid out in a day, and a week later, it probably becomes an actual town, ^{with} ~~with~~ perhaps two stores, twelve saloons and gambling-houses, 5 or 6 mining stock brokers' offices, one hotel, and a vast scattering of tents. It matters not whether the mineral showing warrants such a proceeding or not; the gambling spirit is uppermost, and nearly everything "goes". If the much advertised highgrade ore is not there, the mushroom village will gradually dwindle away to nothing in the course of a year or two. "Boomers", a class of men, who for personal ends, loudly advertise everything in the camp, as the best and greatest in the world, lure many a thrifty laborer to invest his savings of years in "wild-cat" mining enterprises to his sorrow. Quite recently, State legislation, unfavorable to wild-cat mining schemes, has been enacted, which makes for the betterment of this condition.

The marvelous richness and success of two new mining districts in Nevada, did more than anything else to make the above conditions possible. Where so many are seeking in a mineralized region, more rich districts will doubtless be opened up, but the millions of dollars wasted by deceived and ignorant speculators might have been put to better uses.

The man who has the ear of the public in Nevada and publishes that this is the case, is severely censured. His presence will scarcely be tolerated in the boom camps afterwards. Anything that tends to stop the golden stream of money that eastern capitalists are pouring in, is mercilessly condemned by Nevada press and public. What matter if the

means employed to secure this investment be quite legitimate or not? The argument is that it puts money into circulation and makes "good times". It develops the state and so enriches our resources, is the Nevadan argument. Yes, indeed, so do the other gambling games, roulette, faro and poker, also the saloons and hurdy-gurdy houses "put money into circulation and make good times". Yet one hundred dollars, carefully invested, will develop the state more than five thousand invested in worthless stock mining schemes, so cleverly held out as bait to the simple and the foolhardy.

Comparative Costs.

The scale of wages paid to Costa Rican employees is as follows; For the sake of comparison, a similar scale of Nevada wages is placed along side.

		Costa Rica.	Nevada.
Common laborers	per day	\$.75	\$3.50
Miners	" "	1.25 - 1/50	4.00 - 5.00
Shovelers	" "	1.00	3.50
Carpenters	" "	1.25 - 1.50	5.00
Brick and stone masons	" "	1.50 - 3.00	6.00
Mill men	" "	1.25 - 1.50	4.00 - 4.50
Bueyros or ox drivers	" "	.75	
Timber men	\$ "	1.00 - 1.25	4.50
Bueyro, one yoke of oxen and cart	" "	2.50	
Cooks (Negro)	" "	2.00 and board.	

The day is ten hours work in Costa Rica, and eight in Nevada. The amount of work done per unit of time and money as compared with the same in Nevada, varies. Construction work, such as erection of buildings, mills, water power installation, will cost approximately, one-quarter more in Costa Rica.

rolling, shaft sinking, clearing land, cutting timber, will cost approximately, one-quarter less than the same labor anywhere in the western states, on a basis of actual work accomplished for the money spent.

The only labor troubles to contend with in Central America are intemperance and indolence. Strikes are unknown. Intemperance and indolence may be, to a certain degree, controlled. The aid of the government may be obtained to prevent large quantities of cheap contraband liquor from being brought into the mining camps. The laws concerning the manufacture and selling of aguardiente are rigorous, but are not vigorously enforced. If the mine management secures one or two reliable native policemen duly authorized and succeed in capturing and delivering to the authorities a "moonshiner" or two, it will often check the wholesale distribution of drink among the men, which is demoralizing in the extreme. Indolence must be conquered by example and energy; by securing good foremen, and by weeding out the worst offenders, in exactly the same manner as in the states.

In Nevada mines, the chief labor trouble is the strike. Good and bad laborers of all grades and classes are organized by leaders, some of whom are sincere and others unscrupulous. Requests or demands are frequently made by these organizations for the betterment of their condition or for increase of wages. Frequently these demands are unreasonable and are not acceded to by the mining operators. As a result all work is stopped and business paralyzed. It is a large question and much may be said on both sides of it. Its effect is to prevent the even and harmonious development of new mining districts, and in a measure to make level headed men slow to invest money in the new Nevada camps. The minority of miners who do not favor unionism are coerced into joining and are compelled to stop working when a strike is declared, regardless

of their wishes, which is a violation of personal liberty.

Timber and Building Material.

The timbered area of the interior of Costa Rica is extensive. Some authority has stated that there are a hundred and forty-seven varieties of cabinet woods in Central America. The most common woods for ~~ext~~ building purposes are Spanish cedar, pochote, mahogany, nisbro, ajoche, espobel and madera negra. The proportion of these varies with the locality, but the most common is the aromatic Spanish cedar. Nearly all wooden buildings are constructed of lumber sawn from this wood, which is quite soft and takes the same place there as does our pine here. Espobel, an inferior variety of soft, non-aromatic cedar, is abundant in some localities and grows to large size, some trees being four feet in diameter at the base. This does well for interiors and where it may be kept dry. The sap or white parts of these woods are valueless, being subject to rapid decay and the ravages of wood worms.

