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Report on the Metates Mining Company

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REPORT ON THE METATES MINING COMPANY.

SUBMITTED

BY

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REPORT ON THE METATES MINING COMPANY.

OBJECT.

This report is to describe the property and operations of the Metates Mining Company and to propose plans for further development.

LOCATION.

The mining claims and ranch land owned by the Metates Mining Company are located in the Mazatlan District, State of Sinaloa, Mexico, about fifty miles northeast of the city of Mazatlan. Mazatlan, with a population of 35,000, is considered the most important port on the west coast of Mexico and is easily reached from the United States by boat from the Pacific Coast ports, or by the Southern Pacific Railroad of Mexico from Nogales, Arizona. A road and telephone line extend as far as La Noria, a distance of twenty-five miles, and from here a trail is built to Metates. From two to three days are necessary to reach Metates from Mazatlan, usually taking the stage as far as La Noria and the remainder on mule back.

GENERAL DESCRIPTION.

The Metates Mining Company owns 1190 Hectareas of ranch land, of value chiefly for its wood, in addition to the following mining claims which are located upon the ranch land.

Name of Claim	Hectares	Acres.
Columbus No. 1	40	98.8
Columbus No. 2	9	22.2
Columbus No. 3	18	44.5
Amplication de St. Edwigis	3	7.4
Providencia	9	22.2
Mc Coy	5	12.4
Total	84	207.5

I am assured by Mr. F. C. Desmond, treasurer of the company, that the titles to the above land and mining claims are good.

While there are other mineralized veins upon the company's ranch land deserving of exploration, the mining claims are well laid out and control about 4500 feet along the main outcrop, which has a general northerly strike. Present operations are confined to workings along the main outcrop though the mining claims include several minor, parallel veins to the west, which have produced some ore.

The company is mining from twenty-five to thirty tons of ore per day, averaging 20 to 25 ozs. of silver and from 0.10 to 0.15 ozs. of gold per ton. Working one shift per day and six days per week, enough ore is mined to supply the mill. The ore is concentrated in an all oil flotation mill and the concentrates produced are shipped to the Selby Smelter at San Francisco, California. The concentrates have varied from 400 to 1100 ozs, silver and from 3 to 7 ozs. gold per ton. The value has been only in gold and silver for while the ore contains minerals of copper, lead, and zinc, their value in the concentrate has so far been negligible.

The company possesses tools and various equipment necessary for its operation at the present capacity and manner and, in addition to several houses in the village of Metates for native employees, a house and office are provided at the mine for the mine foreman, and a house near the mill for the mill foreman. A powder house, concentrate room, assay office, quarters for the superintendent and assistant, kitchen, dining room, and general store are all built.

Power is supplied by steam generated in two boilers of 30 and 40 H. P. respectively, and used in a 40 H. P. engine made by the Fulton Iron Works of Los Angeles, California. The fuel used is wood cut from the company's land and delivered at the mill by wood contractors. A generator, to furnish light for the mill and office, is run by a small auxiliary steam engine, which when needed runs a circular saw.

Transportation of supplies, concentrates, etc. is by mule back from Mazatlan, requiring ten to twelve days for the round trip. This requires ordering and keeping a stock of supplies on hand but is offset in a way by the fact that the majority of supplies may be purchased in Mazatlan, where Mr. J. H. Rico acts as agent for the company. The cost of packing to or from Mazatlan is $33.33 gold per ton.

Water is supplied from several springs higher up in the mountains and piped to the mill, from various gulches, and from No. 1 Adit.

The altitude of the property is about 3,000 feet above sea level, the climate is healthful, and while there are two seasons, wet and dry, neither is extreme.

The mine development may be considered in two parts, i. e., the older workings or from No. 3 Adit to the surface, in general inaccessible, and the later or present workings, No. 1 and No. 2 Adits. As far as can be learned No. 3 Adit was driven entirely on the vein with the exception of a short crosscut at the portal, was connected to the surface in several places, and contains probably 2,000 feet of drifts, crosscuts, raises, and winzes. Certainly considerable ore has been extracted from the area between No. 3 Adit and surface and it is reported that the finding of good ore in the winze below No. 3 Adit prompted the driving of No. 2 Adit. No. 2 Adit, starting as a crosscut, was driven east a distance of 310 feet, where it cuts the main vein, which was then followed a distance of 50 feet south and north for 850 feet. Several crosscuts have been run both east and west, and four winzes, the deepest reported 82 feet, have been sunk from this level. Santa Anita level, 118 feet above No. 2 Adit, extends 520 feet along the vein and at present is advanced to the north. San Rafael level, 180 feet above No. 2 Adit, has been driven 470 feet along the vein, and at the south end a crosscut to the west, 150 feet long, connects to the bottom of a shaft from the surface, providing good ventilation for the mine. Four raises are being run from this level, two from Santa Anita level, and two headings from the stope between these two levels. These faces in addition to the level

