State Department of Geology and Mineral Industries

1069 State Office Building
Portland 1, Oregon

RAINBOW MINE (Gold)

Baker and Malheur Counties
Mormon Basin District

Owners: Mormon Basin Mines.

"Location: The Rainbow mine is just north of the divide between California Gulch and a southern tributary of the south fork of Dixie Creek, locally known as Rainbow Gulch.

"History and production: The deposit of the Rainbow mine was discovered about 1901, and the Commercial Mining Co. was organized to develop it. By 1907 the mine was a large producer, with a mill of 19 stamps. The capacity of the mill and concentrator was 50 tons a day in 1909. In 1911 no ore was raised, although development work went forward, and a fair production was made from cyaniding tailings. In 1911 the mine was sold under option to the United States Smelting, Refining & Mining Co., of Boston, Mass. This company operated the mine for 32 months until December, 1915, when, by failing to take up the option, it permitted the mine to revert to the original company. In 1916 the mine had a 400-foot shaft, a 1,500-foot adit, and 3,700 feet of drifts and crosscuts. A 100-ton mill and cyanide plant was on the property. A 100-foot winze was sunk from the 400-foot level. In 1918 the mine was closed and dismantled. A small production was made in 1922 and again in 1925 from dump rock worked in a 10-ton mill. In 1926 the mine was sold to the present owners, the Rainbow & Sunday Hill Mining Co.

"The production prior to 1911 was $242,000. The United States Smelting, Refining & Mining Co. produced $1,083,360 from 95,747 tons of ore, saving $11.40 a ton from $12 mill heads. During 1913 to 1915 the mine was the largest producer in the state, but the production since December, 1915, has been small.

"The mine buildings and shaft timbers have been destroyed by fire, and many of the old stopes have caved to the surface, so that the mine was entirely inaccessible at the time of this survey.

"Geology: The geology of the Rainbow mine has been described by Swartley (14:220) as follows:

"The geology of the Rainbow mine is comparatively simple; the country rocks are chiefly slate with some granitic intrusives on the hanging wall side and some limestones and greenstones on the footwall side. The greenstone (shown on pl. 2 as gabbro and related ultrabasic rock) is an intensely altered rock with an excessive development of secondary hornblende; its original character is hard to make out.

"The vein fissure has a strike of N. 60 degrees E. and in the upper levels a dip of 66 degrees N., while in the lower levels a dip of 54 degrees N. Before the period of vein formation the fissure was filled with a porphyry dike locally known as the 'spotted dike'. * * * This rock is a porphyry genetically related to an intrusive magma that is probably a basic granodiorite or quartz diorite or perhaps even a diorite in composition. * * * The Rainbow vein is not of the fissure type but of the brecciated vein type. The fractured zone varies from a few feet in width in some places to over 50 feet in others. It is made up of fragments of country rock cemented by quartz. The porphyry dike is included in the brecciated zone to a large extent. On both walls of the lode there is a quartz vein. The footwall of the lode is the best developed and has been most worked. The vein quartz is fine grained and contains but a very small amount of arsenopyrite and pyrite in which there is some gold. Some of the free gold in the vein is large enough to be distinctly visible, but for the most part it can not be seen. A small amount of actinolite and a little chlorite occur with the quartz, and when these minerals are present the gold

values are said to be greater. This is noteworthy as it points toward the precipitating action of the ferromagnesian silicates.

"There has been some movement since ore deposition, as is shown by the gouge and slickensides. The quartz, however, is not fractured to any great extent.

"The genesis of this vein is simple, that of ascending solutions from the underlying magma. The presence of the porphyry dike shows that the vein fissure followed this line of weakness.

"The mine is worked through a shaft about 500 feet deep, but most of the development has been done on the 200 level, where the vein has been drifted upon for 1,700 feet. Mine and mill are operated by electricity with power furnished by the Idaho-Oregon Light & Power Co."

Reference: Gilluly, Reed, & Parks, 33:37 (quoted).

Rainbow Mine

NAME

OLD NAMES

Gold

PRINCIPAL ORE

MINOR MINERALS

N. of divide between California Gulch & Rainbow Gulch

13 S. (T) 42 E (R) 22 (S)

Baker ..... COUNTY

Mormon Basin ..... AREA

5600 ..... ELEVATION

..... ROAD OR HIGHWAY

12 miles Dixie, Oregon ..... DISTANCE TO SHIPPING POINT

PUBLISHED REFERENCES

Gilluly Reed and Parks 33:37
Oregon Metal Mines Handbook 14-A, page 81

MISCELLANEOUS RECORDS

PRESENT LEGAL OWNER (S) Dr. E. B. Young and associates

Address Baker, Oregon

OPERATOR .....

Name of claims	Area	Pat.	Unpat.
6 claims		x	
many unpatented			

Name of claims	Area	Pat.	Unpat.

EQUIPMENT ON PROPERTY

DEPARTMENTAL RECORDS on file in	P'land	G.P.	Baker
REPORTS			
Elmer and Hogg (includes maps of workings, sections, etc.)			x
Rainbow Mine, from Engr + Min Jour. Vol 146 No. 9 Sept. 1945, p. 130	x		
SHIPMENT AND ASSAY RECORDS			
MAPS			
Plan showing re-opened workings, by Elmer and Hogg 1923, traced by H.K.L. 1940. Another showing claims, buildings, underground			x
Sections on above maps			x
Surface area showing claims and underground by A. E. Glover, 1916			x
Hamm Drift, longitudinal Section showing ore reserved above Hamm drift by Elmer and Hogg			x
Map showing Rainbow & Humboldt claims			x

RAINBOW MINE

MORMON BASIN

DISTRICT: Is 20 miles southwest from shipping point, Durkee, on the Old Oregon Trail and Union Pacific. Consists of 20 unpatented and 8 patented claims, recorded in Baker and Malheur counties. First located 35 years ago. Located in high mountain area; country rock is granite and greenstone foot; vein strata bearing northeast and southwest; width 7 feet, length 1590 feet. Minerals are gold and silver, values of $12. Has a past production of $2,225,000. Water is ample at the mine; power available from Idaho Power Company. Operated 1901-1911, also 1916@1925, no operation since. Mine buildings and machinery have since been destroyed by fire. Report by W. J. Moon.

(Prescott--6/1/37).

INTERMITTENT

Hogg & Elmo Rpt. in files

Too long to put here.

Abstract??

BLANK B—ANNUAL REPORT

Monroe Basin

This report must be properly executed and filed with the Corporation Commissioner on or before July 1, 1930, in order to entitle a corporation mining for any of the precious metals, coal, or prospecting or operating for oil, or operating an oil well, to pay a license fee of only $10. If not so filed, such corporation must pay the same license fees as are required to be paid by other corporations for gain.—Section 6890, Oregon Laws.

Annual Report to the Corporation Department

FOR THE YEAR ENDING JUNE 30, ~~1930~~ 1937

Of BLACK HAWK MINING COMPANY,
(Give legal name in full)

a corporation organized and existing under and pursuant to the laws of the State of Oregon.

The location of its principal office is at No. 612 Lumbermen's Bldg. *Street, in the city of* Portland, *in the state of* Oregon

The names and addresses of principal officers, with the postoffice address of each, are as follows:

NAMES	OFFICE	BUSINESS ADDRESS
Hugh Nelson	President	Lumbermens Bldg., Portland, Ore.
Ernest L. Boylen	Secretary	Stevens Bldg., Portland, Ore.
Ernest L. Boylen	Treasurer	do

The date of the annual election of officers is Second Monday in January

The date of the annual election of directors is do

	Common With Par Value	Common No Par Value	Preferred
Amount of authorized capital stock	$ 30,000.00	Shares	$ None
Number of shares of authorized capital stock	300,000		
Par value of each share	$ 30,000.00	xxxxxx	$
Amount of capital stock subscribed	$ 30,000.00	Shares	$
Amount of capital stock issued	$ 30,000.00	Shares	$
Amount of capital stock paid up	$	Shares	$
Price at which no par value stock issued	xxxxxx	$	xxxxxx

State amount of capital, represented by stock of no par value, with which the corporation began business . . . . . $ None

Total amount of its properties in Oregon (name of claims, lodes, or placers) Mineral Surveys No.661-A. 661-B. 719,662, 718 and 720: Claims known as the Sachem, Willamette, Sioux, Multnomah, Mohawk, Cayuse, Lulu, Princeton, Cayuse Extension, Ratcliffe, St.Croix Extension, Maine, Spring Gulch No.2. Spring Gulch Fraction, Spring Gulch, La Casa, Mizpah and King Fraction

The location of its properties Baker and Malheur Counties

The amount of work done thereon and improvements made thereon since the time of filing last report None

The amount of output or products of the mines or wells of such corporation from January 1, 1936 (1929), to December 31, 1936 (1929), inclusive, None

The value of output or products of the mines or wells of such corporation from January 1, 1936 (1929), to December 31, 1936 (1929), $ None

IN WITNESS WHEREOF, I, Hugh Nelson, President *of said corporation, have signed this report, this* 23rd *day of* June, *A. D. 193*7.

[CORPORATE SEAL]

(signed) (signed on line above notarial acknowledgement)

STATE OF OREGON,
County of } *ss.*

I, ... *being first duly sworn, depose and say, upon oath, that I am* ..... *of the foregoing corporation; that said corporation is not engaged in or transacting any other business except that of locating, prospecting, developing or operating mines for any of the precious metals, coal, or prospecting or operating for oil, or operating an oil well; that the value of the output or products of the mines or wells of said corporation from January 1, 1929, to December 31, 1929, inclusive, did not exceed $1,000; and that the above and foregoing statement is a full, true and*

BLACK HAWK MINING CO. Mormon Basin District.

President is Hugh Nelson, Lumbermens Bldg., Portland, Oregon; Secy.-Treas., Ernest L. Boylen, Stevens Bldg., Portland, Oregon. Capitalization is $30,000.00.

Total amount of its properties in Oregon (name of claims, lodes, or placers) Mineral Surveys, No. 661-A., 661-B. 719,662, 718 and 720: Claims known as the Sachem, Willamette, Sioux, Multnomah, Mohawk, Cayuse, Lulu, Princeton, Cayuse Extension, Ratcliffe, St. Croix Extension, Maine, Spring Gulch No. 2, Spring Gulch Fraction, Spring Gulch, La Casa, Mizpah and King Fraction. No work done at time of report. (1937)

~~Gilbuby, Reed, & Parks 33: 116.~~

~~Plumbers~~

Black Hawk Min Co.

Pres. Allan Russell, Portl.

Sec Ernest Boylan " ,

707 Stevens Bldg.

Portl

Dr. E.B. Young.

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RCM Co.

RCM CO (#2 Recent History)

At the Rainbow Mine the old wagon road, from the Rainbow Mine Camp Building to Rye Valley as shown on Plate IA and No. 16, has been rebuilt for a distance of three fourths of a mile. A tunnel of the Lulu Claim was driven about 50 feet.