For mine timbering, only selected hard woods should be used. For this purpose, nisbro, wyeoan, mahogany, moro (a peculiarly dense, heavy, yellow wood) ajoche and madera negra are probably of most value. In some localities, ebony is also used. These hard woods should be used for all mill constructions work.

Hard woods may be obtained at a nominal cost in the densely timbered districts of the interior. Many are so dense, hard and heavy, that when well seasoned, they cannot be penetrated by a nail, previous to boring holes for the nails to enter.

Following is a list of comparative prices of lumber at the Tres Amigos Mine, Costa Rica, and Goldfield, Nevada.

	Tres Amigos	Goldfield.
Mine Timber	\$16 to 30 per M	\$42.50 Oregon pine
Cedar lumber	30 " "	40.00 soft pine 5/8"
Brown hardwood	30 " "	37.50 carload Oregon P.
Sawn	40 " "	37.50 " " "

These figures will do for a rough comparison, but prices vary largely with the exact locality. In Costa Rica at the Corinthian mine, I secured sufficient pechote lumber, which is a variety of water-and decay-resisting cedar, somewhat similar to our redwood, to build two miles of flume, 54 inches wide and 24 inches deep, at the rate of \$20.62 per M. This was done by supplying 15 or 20 peons with large rip saws, axes and tools and contracting with them for so much per board, which was all whip sawed by hand in the forest, and delivered to the mine. The methods were primitive indeed, but I obtained the lumber cheaper than I was afterwards able to produce it with a good modern saw-mill erected on the property.

Costs of Imported Mine Supplies, Puntarenas, Costa Rica.

Flour, per lb.	\$8.05
Canned Salmon, per box 4 doz. 1 lb. cans, net	\$8.50 to 9.00
" Oysters, " " 4 " 1/2 " " "	7.00 to 8.00
" Sardines (European) per 100 cans 1/2# " each	.06 to .08
" Butter, Danish, per doz 1 lb. cans	7.00
California Fruits, per doz cans	9.00
Jellies, per doz. cans 1 lb. net	4/50
Condensed Milk, per case of 4 doz 1# cans	9.00 to 10.00
American Ham, per lb.	.35 to .40
" Bacon " "	.35 to .40
Canned Corned beef, per doz 1# cans, net	4.50
Crackers. (American Biscuit Co.) per case 7#	2.00
Matches (Imported Danish) 12 pkgs of 12 doz. boxes	7.50
Candles (Mining, no import duty) per 25# box	5.25
Dynamite, 40# per 100#	18.00
Fulminating Caps, per 1000	7.50
Mine Fuse, per 1000 ft.	5.00
Gasoline, per gallon	.75
Imported Nails, per lb.	.08
Domestic " " "	.04
Cyanide (no duty) per lb.	.25

This is actual cost including all freight, laid down at the Pezco Azul Mine, Costa Rica, 30 miles from a seaport.

The freight on machinery of nearly all classes, tankage and similar heavy or rough material, from San Francisco to Puntarenas, Costa Rica, via Pacific Mail steamers, amounts to approximately \$15 per ton, time of transportation being 22 days. The same freight by the Cosmos line of German freight steamers is somewhat less, averaging about \$12.50 per ton, but the time of delivery is uncertain, being from three to six weeks, as these steamers do not carry mail under contract. They do much freight jobbing at numerous ports, and do not confine themselves to a regular schedule. Transportation to the interior of Costa Rica varies with the distance, the condition of the roads, and the seasons, but in making estimates of costs, it may be calculated at \$10 per ton from the port to most of the mines in the western interior.

In Nevada, freight from San Francisco to Goldfield is \$2.50 per hundred, carload lots having a lower rate, below \$2 per hundred, depending on the material.

Prices of Domestic Goods, Costa Rica.

Coffee, per lb. 1st class	\$.12
" " " 2nd "	.08
Rice " "	.06 to .07
Beans " "	.04 to .06
Plantains " "	.01 to .02
Eggs per doz.	.20 to .25
Chickens, each	.30 to .50
Beef, per lb.	.10
Corn " "	.03
Cane Sugar (Nicaraguan) per 100 lbs.	1.25
Potatoes, per lb.	.04 to .06
Cheese, " "	.25
Lard, " "	.20
Native Brown Sugar, per lb.	.05
Native Salt, per 125 lbs.	1.50
Milk, per pint	.05
Onions, per lb.	.15

These are the prices of the upland interior of Costa Rica, given in

There are factors that are strongly against operating in Costa Rica. The American engineer can accustom himself to conditions to which he would not care to subject his family, should he be a married man. Medical service, excepting in the cities, is incompetent. Educational facilities for children, if any at all, are likewise very poor. The moral standard of the whole country is low, and the careful foreigner has no desire for his children to develop in such an atmosphere of accepted and condoned immorality. The larger, older mines have, of course, well established foreign colonies, which do much to ameliorate native conditions, but the benefit of these does not extend to new and smaller mines, often many miles in the wild interior.

In conclusion, I should say that from a mining standpoint alone, and assuming the mines of Costa Rica and Nevada to be equal for the sake of comparison, there is little to choose between the two, and a mine should be as cheaply operated there as here.

Alfred Menitt Smith

May 12th, 1909.