faces mentioned above provide for about 70% of the tonnage needed and the remainder is obtained from the stope back between Santa Anita and San Rafael levels. No. 1 Adit, starting also as a crosscut, was driven east a distance of 390 feet where it cut the vein, from which point the vein is followed 250 feet to the north. The vertical distance from No. 1 Adit to No. 2 Adit is 175 feet, from No. 2 Adit to No. 3 Adit, 320 feet, and from No. 3 Adit to the top of the shaft of the old workings, 200 feet. The development footage in No. 1 and No. 2 Adits amounts to 4540 feet, which may be divided into 640 feet in No. 1 and 3900 feet in No. 2.

HISTORY.

It is reported that Spaniards at one time operated this property and the natives tell of several Americans who met with varied success in working this property. In early days there was considerable mining activity in this district and there are several mines near Metates upon which milling plants were built and that are now idle. There are also numerous native arrastres and smelters for working higher grade ores.

This property finally passed into the hands of a Senor Portillo who operated it for a number of years and sold it in 1909 to the present owners. Portillo mined principally between the highest adit, No. 3, and surface. He also sank below No. 3 and started No. 2 Adit. When he found ore in No. 2 he stopped work in the upper adit and confined his operations to No. 1 and No. 2 Adits. Portillo built

and operated a five stamp mill, using pan amalgamation and table concentration. This mill was located down at the village of Metates and was used by the present owners until 1919 when they completed their present mill.

There is no complete record of the results obtained by Portillo but it is a matter of fact that he did considerable expensive work such as crosscutting through barren rock and sinking. It is certain that some of the ore was very rich but after talking with some of the natives and comparing their ideas of the ore at present and the ore Portillo mined, it is thought that he mined about the same grade as is being mined today. However, as Portillo packed his ore about a mile on burros and the milling capacity was small, probably 8 to 10 tons per 24 hours, he sorted his mine run ore more and therefore his milling grade was higher than that at present.

In company with other mine operators in Mexico, the Metates Mining Company has been unable to operate continuously for the past eleven years, however, this part of Mexico has been comparatively quiet during the various revolutions and the company has had no serious difficulty with either bandits, government officials, or labor. Their difficulties have been mainly due to general conditions and demoralization arising from the revolutions and to internal affairs of the company. At present the general sentiment of the Mexican people is for peace and the reestablishment of industry and the officials of the present government seem to be making effort to achieve that end.

PRODUCTION.

The company has kept no production record except that they have received from the smelter, after paying all smelter charges and deductions, the sum of $160,000.00 gold. This production has all come from No. 2 Adit, and, from the stoped area, it is estimated that 10,000 tons of ore have been mined, this, of course, is independent of mining operations of previous owners. Using the above figures as a basis, it would seem that the ore has netted at the smelter about $16.00 gold per ton.

TOPOGRAPHY.

Leaving Mazatlan the road crosses the coastal plain consisting of low land near Mazatlan and further east a series of low lying hills. The foot hills are reached at about San Marcos and from here the trail crosses the high ridges and deep gulches leading down to the Presidio or Mazatlan River, which rises in the Sierra Madre Mountains, flows in a southwesterly direction, and empties into the ocean to the south of Mazatlan. The company's propety is located on a similar series of high ridges and deep gulches. The drainage of the property is controlled on the western part through El Sauz Gulch and on the eastern part through Palmarito Gulch. The highest point of the divide between these gulches is Canton Peak which is just north of the company's Providencia Claim. In general the gulches and ridges have a north-south trend and the veins outcrop along the ridges, a feature which has permitted the mine to be developed by means of adits. The

surface is covered with vegetation which consists mostly of underbrush on the lower slopes and of pine trees of considerable size on the upper slopes.

GEOLOGY.

In general the geological history has been the laying down of limestone and sandstone which later have been raised, covered with volcanic flows, breccia, and tuffs. These have all been subjected to folding, faulting, to porphyritic intrusions, and later to rather rapid erosion.

The outcrop of the main vein can be traced for about 3,000 feet or up to a point where it disappears under the loose rock on the upper slope of the mountain. It is very silicious, iron stained, oxidized, and thoroughly leached in some places while in others it contains some remaining pyrite and galena. It varies from three to fifteen feet wide and in numerous places along the strike has been explored by open cuts, shafts, and short tunnels.