This is the extent of the operation of the Rainbow Mining Company's activity since November 1926, and the work has been in the nature of assessments to hold the quartz lode location claims. Sufficient work has been performed to fulfill the requirements of the law for the years 1926 and 1927.

In April 1929 the hoist house and gallows frame, at the Collar of the shaft at the Rainbow Mine was destroyed by fire.

A Geological survey is now being made at the Sunday Hill Group of the Rainbow Consolidated Gold Mining Company's property.

The information enumerated has been derived, and Plate No. 38 has been prepared from data furnished by Messrs. Phelan Noon and Nelson.

Other than the above mentioned facts, conditions at the property are covered in detail in Report completed Feb. 12, 1927.

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COPY

The Sunday Hill Mine was acquired by the Rainbow Consolidated Gold Mining Company in September 1926.

There are seven distinct, more or less parallel veins on the property, only one of which has been developed to any extent.

The deposition of these veins was due to the ascending quartz solution filling fractures caused by the solidifying of the granodiorite dykes. The geological conditions existing at the two properties are similar.

Ore Reserves

Gross value of positive or available ore

Rainbow, 19, 286, tons on old dums	$	98,151.10
		456,933.83
Total	$	555,084.93

Gross value of probable ore

Rainbow, 400 level East 4,160 tons	$	37,814.40
		927,254.87
Total	$	965,069.27

Gross value of positive and Probable ore

Rainbow	$	135,965.50
Sunday Hill,		1384,188.70
Total	$	1520,154.20

The profits to be gained by the operation of the property depends entirely upon the cost of production, and the capacity of the mill will control this to a great extent.

The figure of $6.00 per ton is deemed ample to cover all costs of production at the Sunday Hill property and the recovery of 95% of the value of the ore has been used in arriving at the net profits to be gained. This cost can be materially reduced if development outlined in this report shows that a mill of larger capacity than 100 tons per day is warranted.

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Net Value of Positive Ore

Rainbow	$ 49,314.55
Sunday Hill	234,593.14
Total	$ 473,072.53

Net Value of Probable Ore

Rainbow	$ 14,934.40
Sunday Hill	458,138.13
Total	$ 473,072.53

Net Value of Positive and Probable Ore

Rainbow	$ 64,248.95
	692,731.27
Total	$ 756,980.22

Immediate Requirements

The following sums should be provided and held ready for use as required:

Rainbow Mine

For development and betterment, as shown in report of Elmer and Hogg	$ 55,000
Additional development other than recommended in report of Elmer and Hogg	$ 17,500
Unwatering Shaft	5,000
Mill for treatment of ore on dump	$ 15,000
For immediate use	$ 92,500

Of this sum $52,500. is for actual underground development.

Sunday Hill Mine

Underground development	$ 50,800
Sinking Shaft	11,500
Camp Buildings	10,000
Additional equipment	25,000
For immediate use	$ 97,300

Of this sum $50,800 is for actual underground development.

Total Requirement for Immediate Use

Rainbow Mine	$ 92,500
Sunday Hill Mine	97,300
	$ 189,800

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Of this sum $103,300. is for actual underground development, $55,000. for Machinery and camp building, $15,000. for mill for treatment of ore on dumps, $5,000. for unwatering Rainbow Shaft, $11,500. for sinking Sunday Hill Shaft. The underground work should be concluded with full crew within 6 months after actual work is begun.

Future Requirements

Rainbow Mine

Sinking Main Shaft as shown in report of Elmer and Hogg	$ 17,000.
Mill as shown by report of Elmer and Hogg	75,000.
Total.....	$ 92,000.

Sunday Hill Mine

Railroad and aerial tramway	$ 30,000.
Mill	105,000.
Total.....	$ 135,000.

Total requirement for Future

Rainbow Mine	$ 92,000.
Sunday Hill Mine	135,000.
Total	$ 227,000.

This sum to be used for no other purpose than outlined above and to be held in reserve until such time as conditions at the property justify the expenditure of this money.

One mill is contemplated, either centrally located or at one of the two properties, if the results form the development outlined fulfill expectations, then this money will be required within 6 months.

Necessary funds for Immediate and Future Use

RAINBOW MINE

Immediate Use	$92,500	
Reserve for future	92,000	$184,500.

Sunday Hill Mine

Immediate Use	$97,300	
Reserve for future	135,000	$232,300.
Total requirement for Rainbow and Sunday Hill Mines		$416,800.

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COPY

Conclusion

The following facts are to be considered:

1. That the Mormon Basin District in which are situated the Rainbow and Sunday Hill Mines, is a highly mineralized district is unquestionable.

2. Economic conditions are excellent.

3. The past achievement of the Rainbow is excellent.

4. The acquisition of the Sunday Hill Group of claims is a valuable asset.

5. Based on the significance of the facts dealt with in the report of Elmer and Hogg, and additional facts dealt with in this report on the Rainbow Mine, further development of the Rainbow Mine to the extent recommended if fully justified, with the confident expectation that results obtained will be at least equal to the past achievement of the property.

6. The fact that the ore reserve of the Sunday Hill Mine to date have been developed by an unusually small amount of exploration work is remarkable, and further development of this property to the extent recommended in the body of the report is justified with the expectation that this mine will be a big producer.

Respectfully submitted

George C. Hogg
Consulting Engineer

(signed) George C. Hogg.

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Derivation of Data

This report is based upon data obtained as follows:

First: From preliminary examination, sampling and Brunton Survey at the Sunday Hill Mine, made by George C. Hogg from June 25th to June 31st, 1926.

Second: From detailed examination and sampling at Sunday Hill Mine, survey of surface conditions at the Rainbow Mine made by George C. Hogg from October 10th to November 2nd, 1926.

Third: Transit survey of Sunday Hill Mine by Donald Mason.

Fourth: From records, report of Elmer and Hogg firm, dated January 26, 1923.

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Location, Acreage and Climate

The property of the Rainbow Consolidated Gold Mining Company consists of the Rainbow group, 8 patented claims and 18 Quartz lode locations, situated in sections 20 and 21, T. 13 S. R. 42 E. W. M., and the Sunday Hill group of claims, 11 Quartz lode locations, situated in section 8 and 17, T. 13 S. R. 42 E. W. M. Baker and Malheur Counties, Oregon. The mineral holdings consist of the following claims and are shown on Plate No's. 1A and 21.

Rainbow Group

(Patented Claims)

Jim Crow	Quartz	Lode	Claim	M.	S.	No. 719
Hattie B.	"	"	"	"	"	" 661A
Rainbow Mill site	"	"	"	"	"	" 661B
Black Hawk	"	"	"	"	"	" 718
Rainbow	"	"	"	"	"	" 662
K and K	"	"	"	"	"	" 718
St. Croix	"	"	"	"	"	" 720
Tank	"	"	"	"	"	" 713

(Quartz Lode Locations)

La Casa	Quartz	Lode	Claim
Maine	"	"	"
Spring	"	"	"
St. Croix Extension	"	"	"
Cayuse Extension	"	"	"
Princton	"	"	"
Cayuse	"	"	"
Radcliffe	"	"	"
Lulu	"	"	"
Mohawk	"	"	"
King Fraction	"	"	"
Mizpah	"	"	"
Wallula	"	"	" Recently Acquired
Willamette	"	"	" " "
Multonomah	"	"	" " "
Sioux	"	"	" " "
Sachem	"	"	" " "
Silica	"	"	" " "

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Location, Acreage and Climate

Sunday Hill Group of claims, 11 Quartz lode locations: situated in section 8 and 17 T. 13 S. R. 42 E. W. M. Baker and Malheur Counties, Oregon.

Sunday Hill Group			
Ace of Diamonds	Quartz	Lode	Claim
Ace of Clubs	"	"	"
Black Beauty	"	"	"
Red Wing	"	"	"
Red Wing Extension	"	"	"
Independence	"	"	"
Pershing	"	"	"
Royal Flush	"	"	"
Ace of Spades	"	"	"
Ace of Hearts	"	"	"

Bull of the woods Timber Claim
These claims comprise approximately 630 Acres.

The Company also owns 640 acres of timber land, (high altitude Yellow and Jack Pine with a scattering growth of Red Douglas Fir as shown on Plate 12 which is a fair illustration of the company's timber), situated about three miles distance northwest of the mine, and is accessible over a good wagon road. Three hundred and twenty acres of virgin timber, the remaining 320 acres having been cut over during the operations of the property to date. There is sufficient stand of timber for eight years operation on the basis of 100 tons per day capacity.

Rye Valley, a village of fifty people is nine miles northeast of the property and is the nearest town and post office. The nearest railroad point is Brogan on the Burns branch of the Union Pacific system, 17 miles distant. The towns of Durkee and Huntington are 22 and 25 miles distant, respectively, from the mine and are on the O. W. R. & N Company. The property is reached from the railroads over good wagon roads, by means of automobile or motor trucks from May 1st to November 1st, although the grade is steep in places and by wagons and sleds for the remainder of the year. The last few years, however outside of a few days after snowfall, it has been passable for automobiles and trucks the entire year.

The Rainbow group and the Sunday Hill group of claims are located on a high rounded mountain sparsely covered by sage brush. The Sunday Hill group is 1½ miles Northwest of the Rainbow group and the groups are separated by a flat rounded ridge having an elevation of 5,200 ft. above sea-level. The elevation of the shaft at each of the groups, as shown by aneroid readings is 5,100 ft. above sea level. No streams flow through either group of claims, but an ever flowing spring on the Spring Gulch Claim furnishes water through pipes under approximately 50 feet head to the camp buildings, and under low head to the shaft house at the Rainbow as shown on Plate 1A and 15, and there is a good well which supplies water at the Sunday Hill Group of claims.

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COPY

The Climate is delightful in the summer and fall, winters are not severe, the lowest temperature being above zero, such weather being infrequent and of short duration.

Rainfall is limited, there being occasional rains during the Spring and late fall, with but little precipitation during the summer months.

Snow falls from December 20 to March 1st according to local reports, laying on the ground for the period between these dates in normal years. The depth of snow seldom exceeds 3 feet, except in drifts of 4 to 5 feet lies until late in spring.

When the property is in steady operation there is no difficulty in keeping the roads open at all times.

The general location of the Rainbow Consolidated Mining Company's holdings in relation to the eastern central portion of Oregon are shown in Plate No. 3.

The district is known as Mormon Basin and was a well known and profitable hydraulic mining district in the early days of Oregon. The Rainbow group is on the East rim in the Southeast portion of the Basin, while the Sunday Hill group is on the West rim of the Northwest portion of the Basin and are shown on the Panoramic view Plate No. 30 in the front cover of this report.