The vein occupies what is thought to be a fracture zone in andesite and follows a main fracture which has a general North 6 degrees West strike and varies in dip from 50 to 80 degrees to the Northeast. There is some evidence of movement along the main fracture and while it is called the hanging wall at least in one place ore has been found above it. Intrusives, varying from dark, basic to light, acidic, followed the fracturing and it is with these intrusives that the ore occurs giving the ore-bodies the appearance of a series of parallel and overlapping lenses, aggregating from three to ten feet

in width. Later silicious solutions have entered and while in the acidic intrusive the tendency has been to form a banded structure along open cracks, in the basic it seems to have been more a process of replacement of the intrusive itself, and has resulted in secondary silica entirely surrounding pieces of the basic intrusive, giving the appearance of a fault breccia. Oxidation extends deep along certain channels, for instance, in No. 2 Adit near the face and at about 500 feet below the surface, oxidation is evident, while above, along both Santa Anita and San Rafael levels, certain sections are clearly primary. Also in the stope between these levels one lens appears oxidized or to have been enriched while a parallel lens appears unaltered and primary. No. 1 Adit is making considerable water at present but as the natives report that little water was encountered in No. 2 Adit it is thought that the permanent water level has not yet been encountered in No. 2.

The minerals observed were pyrite, hematite, limonite, galena, sphalerite, azurite, crysocolla, chalcopyrite, tetrahedrite, argentie, pyrargyrite, and some native silver.

ORE OCCURRENCE & VALUE.

The present development in the mine indicates that the ore occurs as shoots in a zone roughly 130 feet in normal thickness, from three to ten feet wide, and conforming to the general topography of the surface. Its extension is indicated by the workings in No. 3 and by the deep winze below No. 2 Adit. Two shoots have been opened up so

far, the first consists of the small stope over the deep winze and the Porvenir Stope, and further in the second and larger shoot extending from No. 2 level to San Rafael level.

The following samples were taken, and as there was no means of parting the gold and silver, the results are the combined gold and silver. A close estimate of the gold can be made as the proportion of gold to silver is as 1 is to 150.

Number	Location	Width Ft. - In.	Assay in gold & silver.
1	A	6 - 8	41 ozs. per ton.
2	B	6 - 2	25 " " "
3	C	5 - 6	24 " " "
4	D	8 - 0	28 " " "
5	E	5 - 6	32 " " "
6	F	5 - 0	21 " " "
7	G	6 - 0	15 " " "
8	H	4 - 0	12 " " "
9	I	3 - 6	16 " " "
10	J	5 - 4	33 " " "
11	K	4 - 0	26 " " "
	From Company Records.		
	L	4 - 0	50 " " "
	M	5 - 0	45 " " "
	N	5 - 0	62 " " "

Samples from A,B, D, E, F, G, H, and I represent a normal thickness or height of 100 feet in the ore shoot. Their average is 25 ozs. for an average width of 5 feet 6 inches.

Twenty-three hundred tons of ore were mined by working in places A, B, C, D, E, F, G, H, I, and J under normal working conditions in a period of three months, it was roughly sorted and sent to the mill. There was no mechanical sampler but samples taken at various times of the mill heads varied from 19 ozs. when the ore was low grade to 35 ozs. It is thought that the average was probably 22½ ozs.

Records of the company show that mill heads have been maintained at from 25 to 30 ozs., and that first class ore assaying 400 to 500 ozs. has been shipped direct to the smelter.

For ore in sight I have considered the block bounded by A, B, C, J, I, G, F, E, and A, if not to be absolutely sure to be fairly conservative, and to calculate the tonnage have used a triangle 50 feet by 50 feet with a width of 5½ feet, and a rectangle 90 feet by 50 feet with a width of 5½ feet. This gives a cubical content of 33,175 cubic feet and using 13 cubic feet per ton of ore, I estimate that this block contains 2,251 tons of ore of an average value of 22.5 ozs. silver and 0.15 ozs. gold per ton.

For probable ore I have considered the triangular block below Santa Anita level, with the dimensions 300 feet by 80 feet with a width of 5 feet, and a block 100 feet by 100 feet with a width of 5 feet beyond the present faces of Santa Anita and San Rafael levels. The cubical content of these blocks is 110,000 cubic feet and using 13 cubic feet per ton of ore, about 8,000 tons. I think that this ore will average 20 ozs. silver and 0.12 ozs. gold per ton.

The total of the ore in sight and probable ore is 10,551 tons averaging 20 ozs. silver and 0.12 ozs. gold. This is very close to the estimate of the past production of the company and I am certain that the prospects for more ore have never been better than those at the present.

The possibilities of the mine depend upon:

First, the extension of the present ore shoots upward toward No. 3 Adit and downward toward No. 1 Adit.

Second, finding of other ore shoots either above ore below the present ore shoots.
Third, ore left along the present stoped areas and pillars both in No. 2 and No. 3 Adits.
Fourth, development of the parallel veins to the west.

For the first we have the reports of the ore in the winzes below both No. 2 and No. 3 Adits. Surface workings along 3,000 feet of outcrop indicate mineral value. Workings from the north side of the mountains have been advanced to within 70 feet of the end line of the company's Columbus No. 3 claim and the owner of this group of claims has tried to get the company to mill his ore. These workings are on what is supposed to be the same vein as the main vein of the company. The Metates Mining Company owns 4,500 feet horizontally along the vein, the production of No. 2 Adit has been from about 450 feet along the pitch of the ore shoot, or from less than 10% of the possible productive length.

The sample at K is encouraging for the second possibility and any extensive development campaign should contain provision for the exploration of the vein both above and below the present ore shoots.

Recent development work has opened up ore above a supposedly barren hanging wall at a point fifteen feet below the San Rafael level, and while no assumption can be made at present of its value or extent, the fact of its being along the old stopes and on its dip, projects into unexplored country, strengthens my belief in the third possibility.

As the parallel veins to the west are strong and have produced some ore, their further exploration should be continued.

While the possibilities of the mine can hardly be expressed in terms of tons of ore with any degree of certainty, it is believed that the possibilities are such that further development is advisable.

PRESENT OPERATIONS.

MINE.

Mining at present is confined to the Santa Anita , San Rafael levels, and the stope between. The walls are good and the ore occurs in a good width for mining. The rock is fairly hard but breaks well. Open stopes have been carried up for a height of from 50 to 75 feet, with stulls and occasional pillars, by both overhand and underhand drilling. The ore as broken is shoveled into cars, trammed to a chute and dropped to No. 2 level. From here it is trammed to surface and dumped on a grizzily of about two inch openings over the mine ore bin. A man and two boys are employed on the grizzily to sort out the larger pieces of waste and from the mine bin the ore is trammed to a point above the mill and sent down over a gravity tram to a small coarse ore bin at the mill.

The mine is dry except during the rainy season when the various openings permit surface water to enter the mine. This, however, is easily controlled and drained to the surface. The lowest adit, No. 1, makes considerable water the year around and it is thought that more water may be developed here for use in the mill.

The timber needed for use in the mine, such as stulls and planks, is cut from the company's land.

Drilling is done by hand. The miners work in pairs, double-jacking, and sharpen their own steel. A pair of miners are paid 22½ cents gold, per foot of hole and average from ten to fifteen feet of hole per shift.

The following wages are paid in the mine:

Foreman (Native)	$2.00 gold per day.
Timberman	1.25 " " "
Miner, company account,	1.25 " " "
Head Ore Sorter	1.25 " " "
Ore Sorters (Boys)	0.37½ " " "
Peons	1.00 " " "

The mine crew at present consists of:

1 Foreman
30 Miners
1 Timberman
1 Peon, Timberman Helper
5 Peons, mucking
2 Peons, tramming on No. 2 Level.
1 Head ore sorter
2 Ore sorters
2 Peons, tramming from mine bin to head of gravity tram.
1 Peon, operating gravity tram.
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46 Total.

MILL.

The ore from the mine is dumped into a small ore bin and fed direct to a jaw crusher which crushes to about two and one-half inches, and dropped to the fine ore bin. From here it is fed by a chute and underslung type of feeder to a 5' by 4' Allis-Chalmers Ball Mill. The discharge from the Ball Mill goes to a Model C Simplex Dorr Classifier, the sands returning to the Ball Mill and the overflow goes to a ten foot K & K rougher flotation machine, from which the tailings go to

the tailing pond and the concentrates to a six foot cleaner K & K flotation machine. The concentrates from this machine go to a concentrate box, are partially drained, but into shallow vats, dried, and sacked. The overflow from the concentrate box together with the tailings from the cleaner flotation machine are returned to the Dorr Classifier by means of a bucket elevator.

P. E. oil is fed at the Ball Mill by a K & K Disc Feeder and pine oil at the rougher machine by means of a larger oil cup.

The following wages are paid at the mill:

Mill Foreman (Native)	$0.28	gold	per	hour.
Night Foreman	0.14½	"	"	"
Mill Helpers	0.12½	"	"	"
Fireman	0.14½	"	"	"
Peons	0.12½	"	"	"

The mill crew consists of:

1 Mill Foreman
1 Night Foreman
2 Mill Helpers
1 Crusher Man, Peon
2 Firemen
1 Peon, drying and sacking concentrates
3 Peons, working in wood yard and doing odd jobs.

11 Total

COSTS.

It is impossible to secure accurate costs from the company's records, but the following cost items are accurate and are based on mining and milling 2300 tons of ore.

Mine.

Labor	$2.00 gold per ton.	
Explosives	0.52 " " "	
Misc. supplies	0.25 " " "	$2.77

Mill.