The district extends from Rye Valley, Upper Dixie Creek, westward to Malheur City. It thus takes in both slopes of the divide between Upper Dixie Creek and Willow Creek. The Mormon Basin region proper is close to the divide. Since this divide is the County line between Baker and Malheur Counties the district is in both counties, and is situated a few milew southwest of Pedro Mountain, which is shown on Plate No. 16. It is true basin in shape with many small gulches draining towards the central part where they unite with Mormon Basin Creek, which makes its exit through a small canyon in the southern rim as shown on Plate No. 30 and 31. The elevation of the basin proper, is in other words the floor of the basin is about 4700 feet, containing approximately 3000 acres, and it is probable that the maximum relief is about 1000 feet.

The steep sloping hills are covered with sage brush and the higher elevations with sparse timber.

About 4 miles North of the Rainbow Consolidated Mining Company's property is Pedro Mountain, a bare rounded peak, having an elevation of approximately 5600 ft. The headwaters of Dixie Creek is on the northeast flank and it flows easterly into the Burnt River, which

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COPY

Flows Southerly and joins the Snake River a few miles above Huntington . The East Fork of Willow Creek rises on the west of Pedro and it is into this Creek that Basin Creek which drains Mormon Basin, flows. The East Fork of Willow Creek flows Southwesterly joining Willow Creek, then flows Southeasterly to the Malheur River at Vale. The Malheur River flows northeasterly and joins the Snake River at Ontario.

The Company's mines are located on the ridge between these two water sheds.

Lindgren classifies Pedro Mountain as a granitis origin, and places the age of the ridge between the Burnt River and Willow Creek as pre-neocene.

The Road from Rye Valley ascends the South Fork of Dixie Creek, crossing the divide at the property after passing through schists and greenstones. The elevation of the pass is about 5100 feet, the same as the collar of the shaft at the Rainbow and at the Sunday Hill.

For the last half mile of the distance the road traverses a narrow gulch which appears to be the dividing line between the altered sedimentaries of the Basin and the granite.

Geology of Mormon Basin District

The geologic history of this district is similar to many other regions in eastern Oregon, but with certain phases somewhat accentuated.

The oldest rocks which are the predominant ones, consist of what were originally mudstones, sandstones, siliceous and calcareous sediments. Interbedded with these may have been some lava flows or perhaps the basic igneous rock was intrusive into sediments in the form of sheets and sill.

These sedimentaries were then subjected to severe mountain building forces which folded and faulted the rocks and altered the shales, sandstones, silicious and calcareous rocks into slates, quartzites, cherts and marbelized limestones. By these same forces the basic igneous rocks were altered until they now consist of secondary hornblende, serpentine and other green colored minerals, so that they are now called greenstones.

Just at the close of this period of mountain building which contorted, fractured and changed these sedimentaries into rocks very much as they now exist, came a granitic intrusion.

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The largest batholithic mass now exposed by erosion is that of Pedro Mountain. A stock of considerable size occurs South of the Basin and one's attention is arrested by its peculiar pyramidical shape in travelling along the road to town of Malheur which is about 12 miles southwest of the Rainbow Consolidated Mining CompanY's holdings.

Generally speaking, however, the rock of the district is a granodiorite of medium granular texture and consists of andesine feldspar with quartz hornblende, biotite, and small amounts of magnetite.

There are local variations in composition due to magmatic differentiation. Increase in quartz bringing it nearer a granite, the decrease in quartz making it a quartz diorite, while the absence of quartz makes it a diorite. Accompanying the intrusion in its closing phases were the characteristic dykes of porphyry and aplite. The first mentioned type are of peculiar interest because they have been important factors in mineralization at both the Sunday Hill and Rainbow Groups.

The heat of the intrusion as well as the emanations from it contributed further to the metamorphism of the overlying rock. During the cooling the magma the region was under stress and resulting fissures were filled with molten material, which upon solidifying formed the dykes that have just been mentioned. Later when much of the magma had solidified the fissures which were formed at this time were filled with ascending quartz solutions. These solutions deposited their quartz with the precious metals and other minerals in the veins. Movement took place during vein deposition as is shown by the cemented vein breccia in many of the veins.

The mineralization of the veins in the Mormon Basin varies. In some a large percentage of the gold is free, in others the gold is contained in sulphides which are chiefly arsenopyrite, and pyrite with minor amounts of sphalerite and galena.

After the veins were formed there was a period of erosion. Then came outpourings of Tertiary lavas and the formation of lake beds during the same age. Both acid and vasic lavas are found in the district. The former were probably earlier and are represented by rhyolites and trachytes.

Lake beds were found in the lower part of the basin and probably have a thickness of a hundred feet or more. In places they are imbedded with altered trachytic flow. The lake beds vary in character from coarse gravel to clay. It is probable that the placers of today were at least partly formed by the reconcentration of gold bearing Tertiary gravel beds by present day stfeams.

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COPY

Since the Tertiary series of lake beds and lava flows considerable movement has taken place, as is shown by the tilting and faulting of them.

Recent erosion has taken away much of the tertiary covering. The present day placers have been formed by the wearing away of the aurifierous veins and the consequent deposition of the gold in the stream channels and also by the reconcentration of gold bearing gravels of the lake bed formation.

History of Mormon Basin and Neighboring Claims

In 1864 a band of Mormon cattle rustlers watering their cattle in what is now called Mormon Basin discovered gold in the creek. Claims were immediately staked and a gold stampede was the result. It was soon discovered that profitable placer mining depended upon more water than was available from the melting snow and Spring freshets, as the creeks were practically dry the entire year except for a few months in the Spring. Much money and labor was expended the next few years in building ditches, and the outcome of this activity was the Eldorado Canal or Ditch from the headwaters of the Burnt River, a distance of over 100 miles. This ditch was completed in 1873. The muchroom towns of Amelia, Eldorado and Malheur City as shown on Plate 3 sprang up. No authentic records were kept, so the production of these fields is problematical, but the amount quite large.

With the falling off of production from the rich surface gravels in 1880 attention was devoted to the location of quartz ledges, as many nuggets recovered in the placer operations were impregnated with quartz, which seemed to indicate the source of supply was reasonably close.

In 1880 a man by the name of Porter Colt in his placer operations uncovered the Humboldt Vein. The location of the Humboldt Mine is on the West rim of the Mormon Basin and is shown in panoramic view Plate No. 30 and 31, and is about 1½ miles Northwest of the Rainbow, and 1 mile South of the Sunday Hill. This property was sold by Colt to an Idaho concern for $40,000. and was later acquired and operated several years by the Oregon-Idaho Investment Company. This property is not operating at present, according to report, on account of excessive water and bad ground. There is a shaft 500 ft. in depth (considerable work has been done on each of five levels) and/20 stamp cyanide mill is on the property. That there has been considerable production from this property is evident. Arthur M. Swartley in the Oregon Bureau of Mines report of December 1914, states that for 7 years from 1907 to 1914 the production from Quartz operations in the Mormon Basin were approximately $1,400,000.

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The Humboldt and Rainbow properties were practically the only producing mines in the district at that time. The production of the Rainbow of which records have been compiled in the report of Elmer and Hogg, show that up to that date the Rainbow had produced approximately $950,000., and it is from this data that the conclusion has been drawn that there has been considerable production from the Humboldt.

The Gorman property or the Blue Mud Mine, South of the Humboldt was reopened about six months ago and development work is being carried on with a small crew. The Randall property is about ½ mile South of the Sunday Hill Group. Development work has been carried on on this property the last two years, and it is reported that ore of good grade has been encountered.

The Monohan group is about ½ mile west of the Sunday Hill Group. Considerable work has been carried on at that property the last few years, and it is reported that the property has excellent possibilities.

The location of the above properties are shown in Plate 30. None of the above mentioned properties were personally inspected. The general report, however, being that the formation in these properties is common to the district, and with slight variations similar to that of the Rainbow and Sunday Hill Mines.

In the basin proper are the old placer diggings of the early day operations. The Colt placer holdings which comprise about 300 acres, 240 acres of which are patented, are located in the Basin on Basin Creek and are shown on Plate 30.

Hydraulic operations on a small scale having been carried on by Colt or leasors for several years. Operations have been handicapped, however, owing to lack of water. To facilitate operations, last spring a small storage reservoir was installed near the South exit of the Basin, into which all seepage from the Basin drains. A pumping plant was installed at the reservoir, and the water pumped to sufficient elevation to give ample pressure (head) for hydraulic operations. It was found that by this arrangement the small amount of water available could be used over and over with the result that for fifteen days each month operations were carried on. The report is that the momentary returns from operations this summer were very satisfactory.

Systematic prospecting of the Colt placer holdings by means of test-pits sunk from the surface to bedrock was started last summer and is still being carried on, with the view of building a gold dredge to handle the rich placer gravel of the Basin, if the result of this exploratory work, when completed, warrants it.

To the North of the Rainbow group is the Bond property, on which considerable work has been carried on in recent years, the results of which are not known.

The Wagner Group about one mile East of the Rainbow Mine, which is referred to in the report of Elmer and Hogg as the Mormon Basin Group, was visited last summer. The formation in general is similar to that of the Rainbow. Two distinct veins have been cut by the prospect tunnel, which has been driven South (towards the Rainbow Mine), a distance of about 600 ft. Each of these veins has been drifted on for a distance of about 75 ft.

No samples were taken, but the property has possibilities.

Sunday Hill Mine

History

Some of the claims of this group were located prior to 1890 by Porter Colt.

The second mill in the state of Oregon was erected on these claims. There are no signs of its existence today however.

The mill was crude and the results obtained were not entirely satisfactory, although local report has it that between $40,000 and $60,000. was recovered from ore extracted from the two tunnels, as shown on Plate 22, which are now caved.

The discovery of rich gravel on abandoned placer claims in the Basin by Chinamen in the early 1900's led Colt to again center his activities on placer mining rather than quartz mining. He allowed the quartz locations to lapse and a man by the name of Dick Kidd located what is now Pershing Claim.

In 1916 William Phelan acquired Kidd's holdings. He drove what is designated on Plate 22 as the Colt Tunnel, the location of which is 85 ft. Lower in elevation than the original Colt Tunnel, which was caved.

This tunnel was driven through the slate country rock and encountered the Colt vein 170 ft. distance from the portal of the tunnel. The vein was drifted on both sides East and West from the tunnel, and considerable ore was extracted by stopping methods, above the tunnel.

The general strike of the vein is N. 10° W. with a dip of 33° N. E. the vein where sampled shows a width of 2.5 ft. and consists of 2 ft. of oxidized brecciated material, and six inches of hard white quartz.

next to the foot-wall. Both the foot and hanging-wall of the vein are a very materially altered granodiorite porphyry.

This vein, as well as the other veins on the property, was probably formed by the ascending quartz solutions filling the fissures caused by the solidifying of the intrusive grandiorite prophyry dykes.

This tunnel was caved but was reopened for this examination and is shown on Plate 20. Samples 132, and 133 and 134 were taken, the location of which are shown on Plate 22. The description and value are found in the body of the report under caption of Miscellaneous Samples.