Labor	0.42 " " "	
Power labor	0.21 " " "	
Power supplies, wood only	1.30 " " "	1.93
Sacking and drying concentrates	0.05 " " "	
Marketing concentrates, including smelter deductions.	3.00 " " "	3.05
Total		$6.75

To the above total must be added such items as , mill supplies, general, and overhead.

The costs of the various supplies used, and delivered at the mine are as follows:

40% Hercules 7/8" powder, per box of 50 lbs.	$13.00 gold.
Dreadnaught Fuse, per 100 feet	1.00 "
No. 6 Blasting Caps, per 100	2.00 "
Wood for fuel, per cord of 8' by 4' by 3'-4"	3.50 "
Steel Balls for mill, per lb.	0.08 "
Sodium Sulphide, per lb.	0.12½ "
Pine oil, per gallon	3.00 "
Carbide, per lb.	0.16 "
Lubricating Oil, per 5 gallons	2.70 "
Cup Grease, per 50 lbs.	8.65 "
Cylinder Oil, per 5 gallons	5.29 "
Plank, 1" thick, per 1,000 board feet	60.00 "
Plank, 2" thick, per 1,000 board feet	31,00 "
Packing freight and concentrates to or from Mazatlan, per lb.	0.0166"

EXTRACTION.

In order to secure a good extraction, sodium sulphide must be added to the ore. The following tests, made by a representative of the Southwestern Engineering Company, at the mine in December 1919, indicate the extraction which should be expected.

Test Number	1	2	3	4	5	6	7	8	9
Pounds of P. E. Oil/ Ton	1½	1½	1½	1½	1½	1½	1½	1½	1½
Pounds of Sodium Sulphide / Ton	1½	1½	1½	1½	1½	1½	1½	1½	1½
Cresote Drops / Min.	120			16		10		20	40
Pine Oil No. 5 Drops / Min.		40	30	10					
No. 350 Oil Drops / Min.					16	12			
No. 80 Oil Drops / Min							20		
No. 1580 Oil Drops / Min.								60	
No. 90 Oil Drops / Min.									40
Heads, ozs. Silver	31.74	22.90	31.42	21.50	29.50	20.90	24.50	23.70	21.80
Tails, " "	1.9	2.6	1.9	2.6	2.8	2.3	2.2	1.5	2.3
% Extraction	93.7	93.7	94.1	87.7	90.6	88.9	91.1	93.8	89.4

In general, operating conditions are poor. The mine is handicapped by lack of development work but sufficient ore has been mined to supply the mill and this tonnage can be increased by working

a night shift in the mine. The engine at the mill is rated at 40 H. P. and is carrying a normal load of 60 H. P. so that irregularities in its work should be expected and its upkeep costs high. A new engine should be installed or some other power provided. The extraction in the mill at present is about 60%. The float valves on the flotation machines seem to be broken so that when it is necessary to stop the engine, which is quite often, the pulp in the machines flows out the tailing discharge causing a considerable loss. No sodium sulphide is being used at present which also accounts for a loss in the mill tailings. Supplies are purchased in a random, haphazard way and in quantity that does not permit of economy.

MISCELLANEIOUS INCOME.

The company operates a store in which is carried a general line of merchandise. A profit of from 15 to 20% should be expected on the sales which amount to 70% of the total pay-roll.

GENERAL CONSIDERATIONS.

It is thought that the Metates Mining Company has failed to make a success of its operations for the following reasons:

First, it has operated at times when, through no fault of its own but due to revolutions and general demoralization in Mexico, mining has been unprofitable.
Second, at times when profitable mining was possible, mismanagement and general inefficiency have prevailed both at the mine and home office.
Third, the company has been under financed, and the profits possible from the small tonnage milled could not be realized because necessary equipment could not be installed.

Power at present is a large factor. It costs over $1.50 gold per ton and is responsible for at least 50% of the delays at the mill and uses at least 50% of the water which might otherwise be used for milling purposes. It is thought that water power might be developed on the Palmarito Creek at a point where the transmission line to the mill would not be over three miles long. The stream was not gauged, but it is thought that there is sufficient water and head to develop 125 H. P. The dam site was previously used for this purpose. The canyon narrows down to a neck about seven feet wide at the water level, and a dam 20 feet high would not be over 20 feet long. A tunnel about 30 feet long, for the intake, has been driven six feet above the present water level. The old ditch line is from 1200 to 1500 feet long and stops with a head of about 100 feet. This ditch or pipe line can be extended down the canyon until the required head is obtained. The installation of a power plant here would be comparatively cheap and I think that a plant to generate 125 H. P. together with transmission line and motors for the mill can be installed for $12,500.00 gold.