Development at Sunday Hill Mine

In 1919 Wm. Phelan interested Frank Harris, John Daniels and W. H. Bohnenkamp, all of La Grande, Oregon, in the property. A shaft was sunk on the Independence Claim, the location of which is shown on Plate 22. The elevation of the collar of the shaft is shown on Plate 22. The elevation of the collar of the shaft is 5,100. Thirty-five feet below the surface or collar of the shaft a vein was encountered which has been designated in this report as the "Phelan Vein". It is on this vein that practically all of the exploratory work, open for inspection, has been carried on.

The shaft was sunk 70 ft. and a cross-cut was driven from the bottom of the shaft, a distance of 70 ft. encountering the Phelan Vein. This level has been designated as the 100 level in this report. The Phelan Vein was drifted on, on this level, a distance of 80 ft. A raise designated as Incline Raise was driven, on the Phelan Vein at sta. 101, to the surface, a distance of 112 ft. Thirty feet vertically above 100 level, or 40 ft. on the dip of the vein, a drift was driven, off of the incline Raise of the vein, a distance of 65 ft. This has been designated as the 50 level.

A raise was driven off of the 50 level at sta. 31 a distance of 15 ft. on the vein.

At Sta. 102, 100 Level, a raise connects the 100 Level with the 50 Level. The length of this raise, which is partially caved, is 45 ft.

To obtain more depth on the vein, the Adit Tunnel or 200 Level was driven. The elevation of the portal of the tunnel is 4,945. The difference is elevation between the collar of the shaft on the Independence Claim and the portal of the tunnel being 155 ft.

Two hundred and Seventy ft. from the portal of the tunnel another vein was encountered, which was drifted on for a distance of 305 ft. At this point what is designated as the Kendall Vein was encountered and from this point the Kendall drift was driven, a distance of 45 ft. South, and 75 ft. North, at which point the Phelan vein was cut.

The Phelan vein on this level has been drifted on for a distance of 200 ft. Raise No. 1 was driven off of this drift on the vein a distance of 50 ft. Raise No 2, which is 35 ft. Northwest of Raise #1, was driven a distance of 110 ft, and connects the 200 level with the 100 level. The vertical distance between the 100 level and the 200 level is 85 ft. Forty-five feet above the 200 level at sta; 105 a drift was driven Northwest 35 ft. This has been designated as the 150 level. A raise was driven on the vein a distance of 10 ft. off of this level, also a branch raise was driven Southwest at sta. 105 to connect with the 100 level. The length of this raise is 70 ft.

Five feet West of Sta. 214 a winze was sunk on the vein a distance of 30 ft. The vertical distance of the bottom of the winze below the 200 Level is 24 ft.

What has been designated as the King drift has been driven N. W. a distance of 75 ft. from the Kendall Drift at Sta. 211.

This drift was driven in a granodiotite Porphyry dyke. It is this dyke that is the foot-wall of the Phelan Vein. This dyke will be referred to in the text of the report as the foot-wall dyke. In the King Drift 65 ft. N. W. of Sta. 211 a vein was encountered having a strike N. 35 degrees W. with a dip of 43 degrees N. E. This vein has been designated as the King Vein.

At Sta. 212 a cross-cut was driven North a distance of 75 ft. in an altered granodiorite porphyry dyke. This dyke is the hanging-wall of the Phelan Vein and will be referred to as the Hanging-wall dyke.

Summary

The following is a group of the data previously outlined:

Place	Elevation	Vertical Distance below Collar of Shaft
Collar of Shaft	5100	
50 level	5060	40 ft.
100 level	5030	70 ft.
Adit Tunnel or 200 Level	4945	155 ft.
Bottom of Winze	4921	179 ft.

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Remarks

Prior to the preliminary in June and the detailed examination in October and November, the property had never been mapped, surveyed or sampled except haphazardly here and there. Consequently the owners worked at a great disadvantage.

Great credit is due Wm. Phelan for the amount of ore developed considering the limited amount of development work carried on, on the property.

The Rainbow Consolidated Mining Company acquired the Sunday Hill Mine and Group of claims in September 1926.

Geology and Vein Occurrence

No geological folio of the district has been published.

The geologic history of the Basin, in general, applies to the Sunday Hill Mine and will therefore near repetition in part.

The original formation was probably mudstones, sandstones, siliceous and calcareous sediments. The basic igneous rock was intrusive into these sediments in the form of sheets and sills.

This series was subjected to severe stress, which tilted the series to a position, in general, from 45 degrees to 65 degrees from the horizontal, with inclination to the Northeast, and strike N. W. and S. E., and altered these sediments into slates, quartzites, cherts and limestones. The basic igneous rocks were altered until now consist of secondary hornblende, serpentine, and green colored minerals commonly called greenstones.

Then came the granitic intrusion contributed to the metaporphism of the overlying rock. During the cooling of the magma the region was under stress and the resulting fissures or fractures were filled with molten material which, upon solidifying, formed the granodiorite porphyry dykes.

Later, when the magma had solisified, the fissures or fractures formed by this cooling, were filled with ascending silica solutions, deposition of the quartz and metallic sulphides in the veins.

It is in these fissures or fractures in the granodiorite dykes that the seven distinct veins on the property occur. It is not known whether the deposition of these veins occurred during the same period, it being impossible to determine on account of the limited amount of development open for inspection on other than the Phelan and Kendall veins.

That the Phelan Vein is the older origin than the Kendall Vein is apparent.

The Kendall vein is the only vein observed which had other than a strike of N. W., with dip N. E. The Kendall vein has a strike of North, or slight Northeast, with a dip of nearly East. This vein has been instrumental in the faulting of the Phelan vein 12 ft. N. of Sta. 212, and appears to have been cut off entirely 5 ft. N. of 212, by the altered granodiorite dyke, the Hanging-wall of the Phelan vein.

It is quite obvious that the mine is situated in a zone of weakness where the fissures or fractures, and movements have taken place many times.

Movement took place during the vein deposition is shown by the cemented vein breccia. Also considerable post-mineralization has taken place, as evidenced by the sugary quartz, prevelant in the veins at places, the gouge, and actual faulting of the Phelan vein 12 ft. East of Sta. 212.

The chief gangue mineral is quartz and much of it is in a sugary condition in both the Phelan and Kendall veins, particularly in the Phelan vein on the 50 and 100 Levels. In the Phelan vein there is a considerable free gold on the upper levels, while on the tunnel level more sulphides are found. They are chiefly arsenopyrite and pyrite.

That more than one period of dyke deposition occurred is possible, and is supported by the fact that the foot-wall dyke of the Phelan vein is considerably less altered than the hanging-wall dyke of the vein.

A petrographic description of the foot-wall dyke made by Professor George E. Goodspeed, of the University of Washington is as follows:

"The specimen submitted is a granodiorite porphyry of medium prophyritic texture, grey in color, with plagioclase phenocrysts, and contains a few veinlets of quartz and some biotite. Under the microscope the thin section shows pheno-crysts of plagioclase and biotite in a finer grained mosiac of quartz and feldspar.

From 18 to 28 ft. North of Sta. 217 the dyke changes in character and has been classified by Prof. George E. Goodspeed as a Dacite Porphyry, the analysis of which is as follows:

"The specimen submitted is a dense porphyritic structure, grey in color, impregnated with sulphides (pyrrhotitie) and altered biotite.

"A microscopic examination shows phenocrysys of andesine and remants of femics in an uneven mosaic of quartz and feldspar, biotite, atinolite and pyrrhotite are present.

"Primary minerals are: andesine 70%, quartz 20%, biotite 5% and pyrrhotite 5%.

"Alteration minerals are: aotinolite, serioite, kaolin and linonite.

Remarks: Zonal structure in feldspar.

A specimen of the Hanging-wall cross-cut No. 1 - 100 Level was submitted to Prof. D. C. Livingston of the School of Mines at the Oregon Agricultural College, and is as follows:

"The specimen submitted is iron stained, weatheres prophyry, showing feldspar phenocrysts in a fine light colored iron stained ground mass.

"Microscopic: The feldspar are mainly plagioclase, but somewhat difficult to recognize on account of the alteration. The ground mass contains a good deal of quartz. The rock might be tentatively classed as granodiorite porphyry, which has been stained with limonite from decomposition of the phrite."

A comparison of the analysis quoted above, shows that there is a similarity of composition of the dyke, the difference in composition being due to the different stages of alteration that have taken place.

Numerous quartz stringers verying from $\frac{1}{4}$ inch to 2 inches in width occur in the dyke on the 200, as well as the 100 Levels, wherever observed.

Vein Data

Sunday Hill Group

The seven distinct veins of the Sunday Hill group are listed and briefly described below:

1. Shadow Lawn
2. Colt
3. Quartzite
4. King
5. Phelan
6. Noon
7. Kendall

Shadow Lawn Vein

This vein is the most Westerly quartz indication on the Sunday Hill group, and may be traced on the surface for a distance of approximately 1,000 ft. with width varying from 8 to 12 ft. The outcrop of this vein is on the Pershing and Royal Flush Claims, the location of which is shown on Plate 21. This vein has a general strike of North 25 degrees W. with a dip of 80 degrees N. E. Some years ago a tunnel which was not open for inspection (it is now being caved), was driven on this vein. It is reported that ore of good grade was encountered.

The development on this vein inspected, was the Discovery Shaft on the Pershing Claim and Surface Trenches Nos. 8 and 9 on the Royal Flush Claim. The trenches were recently dug to a depth of 2 ft, across the width of the outcrop.

This development shows the continuity of the vein between the Discovery Shaft on the Pershing Claim, and Trench No. 9 on the Royal Flush Claim, a distance of 930 feet. Samples 141, 142 and 143 were taken in the cuts above mentioned, the description and value of which are listed in the body of this report under the title of "Miscellaneous Samples."

The fact that the samples taken show low value, does not signify that this vein does not have possibilities. The width of the quartz sampled in Trench No. 8 and No. 9 was 10 ft. Also these samples were taken only 2 ft. below the surface where erosion had its effects.

This a well defined, strong vein on the surface and a cross-cut driven from the bottom of the proposed vertical shaft to cut this vein at a depth is recommended.

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Colt Vein

The development on this vein is 1,000 ft. South of the most Southerly development on the Shadow Lawn Vein. The projection of the Shadow Lawn Vein South on its strike to a point West of where the Colt Vein is encountered, would indicate that the Colt Vein is encountered, would indicate that the Colt Vein is located approximately 200 feet East of the Shadow Lawn Vein.

Local report has it that the Colt Vein where worked in the early days was high grade in places.

This vein should most certainly be developed at depth which can be most advantageously carried on by driving a cross-cut West from the Phelan drift on the 200 level. A cross-cut 355 ft. in length should encounter the Northerly extension of the Colt vein at a depth of 85 ft. vertically below the Colt tunnel.

Quartzite Vein

The outcrop of this vein is along the crest of the hill which crosses diagonally the Pershing Claim, 125 ft. East of the Colt Vein, and is shown on Plates 21 and 23, and can be traced on the surface a distance of 800 ft.

The development on this vein consists of surface Trenches Nos. 4, 5, 6 and 7 and Pit No. 8, recently dug. The trenches have a depth of 2 ft. and have been driven across the quartzite outcrop which varies in width from 15 ft. in Trench No. 5, to 75 ft. in trench No. 7. A quartz vein cuts through the quartzite having a strike of N. 35 degrees W. with a dip of 72 to 76 degrees N. E. The quartz blends into the quartzite so it is difficult to determine where the quartzite commences and the quartz leaves off, which leads one to believe that the heat of the ascending mineral solutions further metamorphoses the sandstone to its present condition, or that it was in a semi-molten condition, due to the granitic intrusion when the quartz solutions were deposited, hence the blending of the quartz into the quartzite.

In trenches Nos. 4, 5, and 6, 19 ft., 4 ft., and 1 ft. of quartz respectively were encountered. Samples 137, 138 and 139 were taken, the location of which are shown on Plate No. 22, the value and description are listed in body of report under "Miscellaneous Samples." Plate No. 35 shows the outcrop at trench No. 4.

No quartz was encountered in Trench No. 7 and Pit 8, which is shown on Plate 36, both being entirely in quartzite.

Sample No. 140 was a grab sample taken in bottom of trench No. 7 and carried no values.

This seems to indicate that the mineral solution failed to penetrate the metamorphosed material much further North, on the surface at least, than Trench No. 6.

This vein was cut in the Colt Tunnel, 95 ft. from the portal of the tunnel which is 115 ft. vertically below Trench No. 4.

The continuity of the quartz in this vein is therefore established from Trench No. 6 to the Colt tunnel, a distance of 470 ft.

The importance of the exploration of this vein as at once recognized as 19 ft. of quartz was encountered in Trench No. 4 which showed a value of $2.40 per ton and 4 ft. of quartz sampled in Trench No. 5 assayed $3.20; also the fact that the Colt vein has a dip of 33 degrees while the dip of the quartzite vein where observed varied from 72 to 76 degrees, which means that without there is a change of dip, these two veins will unite 20 ft. above the 200 Levels as shown on Plate 23.

A cross-cut driven from the Phelan drift, 200 Level, will cut this vein at a vertical depth of 200 ft. below the outcrop at Trench No. 4, and the approximate distance of this cross-cut will be 355 ft. and if the value of the ore encountered justifies, the vein should be drifted on both Northwest and Southeast.

King Vein

The King Vein was encountered in the King drift 200 Level, as shown on Plate 22, 65 ft. N. W. of Sta. 211, has a strike of N. 35 degrees W. with dip of 43 degrees N. E. and is more or less parallel to and 45 ft. West of the Phelan vein. The theoretical position of the vein projected to the surface, as shown on Plate 21 and 23, is 180 ft. East of the Quartzite vein.

The vein was sampled for a width of 5 ft. and shows considerable post-mineralization, consisting of 1.5 ft. of sugary quartz and 3.5 ft of oxidized material. Samples 32, 95 and 111 were taken, the location of which are shown on Plate 22, description and value of which are listed under caption of "Miscellaneous Samples" and the average used as the true value of the ore.

The foot-wall of the King vein is a highly metamorphosed rock, probably either a schist or quartzite. The hanging-wall is the granodiorite dike which is the foot-wall of the Phelan vein.

The vein encountered 270 ft. from the portal of the Adit tunnel, 200 Level, is probably a continuation of the King Vein East of the Kendall vein, having more or less the same strike.

The continuity of the King vein seems to have been broken by the hanging-wall dyke of the Kendall vein at Sta. 207. Samples 100, 101, 110 and 109 were taken on the Eastern extension of the King vein, the location of which are shown on Plate 22, description and value listed under the caption "Miscellaneous Samples."

The cross-cut from the Phelan drift driven West to cut the quartzite vein will also cut the King vein, and if the value of the ore encountered at that point justifies it, the King vein should be drifted on but N. W. and S. E.

The king vein should unite the Phelan vein 190 ft. below the 200 Level, as shown on Plate No. 23, assuming the dip of the two veins to remain the same as observed on the 200 Level.

Phelan Vein

The Phelan vein has been briefly discussed in the preceding text. This vein is approximately 200 ft. East of the quartzite vein, as shown on Plates 21 and 23. The general strike is N. 45 degrees W. with a dip which varies from 45 degrees N. E. on the 50 and 100 Levels to 54 - 62 degrees N. E. on the 200 Level.

The development on the 200 Level shows the continuity of the ore-shoot to date to be 200 ft. on that Level, with an average width of 4.2 ft. and value of $21.05 per ton. The limit as to the length of the ore-shoot has not yet been reached as the West face is in 4 ft. of ore which has a value of $17.90 per ton. This drift must be continued West on the vein to determine the length of the ore-shoot.

Samples were taken on the vein on this level every 5 ft., 27 in all, as shown on Plate No. 22, except where prevented by tight lagging or bad ground. Samples 1, 2, and 3 were collectively one sample taken across the vein, 5 ft. N. W. of Sta. 212, Sample No. 1 being the hard white quartz, No. 2 the dyke, and No. 3 the oxidized material, and the arithmetical average used as the value of the ore at this point. The object in taking the sample this way was to determine whether the dyke and oxidized material composing the vein carried values.

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The structure of the Phelan vein varies in places due to dyke replacement. Plate No. 34 is a flashlight showing the vein structure opposite Sta. 214 - 200 Level.

Samples Nos. 12 and 15 were both taken 8 ft. E. of Sta. 214. Sample No. 12 for the entire width of the vein 5.5 ft. While in Sample No. 15, 2.5 ft. of hard quartz was alone sampled, care being taken however, to omit as much of the sulphides as possible, which are noticeable to the eye. The average of these two samples has been considered the value of the ore at this point.

Samples 11, 22 and 25 showed high values, and check samples were taken at the identical place of these samples, description and value of which are listed under caption "Phelan Drift Samples," and the average of the check sample and the original sample taken as true value of the ore at this point.

The values of 27 samples taken over a distance of 200 ft. in the Phelan drift vary from $3.20 to $79.26, which leaves the impression that the values are extremely spotty, but upon closer examination it is found that this is not the case. 5 samples or 20% of the samples taken carry less value than $6.00 per ton, which ordinarily would be unprofitable to mine. Five samples, or 20%, carry values from $10.00 to $19.60 per ton, while eleven samples, or 40% carry values from $19.80 to $79.25 per ton. Also from 10 ft. East of Sta. 213 to 10 ft. West of Sta. 213, a distance of 20 ft. the lowest value is $20.55. From Sample No. 25 to Sample No. 67, a distance of 45 ft. the values vary from $17.90 to $45.02. So it is seen the values are not as spotty as one would first believe. This variation of values is characteristic of gold bearing veins.

Twelve feet East of Sta. 212 the Phelan vein has been cut off by a fault having a strike of S. 45 degrees E. with a dip of N. 40 degrees E. The striations are plainly discernible on the slickensides of the hanging-wall dyke and show the throw of the fault to be approximately 20 to 25 ft. S. E. A cross-cut was driven S. 25 ft. East of Sta. 212, a distance of 10 ft. where it passed through the fault material into the foot-wall dyke. This cross-cut should be continued East until the vein again is picked up. The vein should be then drifted on. There is no logical reason to believe that the vein will not be encountered East of the fault, as the vein was 4 ft. wide where cut off by the fault, and can be plainly distinguished in its downward and upward course.

The purpose of Raise No. 2 was to connect the 100 and 200 Levels, for air, Mr. Phelan states, and no attention was paid to the following the vein. It appears that except for the first 10 ft. above the

Phelan drift to the 150 Level, a distance of 65 ft., the Raise has been driven in the hanging-wall dyke. This is also true of the 150 Level, which has been driven in this dyke. From the 150 Level to the 100 Level the raise has been driven considerably flatter and the hanging-wall streak of the Phelan vein has been followed.

The inspection of Raise No. 1 seem to verify the above statement. Plate 37 is a typical section and shows the vein structure 10 to 15 ft. up Raise No. 1 at the place where Sample No. 38 was taken.

In calculating the value of the Phelan vein ore body, the values of the dyke encountered in Raise No. 2 have been considered as if the vein had been driven on. In Mining this block of ground the foot-wall should be followed, with reasonable expectation that the value of the ore extracted will be considerably higher in value than $8.32, the average value of the Samples taken in Raise No. 2.

The development on the 100 Level shows continuity of ore-shoot to date of 80 ft. Twelve samples were taken, as shown on Plate 22 and 24, the description and value of which are listed under caption of "100 Level" samples, which show an average width of 3.54 ft. and value of $10.87. The limit as to the length of the ore-shoot has not yet been reached, as the West face is in 2 ft. of ore, the value of which is $11.30. Plate 28 shows the vein structure on the 100 Level at top of Raise No. 2. The 100 Level should be continued West on the vein. There seems to be no reason, in fact it is most likely that the Westerly limit of the ore shoot on the 100 and 50 Levels will be even further West than it will be on the 200 Level, as the available data indicates the rake of the Phelan vein to be to the East on its downward extension.

Samples 54 and 55 were taken opposite Sta. 101. Sample 54 was taken the entire width of the vein, while Sample 55 was the quartz only. The average of the two samples has been considered the value of the ore at this point.

The development on the 50 Level shows a continuity of ore-shoot to date of 65 ft. Five samples were taken, the average width of which is 3 ft. and the value $12.11. The west face is in the 5 ft. of ore the average value of which is $12.40. Plate No. 27 shows the vein structure at the face of the 50 Level. This drift should be continued West on the vein.

The winze below the 200 Level, Raises Nos. 1 and 2 off of the Phelan drift, Incline Raise between 100 Level and Surface Raise off of 50 Level, have been driven on the Phelan vein, and were sampled as indicated on Plates 22 and 24.

Description and Value of Samples will be found under the Caption of "Winze Raise N. 1," "Raise No. 2," "Incline Raise" and "50 Level" respectively.

The Raise off of the 150 Level was driven on the hanging-wall streak of the Phelan vein, and was sampled as indicated on Plate 22, the description and value of sample is found under the caption "Miscellaneous Samples".

The branch Raise off of Raise No. 2 driven from 150 Level to the 100 Level, and the Raise from the 100 Level to the 50 Level were partially caved, consequently it was impossible to examine them closely, but they seem to have been driven in the hanging-wall dyke. Samples were taken as shown on Plate No. 22.

Summary

The Phelan vein has been developed from the surface to 24 ft. vertically below the 200 Level, by raises and drifts, and a winze; a positive and probable tonnage of 10,326 tons has been developed which will be discussed under caption of "Ore Reserves." Both walls of the vein are a granodiorite porphyry.

Considerable replacement of the dyke by the vein has occurred in places, also post-mineralization has taken place to some extent as evidenced by the sugary condition of the quartz which is the chief gangue mineral. This is particularly noticeable on the 50 and 100 Levels. There is considerable free gold on these Levels, while on the 200 Level there are more Sulphides, chiefly arsenopyrite and pyrite. Movement has taken place during vein formation, as shown by the crushed quartz and the re-cementing of the broken quartz fragments.