During the dry season, a period of approximately four months, there is a shortage of water and the mill can only be run for ten hours per day. With a power plant such as above the water now used in the boilers could be used in the mill and without a doubt the mill could be run for 24 hours per day even in the dry season.

Labor is not plentiful and it is not cheap. It costs at present $2.52 gold per ton for labor and explosives in the mine. The

total costs with mechanical drills should be $2.25 gold per ton, using one-fourth the number of men and one-fifth the number of working places for the same tonnage. While machine drills are expensive I think that a reduction in costs can be made here by their use. Development faces are advanced at the rate of six inches per day per pair of miners and it is evident that at that rate development can hardly be kept ahead of production. With machine drills an advance of at least two and one-half feet per miner should be expected, so it is thought that if development is to be pushed ahead of production, or if a development campaign is to be completed in a reasonable length of time, machine drills should be installed. The company has recently purchased an electric rock drill which will probably tax the total capacity of the small dynamo now installed. If this drill proves a success a sufficient drilling capacity can be secured at a cost of about $3,000.00 gold if the hydro-electric power plant be installed, or for $5,000.00 gold if a larger generator is installed at the mill. A compressor, air drills, and necessary equipment can be installed for $7,500.00 with a motor for electric power or, without the motor, for $6,000.00 gold.

The present mill can be placed in good operating condition and the tonnage increased to probably 45 tons per 24 hours by installing another crusher to reduce the size of feed to the ball mill, by installing another flotation machine to treat the tailings from the first machine, by installing a dewatering device to save water and oil in the general mill tailings, by installing a small pump to return this water to the mill system, and by making a few repairs on the

present equipment. With these improvements an extraction of over 85% should be obtained. A crusher such as is needed may be obtained from the old Cerro Gordo Mill near Metates and all the improvements can be installed at a cost of about $2,000.00 gold.

The cost of the disposal of the flotation concentrate is a large part of the present costs. Tests should be made to determine a more economical treatment, although at the present time there is not enough ore in the mine to justify any change.

A development campaign which would prove up the mine's first possibility would be as follows:

	Drifting	Raising
Drive No. 1 Adit 550 feet north, and raise 93 feet to connect with winze from No. 2 Adit.	550	93
Drive San Rafael level 400 feet north, and raise 55 feet to connect with winze from No. 3 Adit.	400	55
Drive Santa Anita level 300 feet north, and raise 65 feet to San Rafael level.	300	65
Total footage	1250	213

To complete the above work with drills working in three places would require about seven months, and cost $15,000.00 gold, with one drill it would take probably two years and cost $17,500.00 gold. To do this work by hand would take three years and cost $20,000.00 gold.

Under fair operating conditions, purchasing supplies in an economical way, and in general operating on a sound business basis, the following costs should be obtained:

Mining	$2.25 gold per ton of ore	
Milling	2.50 " " " " "	
Concentrate charge, general and overhead	4.50 " " " " "	
Total cost		$ 9.25
Value of ore, 20 ozs. Silver, 0.12 ozs, Gold 85% extraction and ratio of concentration of 50 to 1. Silver at $0.50 per oz.		12.24
Profit per ton		$2.99

It seems reasonable to think that a better extraction than 85% can be obtained, and if a process of reducing the concentrate to bullion can be applied a further profit can be made.

CONCLUSIONS.

It is thought that the property of the Metates Mining Company has been mismanaged, the Company's operations have been interferred with by conditions in Mexico, but that it still offers possibilities of developing into a well paying proposition.

The following plans seem open for consideration:

First, put the mill in good operating condition, continue mining operations as at present, and start the development work outlined above with the electric drill working in the north face of San Rafael level. As soon as the point below the winze from No. 3 Adit is reached, raise by hand work and change the drill to the north face of Santa Anita level. Continue in this way until the face of No. 1 Adit can be started. Success in this plan would depend upon the electric drill to a large extent. Milling capacity would be small due to a shortage of water and because of reduced tonnage and of high power cost, the profit expected would be about $2.00 gold per ton. The cost of this plan would be:

Additions to the mill	$ 2,000.00 gold.
Development work	17,500.00 "
Total	19,500.00 "
Probable profit from 10,551 tons of ore	21,102.00
Profit from operations	$1,602.00 "

This plan gives promise of proving up the first possibilities of the mine and making expenses with a small initial investment. It does not remove all the troubles of operation, those of water and power, and runs the chance of increased cost if the present power plant should fail. A 75 H. P. engine in fair condition can be obtained from a property near by and installed for $500.00 gold. This plan could be completed in two years.