The average width of the vein on the 50 Level is 3 ft. with average value of $12.11 per ton, while on the 200 Level the average width is r.2 ft. and average value is $21.05 per ton, which seems to indicate that the width and values of the vein accounted for by the fact that the foot-wall dip of the vein is steeper than the hanging-wall dip.

When we consider the fact that the deposition of the vein has been caused by ascending thermal solutions from the underlying magma, and that the veins are therefore of deep seated origin, together with the probability of the King, Phelan and Noon veins jointing, and forming one vein with depth, as shown on Plate No. 23, it is apparent that an immense ore-body may be developed.

A cross-cut driven 205 ft. W. from the proposed shaft 400 Level - will cut the Phelan vein and determine the magnitude of the ore-shoot at that point. The Phelan vein should be drifted on both N. W. and S. E. on the Level.

Granodiorite Dyke

The altered granodiorite dyke, the hanging-wall of the Phelan vein - 200 Level - is mineralized and the portion of it in close proximity to the Phelan vein carries appreciable values. This dyke cannot be called the Phelan vein because of different periods of deposition, but on account of its position it will be considered an auxiliary deposit of the Phelan vein at least from the 200 Level to 10 ft. vertically above the 50 Level.

This dyke has been developed by cross-cuts Nos. land 2 on the 200 Level and cross-cut No. 1 on the 100 Level.

One large sample (No. 30) as shown on Plates 22 and 25, was taken and then quartered down, over a distance of 25 ft. in the preliminary examination. A horizontal cut 2 inches wide and 1 inch deep for the entire distance was the method used in taking this sample.

Later in the detailed examination this dyke was sampled by taking three vertical cuts every 5 ft. for 25 ft. and samples 151, 152, 73, 107 and 108 taken. Sample 73 was again checked by Samples No. 153; Sample No. 107 by Sample Nos. 112 and 155 and Sample No. 108 by Sample No. 155.

The average of the original sample, the five 5 ft. samples, and the check samples were used in calculation of the value of the dyke. The result of this sampling was an average value of the dyke for 25 ft. of $8.00 per ton.

Because of the numerous quartz stringers cutting through the dyke and the extreme hardness of the dyke itself, the difficulty in sampling the dyke is apparent. Errors in the result finally obtained were eliminated it is thought by the taking of several samples and using the average value as the true value.

Hanging-wall cross cut No. 2 - 200 Level - was recently driven North from Sta. 217 with the view of determining the continuity of the dyke itself as well as the values. Samples and check samples taken, as indicated on Plate 22 and 25, show an average value of dyke for a distance of 25 ft. to be $13.40 per ton.

No sampling on the dyke other than above but Phelan claims he encountered values on Dyke for a considerable distance.

Hanging-wall cross-cut No. 1 - 100 was recently driven for the purpose of determining the continuity of the dyke on this level. Samples and check samples were taken as indicated on Plates 22 and 25 and show an average value for the dyke of $14.16 for a distance of 60 ft.

The cross-cut driven from the shaft - 400 Level - to cut the Phelan vein will pass through the hanging-wall dyke of the Phelan vein, and the extent and values of the dyke will be thus determined.

Noon Vein

The Noon vein was encountered in the hanging-wall cross-cut No. 2, 29 ft. North of Sta. 217, as shown on Plate 22, and is 25 ft. East of the Phelan vein at that point. The theoretical position of the vein projected on the dip of the vein to the surface, as shown on Plate 21 and 23 is 410 ft.

The strike of the vein is N. 55 degrees W. with a dip of 65 degree N. E. The vein was sampled for a width of 4 ft. and consists of 3.5 ft. of oxidized material and 0.5 ft. of high grade hard white quartz, containing some sulphides.

Samples 70 and 113 were taken, the location of which are shown on Plate 22, description and value of which are listed under the caption "Miscellaneous Samples." The quartz was omitted in sample 70. Both the quartz and oxidized material were taken in Sample No. 113 and the average of these two has been considered the value of the ore. One Sample was taken of the quartz alone which had a value of $1,320.00. This sample was ignored.

The foot-wall of the Noon vein is the hanging-wall of the Phelan vein, and is practically a granodiorite. Professor Goodspeed classifies it as a "Dacide Porphyry," however, the hanging-wall of the vein is a metamorphosed rock, probable a micaceous quartzite.

The Noon vein should be drifted on both northwest and southeast, also the hanging-wall cross-cut No. 1 should be driven North a distance of approximately 35 ft. to cut Noon vein on the Southeasterly extension of the vein.

If the dips of the Phelan and Noon veins remain the same on their downward extension as observed on the 200 level, shown on Plate 23, the two veins will unite 300 feet below the 200 Level.

Kendall Vein

The Kendall vein is the only vein observed on the property having a strike other than N. W. with dip N. E.

This vein has a strike of N. 23 degrees E. with dip of 54-60 degrees S. E. and shows a continuity on the surface from cut No. 1 to cut No. 3, a distance of 96 ft., and on the 200 Level from Sta. 212 to 45 ft. S. of Sta. 209, a distance of 116 ft. as shown on Plate No. 22.

The development of this vein is confined to the above mentioned places, and a probable tonnage of 2250 has been developed to date, which will be discussed under caption of "Ore Reserves."

The limit as to the length of the ore-shoot on the 200 Level has not yet been reached as Sample No. 123, taken 5 ft. from the face of the Kendall drift shows the vein to have a width of 2 ft. and value of $22.40 per ton. The vein in the face of the drift was not sampled on of tight lagging.

This drift should be continued South on the vein at least 250 ft. to a point vertically under Cut No. 1, and at least two raises should be driven on the vein to the surface.

Six samples were taken on the vein on the 200 Level having an average width of 2.1 ft. and average value of $16.72 per ton, the location of these samples is shown on Plate 22, the description and value are listed under caption of "Kendall Drift Samples" and the vein consists of sugary and crushed quartz combined with oxidized material.

The walls appear to be granodiotite, porphyry, the foot-wall of the Phelan vein.

The Kendall vein has been cut off in its Northerly course by the Phelan vein. Lack of sufficient data prevents any explanation as to the cause or effect of this condition.

This vein should be developed on the 400 Level, primarily to develop the vein, and secondly, the data so obtained will determine what part the Kendall vein has played in faulting the Phelan vein 12 ft. East Sta. 212.

Ore Reserves

The development carried on at the Sunday Hill Mine to date established beyond a question of a doubt certain tonnage in the Phelan vein, the Hanging-wall Dyke and the Kendall vein.

What has been termed positive or available tonnage is when ore has been developed on three sides of the block, or if not, then in the certainty of its existence.

Block A, B, C and D have been considered available or positive ore and the limits of the blocks are shown on Plate 24 and 25, and the procedure followed in calculation the tonnage is outlined in detail in the text that follows.

Block A and B have been developed on three sides. Block C on two sides, the Phelan drift, and the Winze below the 200 Level. The winze was full of water but was pumped out sufficiently so that a sample could be taken 12 ft. below the Phelan drift, and the continuity of the vein observed. It is upon the continuity of the vein in the Winze which shows an increase in width 15 ft. below the Phelan drift, over the width of the vein in the Phelan drift, which has led to the assumption that this block may be considered positive ore.

No deduction has been made for tonnage extracted (530) from Blocks A, B and C included in the calculation of the tonnage of these blocks, as the ore is stored on the surface on the dump at the collar of the shaft and at the portal of the Adit Tunnel. Grab samples of the ore on these dumps were taken and showed values of $11.20 and $18.00 per ton respectively.

Block D is the mineralized Hanging-wall Dyke, the auxilliary deposit of the Phelan vein. This block has been developed on two sides. The Hanging-wall cross-cuts Nos. 1 and 2 - 200 Level - one side and the Hanging-wall cross-cut No. 1 - 100 Level - the other side. The persistency of values in the dyke wherever sampled in this examination led to belief that this block was available or positive tonnage.

Block E and F have been considered probable tonnage and the limits of the blocks are shown on Plates 24 and 25. The calculation of the tonnage is explained in detail in the text which follows.

When the uniformity of the Phelan vein on the 200 Level is considered and the fact that the West faces of the 200, 100 and 50 Levels are in ore, as well as the persistency of the values in the Hanging-wall Dyke, it is reasonable to consider the blocks outlined as E and F, as probable ore.

The probable ore in block G is outlined on Plate No. 26 and is explained in detail in the text that follows, under caption "Probable Ore in Kendall Vein."

In the following calculations of probable and positive tonnage, no attempt has been made to eliminate any ore of lower grade than $6.00 per ton, because the ore will have to be mined anyway and there is

sufficient ore of higher grade to keep the mill heads above $15.00 per ton. However, if it is deemed advisable after the exploratory work outlined is completed to immediately mine the dyke ore in conjunction with the Phelan vein ore, then mill heads can be kep above $13.00 per ton.

Phelan Drift Samples

Assays of samples taken on the Adit Tunnel or 200 Level in the Phelan drift are shown on Plates 22 and 24 and are listed below. The gold and silver values have been combined in figuring the values. Gold has been calculated at $20 per Troy Oz, and Silver 50¢ per Troy Oz. The silver values vary only being noticeable in the ore containing heavy sulphides. The general average being 1.5 oz. of Silver to 1 oz. of Gold.

Samples No	Description	Width ft.	Gold & Silver Values per Ton
28	200 Level Phelan Drift 3 ft. E. of Sta. 212 E. side Kendall drift Sugary and hard white quartz, some sulphides. Foot-wall dip 52 degrees N. Hanging-wall dip 56 N.	3.5	$ 19.60
71	8 ft. E. of Sta. 212 N. side drift Sugary quartz	4.5	$ 3.20
1	5 ft W. of Sta. 212 S. Side drift. Hard quartz	2.0	$ 4.90
2	5 ft. W. of Sta. 212 S.side drift. Dyke below the quartz.	2.5	$ 3.60
3	5 ft. W. of Sta. 212 S. side drift crushed quartz and oxidized vein material above quartz next to hanging-wall	2.0	$ 4.60
1-2-3	5 ft. W. of Sta. 212 S. side drift average of these three samples Foot-wall Dip 55 degrees N.	6.5	$ 4.34

#35 RCM Co.

Samples No.	Description	Width ft.	Gold & Silver value per ton
4	10 ft. W. of Sta. 212 S. side drift hard quartz and some sulphides, possible arsenopyrite and pyrite	3.0	$ 61.30
5	15 ft. W. of Sta. 212 S. side drift hard quartz	3.0	9.20
6	20 ft. W of Sta. 212 N. side drift crushed quartz and oxidized material	5.0	4.20
7	25 ft. W. of Sta. 212 N. side drift crushed quartz and oxidized material	5.0	5.10
8	30 ft. W. of Sta. 211 N. side drift 2 ft. decomposed dyke. 1.5 ft. Hard white quartz. 0.5 ft. oxidized material	4.0	7.60
9	35 ft. W of Sta 211 N. side drift 2 ft. dyke 2 ft. Hard white quartz some sulphide. 1 ft. oxidized material. Hanging-wall dip 52 degrees N.	5.0	20.55
10	40 ft. W. of Sta. 212 N. side drift 3 ft. decomposed dyke. 1.5 crushed quartz and oxidized material. 1.5 hard white quartz some sulphides	6.0	39.45
11	4 ft. W. of Sta. 213 N. side drift 3 ft. decomposed dyke and crushed quartz 2 ft. hard white quartz some sulphides 1 ft. oxidized material	5.5	142.30
103	4 ft. W. of Sta 213 N. side drift, same place and material as sample 11 except care taken to take no sulphides	5.5	16.22
11 & 103	4 ft. W. of Sta. 312 average of these two samples	5.5	79.26

#36 RCM Co.

Samples No.	Description	Width Ft.	Gold & Silver Values Per Ton
12	9 ft. W. of Sta. 213 N. side drift 3 ft. decomposed dyke and oxidized material. 2.5 hard quartz some sulphides	5.5	62.85
15	9 ft. W. of Sta. 212 N. side drift 2.5 ft of quartz only. Same place as sample No. 12. Hanging-wall dip 50 degrees N.	2.5	38.00
12 & 15	9 ft. W. of Sta. 213 N. side drift average of two samples	5.5	50.43
13	14 ft. W. of Sta. 213 side drift 3 ft. of decom posed dyke and oxidized material 2 ft. hard white quartz and oxidized material.	5.5	13.00
14	At Sta. 214 N. side drift 3 ft. dyke 1.5 white quartz 1 ft. crushed quartz and oxidized material	515	5.50
16	15 ft. W. of Sta. 214 N. side drift crushed quartz and oxidized material	2.5	6.56
17	3 ft. W. of Sta. 215 N. side drift crushed quartz and oxidized material	3.0	17.00
18	8 ft. W. of Sta. 215 N. side drift crushed quartz and oxidized material	3.5	23.00
19	12 ft. W. of Sta. 215 N. side drift crushed quartz and oxidized material Hanging-wall dip 62 degrees	4.0	8.80
20	22 ft. W. of Sta. 215 N. side drift crushed quartz and oxidized material.	4.5	14.44

#37 RCM Co.

Sample No.	Description	Width Ft.	Gold & Silver Values Per Ton
21	27 ft. W. of Sta. 215 N. side drift crushed quartz and oxidized material Hanging-wall dip 61 degree N.	3.5	12.40
22	35 ft. W. of Sta. 215 N. side drift 1 ft. sugary quartz, some sulphides	1.0	130.80
104	35 ft. W. of Sta. 215 N. side drift same place and material as sample 22 except no sulphides taken	1.0	18.60
23	35 ft. W. of Sta. 215 N. side drift same place and material as sample 22 decomposed dyke and oxidized material under the quartz	3.0	4.60
22-23-104	35 ft. W. of Sta. 215 N. side drift average of the three samples Hanging-wall dip 55 degrees N.	4.0	22.30
24	3 ft. W. of Sta. 215 N. side drift. Hard blocky quartz some sulphides	2.0	62.65
25	13 ft. W. of Sta. 215 N. side drift white sugary quartz	2.0	5.60
105	13 ft. W. of Sta. 215 N. side drift same place and material as sample 25 except no sulphides taken	2.0	27.39
25-105	13 ft. W. of Sta. 216 N. side drift average of two samples	2.0	45.02
26	20 ft. W. of Sta. 216 S. Side drift 4 in. hard quartz 4.2 ft. oxidized material decomposed dyke.	4.5	23.57

#38 RCM Co.

Sample No.	Description	Width Ft.	Gold & Silver Value Per Ton
27	30 ft. W. of Sta. 216 S. side drift 4 in. hard quartz 3.7 ft. of decomposed dyke and oxidized material	4.0	19.80
130	40 ft. W. of Sta. 216 S. side drift decomposed dyke and oxidized material	4.5	21.35
67	4 ft. W. of Sta. 217 in face of Phelan drift 1 ft. Hard white quartz. 1. 5. ft. oxidized material. Foot-wall dip 65 degrees N. Hanging-wall dip 40" N.	2.5	17.90

Sample No.	Width Feet	Ton Value	Width Value
28	3.5	19.60	68.60
71	4.5	3.20	14.40
1-2-3	6.5	4.34	28.21
4	3.0	61.30	183.90
5	3.0	9.20	27.60
6	5.0	4.20	21.00
7	5.0	5.10	25.50
8	4.0	7.60	30.40
9	5.0	20.55	102.75
10	6.0	39.45	326.70
11-103	5.5	79.26	345.93
12-15	5.5	50.43	277.36
13	5.5	13.00	71.50
14	5.5	5.50	30.25
16	2.5	6.56	16.40
17	3.0	17.00	51.00
18	3.5	23.00	80.50
19	4.0	8.80	35.20
20	4.5	14.55	65.47
21	3.5	12.40	43.40
22-23-103	4.0	22.30	89.20
24	2.0	5.60	11.20
25-105	2.0	45.02	90.04
26	4.5	23.57	106.06
27	4.0	19.80	79.20
130	4.5	21.35	96.07
67	4.0	17.90	71.60
	113.50		$2,389.44

#39 RCM Co.

Average Width - $\frac{113.50}{27}$ - 4.2 Average Ton Val. $\frac{\$2,389.44}{113.50}$ - $21.05

Raise #1 - 200 Level off of Phelan Drift

Samples taken in Raise No. 1 off of the Phelan drift are shown on Plates 22 and 24 and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Values Per ton
41	8 ft. up Raise above Phelan Drift on E. slope oxidized material. Foot wall dip 50 degrees N.	5.0	$2.40
40	8 ft. up Raise above Phelan Drift W. side of Slope, hard white quartz	1.5	15.20
38	13 ft. up Raise above Phelan Drift E. side Stope. 2 ft. quartz some sulphides and oxidized material	5.0	45.40
37	18 ft. up Raise above Phelan drift side stope oxidized material	5.0	2.60
39	18 ft. up Raise above Phelan Drift W. side stope. Quartz some sulphides	1.0	111.30
106	Same Place and material as sample 39 taken except no sulphides taken.	1.0	40.88
39-106	18 ft. up Raise above Phelan Drift 1 ft. quartz W. side stope, some sulphides average of these two samples	1.0	76.09
36	28 ft. up Raise above Phelan Drift W. side Raise. 1.5 ft. oxidized material	1.5	18.55
34	33 ft. up Raise above Phelan Drift W. side Raise 2.5 ft. oxidized material	2.5	7.40

#40 RCM Co.

Samples	Description	Width Ft.	Gold & Silver Values Per Ton
35	35 ft. up Raise above Phelan Drift W. side Raise 2.5 ft. quartz under oxidized material	2.5	39.10
34-35	33 ft. up Raise above Phelan Drift W. side Raise 25 ft. quartz some sulphides 2.5 ft. oxidized material average of these two samples	5.0	23.25
33	43 ft. up Raise above Phelan Drift W. side Raise crushed quartz. Hanging-wall dip 45 degrees N.	3.0	6.72

Sample No.	Foot Width	Ton Value	Foot Value
41	5.0	2.40	$ 12.00
40	1.5	15.20	22.80
38	5.0	2.60	13.00
37	5.0	45.40	227.00
39-106	1.0	76.09	76.09
36	1.5	18.55	27.82
34-35	5.0	23.25	116.25
33	3.0	6.27	20.16
	27.0		$515.12

Average width - $\frac{27.0}{8}$ - 3.37. Average Value Per Ton - $\frac{515.12}{27}$ - 19.08

Raise No. 2 - 200 Level off of Phelan Drift

Samples taken in Raise #2 off of Phelan drift are shown on Plates 22 and 24 and are listed below:

Sample No.	Description	Width Ft.	Value Per Ton Gold & Silver
144	2 ft. S. of Sta. 214 up Raise W side Raise hard white quartz	2.0	$ 5.00
94	10 ft. W. of Sta. 214 up Raise W. side Raise Sugary White quartz	2.0	1.20

#41 RCM Co.

Sample	Description	Width Ft.	Gold & Silv Value Per T
93	15 ft. up Raise above Phelan Drift W. side Raise oxidized material	1.5	$ 1.80
92	25 ft. up Raise above Phelan Drift W. side Raise oxidized material	4.0	1.60
91	35 ft. up Raise above Phelan Drift W. side Raise oxidized material	4.5	5.28
90	40 ft. up Raise above Phelan Drift W. side Raise material oxidized	3.5	3.91
89	50 ft. up Raise above Phelan Drift W. side Raise dyke	4.0	1.80
81	60 ft. up Raise above Phelan Drift W. side Raise 1.5 ft. quartz	1.5	10. 00
80	80 ft. up Raise above Phelan Drift W. side Raise oxidized material	3.0	22.26
78	100 ft. up Raise above Phelan Drift W. side Raise oxidized material	4.0	25.13

Sample No.	Ft. Width	Ton Value	Ft. Value
144	2.0	5.66	$ 11.32
94	2.0	1.20	2.40
93	1.5	1.80	2.70
92	4.0	1.60	6.40
91	4.5	5.28	23.76
90	3.5	3.91	13.68
89	4.0	1.80	7.20
81	1.5	10.00	15.00
80	3.0	22.26	66.78
78	4.0	25.13	100.52
	30.0		$249.76

Average Width - $\frac{30.0}{10}$ - 3.0 Average Value Per Ton - $\frac{249.76}{30}$ - 8.32

100 Level

Samples taken on 100 Level are shown on Plate 22 and 24 and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Value Per Ton
79	23 ft. No. of Sta. 103 at top of #2 Raise from the 200 Level W. side of drift quartz stringers and oxidized material. Hanging-wall Dip 35 degrees N. Foot-wall dip 40 degrees N.	2.0	$ 11.30
64	18 ft. N. of Sta. 103 W. side of drift decomposed dyke (porphyry)	5.0	1.20
65	13 ft. N. of Sta. 103 5 ft. below 100 Level in branch Raise N. side of Raise Sugary white quartz	1.5	11.18
63	11 ft. N. of Sta. 103 W. side drift decomposed dyke (porphyry)	5.0	1.80
62	8 ft. N. of Sta. 103 W side drift decomposed Dyke (porphyry) quartz stringers	5.0	23.20
61	20 ft. N. of Sta. 102 W. side drift decomposed dyke (porphyry)	5.0	2.00
60	10 ft. N. of Sta. 102 W side drift decomposed dyke (porphyry)	6.0	24.40
59	5 ft. N. of Sta. 102 W. drift white sugary quartz Hanging-wall Dip 45 degrees N.	2.5	19.00
58	Opposite Sta. 102 W. side drift in back of drift. White sugary quartz	2.0	6.20
57	18 ft. W. of sta. 101 N. side drift quartz	1.0	5.20

43 RCN Co

Samples No.	Description	Width Ft.	Gold & Silver Value Per Ton
56	13 ft. W. of Sta. 101 N. side drift oxidized materials	2.0	$ 3.10
54	3 ft. W. of Sta. 101 side drift 1 ft. crushed quartz and oxidized material 3 ft. decomposed dyke, 1.5 crushed quartz	5.5	7.75
55	3 ft. W. of Sta. 101 N. side drift. 1.5 ft. crushed quartz some sulphides. Same place as 54 except quartz only sampled	1.5	16.54
54-55	3 ft. W. of Sta. 101 N. side drift 1 ft. crushed quartz, and some oxidized material. 3 ft. decomposed dyke 1.5 ft. crushed quartz some sulphides, average of these two samples Hanging-wall dip 48 degrees N.	5.5	9.70
52	3 ft. E. of Sta. 101 in East face of 100 Level oxidized material	5.0	4.10.