Second, install a hydro-electric power plant, put the mill in good operating condition and start mining operations with a drill sorking in the north face of San Rafael and Santa Anita levels and No. 1 Adit. This plan can be completed in seven months of mine operation and 10,551 tons of ore should be milled in eight months. Under this plan I think that a profit of $3.00 gold should be expected from the ore milled. The cost of this plan would be as follows:

Installation of Power Plant	$12,500.00 Gold
Additions to mill	2,000.00 "
Drilling equipment	3,000.00 "
Development work	15,000.00 "
Total	$32,500.00 "
Probable profit from 10,551 tons of ore	31,653.00 "
Loss	$847.00

This plan also depends upon the success of the electric drill but otherwise provides good operation conditions and on an increased tonnage basis. It requires higher initial investment but can be completed in a shorter time and the loss sustained is more than balanced by any ore developed.

Third, this plan follows the same outline as in the second plan except that should the electric drill prove unsuitable to install an air compressor and air drills. The cost of this plan would be as follows:

Installation of Power Plant	$12,500.00 gold.
Additions to mill	2,000.00 "
Compressor and eqipment	7,500.00 "
Development work	15,000.00 "
Total	37,000.00 "
Probable profit from 10,551 tons of ore	31,653.00 "
Loss	$5,347.00 "

This plan will place the property in good operating condition with machines of proven success.

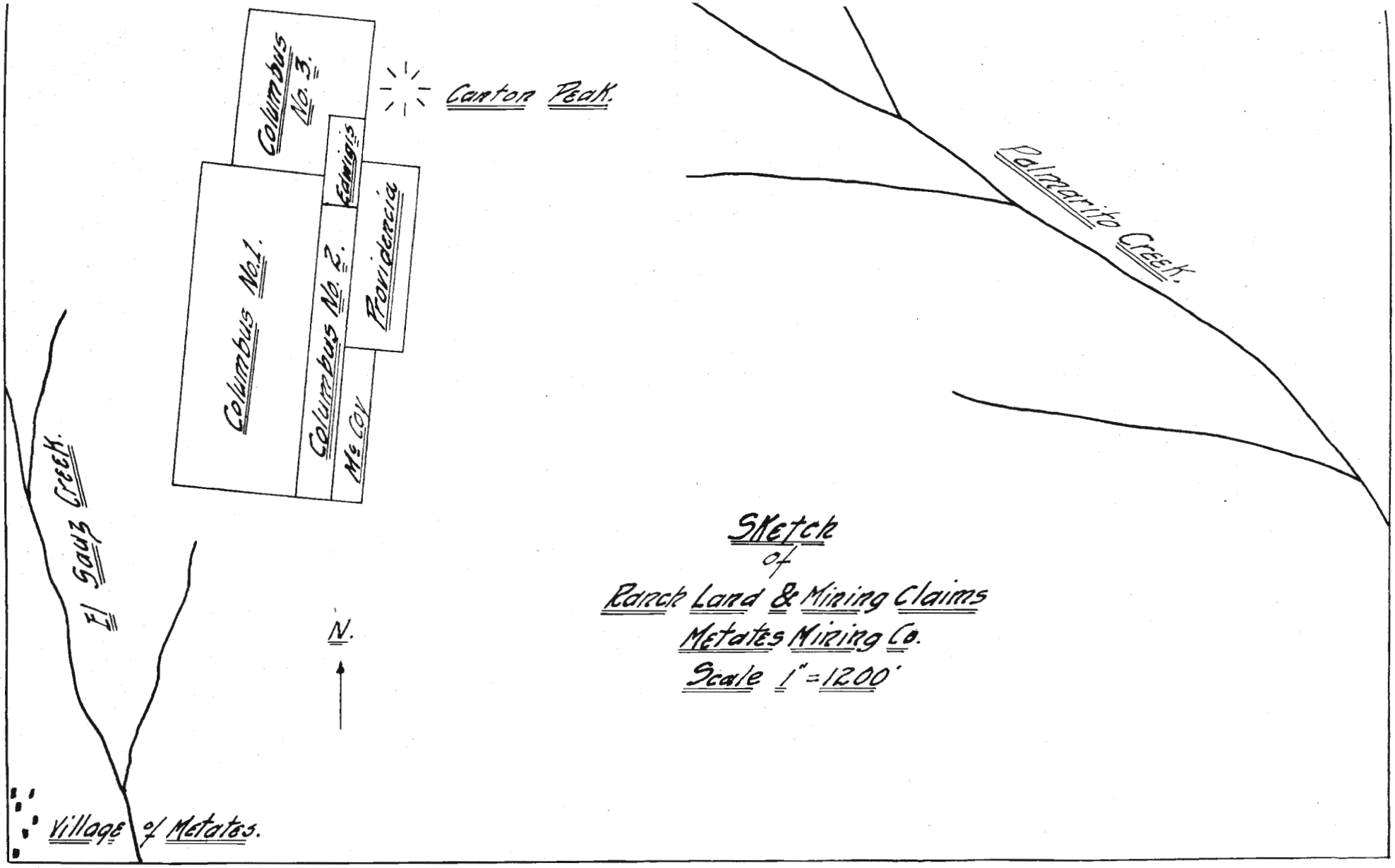
Fourth, a plan whereby milling operations be stopped and development work be carried on will require a longer period of time and cost $20,000.00 gold, doing the work by hand, or a larger amount of money with drilling equipment. It has the advantage of reserving the ore until a more definite knowledge of its amount is known.

I consider the fourth plan to be out of the question for while it is ordinarily poor practice to build a mill before the mine justifies it in this case the mill is built and the amount of money needed to place it in good operation is but a small part of the money needed to prove up the property. Also in case the development work proves the existence of considerable more ore, the experience in operating the mill should be of value in making changes or additions to the metallurgical treatment of the ore.

I think that the second plan, if the electric drill proves a success, should be adopted. If the electric drill does not prove successful, then the third plan should be adopted. In the case neither the second nor the third plan can be followed, then the first plan will eventually prove up the property.

The company should in any event take steps to secure the power site mentioned, for at any time it will prove a valuable asset.

Assuming that the property is given careful, honest, and efficient management, I consider that the property of the Metates Mining Company and the surrounding territory offers the opportunity of developing into mining operations of considerable magnitude, that its development as outlined will be inexpensive and that the possibilities justify the cost.



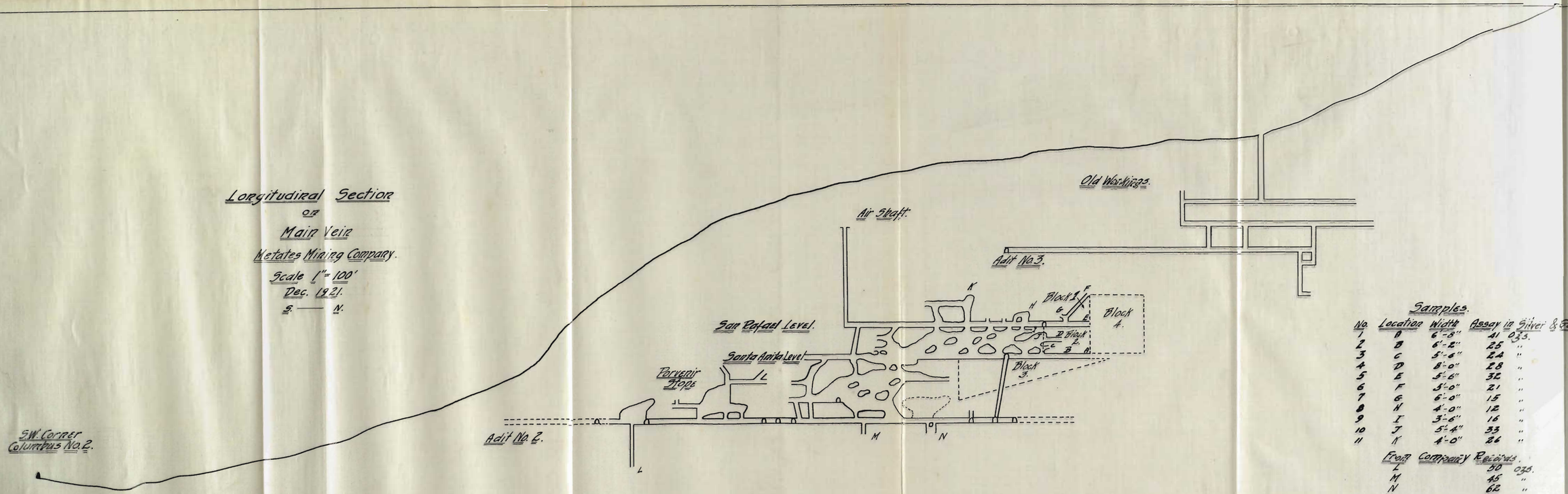
Sketch
of
Ranch Land & Mining Claims
Metates Mining Co.
Scale 1" = 1200'

Longitudinal Section
on
Main Vein
Metates Mining Company.

Scale 1" = 100'

Dec. 1921.

S. —— N.



Samples.

No.	Location	Width	Assay in Silver & Gold.
1	A	6'-0"	41 ozs.
2	B	6'-2"	25 "
3	C	5'-6"	24 "
4	D	8'-0"	28 "
5	E	5'-6"	32 "
6	F	5'-0"	21 "
7	G	6'-0"	15 "
8	H	4'-0"	12 "
9	I	3'-6"	16 "
10	J	5'-4"	33 "
11	K	4'-0"	26 "

From Company Records.		
L	30	ozs.
M	45	"
N	62	"