Sample No.	Ft. Width	Ton Value	Ft. Value
79	2.0	$11.30	$ 22.60
64	5.0	1.20	6.00
65	1.5	11.18	16.77
63	5.0	1.80	9.00
62	5.0	23.20	116.00
60	6.0	24.40	146.40
59	2.5	19.00	47.50
58	2.0	6.20	12.50
57	1.0	5.20	5.20
56	2.0	3.10	6.20
54-55	5.5	9.70	53.35
52	5.0	4.10	20.50
	42.5		$461.92

Average Width - $\frac{42.5}{12}$ - 3.54. Average Value Per Ton - $\frac{461.92}{42.5}$ - 10.87

#44 RCM Co.

This block of ground between the Phelan drift and the 100 Level as shown on Plate 24, is designated as Block A, and it is considered available ore. Block A. has been sampled on three sides; the Phelan Drift (200 Level), 100 Level, Raise No. land Raise No. 2, which connects the Phelan Drift with the 100 Level. The distance between the Phelan Drift and 100 Level is 110 ft. on the dip of the vein. Samples have been taken every five feet where possible. Intervals of more than five feet between Samples was due to the drift or Raise being lagged or due to bad ground.

Place	Length	Width	Average Value	Width Value
Phelan Drift	200'	4.2	$ 21.05	$ 88.41
100 Level	80'	3.54	10.87	38.48
Raise #1		3.37	19.08	64.30
Raise #2		3.0	8.32	24.96
	280'	14.11		$ 216.15

Average Length of Block - $\frac{280}{2}$ - 140. Aver. Width of ore Sampled - $\frac{14.11}{4}$ - 3.7

Average Value Per ton - $\frac{\$216.15}{14.11}$ - $15.32.

Dimensions of Block, 140 x 110 x 3.7

Tonnage in Block $\frac{140 \times 110 \times 3.7}{14}$ - 4070 Tons.

Average Value Per Ton $15.32.

The gross value of Block A, is then:
4070 Tons x $15.32 Val. Per Ton - $62,352.40.

Because of crushed and loose nature of ore a factor of 14 Cu. Ft. per ton is used.

Incline Raise

Samples taken in Incline Raise are shown on Plates 22 and 24 and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Values Per Ton
50	12 ft. N. of Sta. 28 E. side of Raise crushed quartz	1.0	$18.60
51	25 ft. N. of Sta. 28 E side Raise oxidized material	3.0	6.62

#45 RCM Co.

Sample No.	Description	Width Ft.	Gold & Silver Values per Ton
48	17 N. of Sta. 28 E. side Raise quartz	2.0	13.62
49	17 ft E. of Sta. 28 E. side Raise oxidized material	2.0	18.00
48-49	17 ft. N. Sta 28 E. side Raise 4 ft. quartz and oxidized material Average of these two samples	4.0	15.80
44	5 ft. S. of Sta. 28 E. side Raise Quartz	1.0	20.00

Sample	Ft. Width	Ton Value	Ft. Value
50	1.0	$18.60	$18.60
51	3.0	6.62	19.86
48-49	4.0	15.80	63.20
44	1.0	20.00	20.00
	9.0		$121.66

Average Width 9.00 - 2.25. Average Value Per Ton $\frac{121.66}{9}$ = 13.52

50 Level

Samples taken in 50 Level are shown on Plates 22 and 24 and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Values Per Ton
152 A.	3 ft. W. Sta. 30 S. side drift oxidized material Hanging-wall Dip 45 degrees N.	3.5	$ 13.40
75	7 ft. W. of Sta. 31 N. side drift, hard iron stained quartz	2.0	3.50
46	Opposite Sta. 31 S. side drift Hard Quartz Hanging-wall Dip 46 degrees N.	1.0	13.60
45	3 ft. W. of Sta. 31, 15 ft. up Raise in face 2.5 ft. quartz	5.0	12.40

#46 RCM Co.

Sample No.	Description	Width ft.	Gold & Silver Values Per Ton
47	22 ft. W. of Sta. 31 in face of drift 3.5 ft. quartz. Hanging-wall Dip 50 degrees N. Foot-wall Dip 60 Degrees N.	3.5	$ 4.80

Sample No.	Foot Width	Ton Value	Foot Value
152 A	3.5	$13.50	$47.25
75	2.0	3.50	7.00
46	1.0	13.60	13.60
45	5.0	12.40	62.00
47	3.5	14.80	51.80
	15.0		$181.65

Average Width - $\frac{15.0}{5}$ - 3. Average Value Per Ton $\frac{181.65}{15}$ - $12.11

The block of ground between the 100 Level and 15 ft. above the 50 Level as shown on Plate 24 is designated as Block B and is considered available ore. Block B has been sampled on three sides: The 100 Level, 50 Level, Incline Raise which connects the 100 Level and 50 Level, and the Raise 15 ft. above 50 Level.

The distance between the 100 Level and the top of Raise above the 50 Level is 62 ft. on the dip of the vein.

Place	Length	Width	Average Value	Width Value
100 Level	80'	3.54	$10.87	$ 38.48
Incline Raise		2.25	13.51	30.40
50 Level	70'	3.0	12.11	36.33
		8.79		$ 105.21

Average Length of Block - $\frac{150}{2}$ - 75'. Average Width of ore sampled - $\frac{8.79}{3}$ - 2.93

Average value Per Ton - $\frac{\$105.21}{8.79}$ - $11.96

Dimensions of Block - 75 x 62 x 2.93.

Tonnage in Block - $\frac{75 \times 62 \times 2.93}{14}$ - 973 Tons

Average Value Per Ton - $11.96

The gross value of Block B, is then: 973 Tons x $11.96
Val. Per Ton - $11.63 - 7.08

#47 RCM Co.

Winze Below Phelan Drift

Sample taken in Winze below Phelan Drift is shown on Plate 22 and 24, and is listed below:

Sample No.	Description	Width Ft.	Gold & Silver Value Per Ton
123 A	12 ft. below Phelan Drift W. side Winze. Quartz and some Sulphides	4.0	$18.90

A block of ground below the Phelan drift has been considered available ore, and is shown on Plate 24 and designated as Block C. The winze was full of water, but was pumped out so that the continuity of the vein could be determined, and sample 123A, 4 ft. of quartz containing some sulphides was taken 12 ft. below the Phelan drift on the west side of the winze.

Place	Length	Width	Average Value	Width Value
Phelan drift	200	4.2	$21.05	$88.41
		4.0	18.90	75.60
	200	8.2		164.01

Aver. Length of Block - $\frac{200}{1}$ - 200. Aver. Width of Ore Sampled - $\frac{8.2}{2}$ - 4.1

Aver. Value Per Ton - $\frac{\$164.01}{8.2}$ - $20.00

Dimensions of Block - 200 x 30 x 4.1

Tonnage of Block - $\frac{200 \times 30 \times 4.1}{14}$ - 1757 Tons.

Average Value Per Ton - $20.00

The gross Value of Block C, is then: 1757 Tons x $20.00 Value Per Ton - $35,140.00

Hanging-wall Cross-cut #1 - 200 Level

Samples taken in Hanging-wall Cross-cut #1 - 200 Level are shown on Plates 22 and 25, and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Values Per Ton
30	3-8 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringer	5	$14.85

#48 RCM Co.

Samples No.	Description	Width Ft.	Gold & Silver Values Per Ton
151	Same Place and material as sample No. 30. No quartz stringers taken	5.	2.80
30-131	8 ft. N. of Sta 212 W. side cross-cut. Dyke quartz stringers. Average of the two samples	5.	8.80
30	8-13 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringers		14.85
152	Same place and material as sample 30		6.80
30	13-18 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringers		14.85
30-152	8-13 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringers average of two samples		10.80
73	Same place and material as sample 30		1.80
153	Sample place and material as sample 30		7.60
30-75-153	13-18 Ft. N. of Sta. 212 W. side cross-dyke and quartz stringers. Average of three samples		8.00
30	18-23 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringers	5.0	14.85
107	Same place and material as sample 30		.80
112	Same place and material as Sample 30		8.20
154	Same place and material as Sample 30		4.00

#49 RCM Co.

Sample	Description	Width Ft.	Gold & Silver Values per ton
30-107 112 & 154	18-23 ft. N. of Sta. 212 W. side cross-cut dyke and quartz stringers. Average of these four samples	5.0	6.90
30	23-28 ft. N. of sta. 212 W. side cross-cut dyke and quartz stringers	5.0	14.85
108	Sample place and material as sample 30		.80
155	Same place and material as sample 30		1.00
30-108 & 155	23-28 ft. N. of Sta. 212 W. side cross-cut Dyke and quartz stringers. Average of 3 samples		5.50

Sample No.	Width Ft.	Ton Value	Width Value
30-151	5	8.80	44.00
30-152	5	10.80	54.00
30-73-153	5	8.00	40.00
30-107-112-154	5	6.90	34.50
30-108-155	5	5.50	27.50
	25		$200.00

Average Width - $\frac{25}{5}$ -5. Average Ton Value - $\frac{200.00}{5}$ - $8.00

Hanging-Wall Cross-cut #2 - 200 Level

Samples taken in Hanging-wall Cross-cut #2 - 200 Level are shown on Plates 22 and 25 and are listed below:

Sample No	Description	Width Ft.	Gold & Silver Values Per Ton
68	3-18 ft. N. of Sta. 217 W. side cross-cut Talc	15.0	$ 3.20
128	Same place and material as sample 63	15.0	32.80
68-128	3-18 Ft. N. of Sta. 217 W. side cross-cut Talc. Average of these two samples	15.0	18.00

#50 RCM Co.

Sample No.	Description	Width Ft.	Gold & Silver Values Per Ton
89	18-20 ft. N. of Sta. 217 W. side cross-cut dyke (Dacite Porphyry) no quartz stringers taken	10.0	$2.40
129	Same Place and material as sample 69 except quartz stringers taken	10.0	14.10
145	Same place and material as sample 68. No quartz stringers taken	10.0	3.00
69-129 & 145	18-28 ft. N. of Sta. 217 W. side cross-cut. Dyke (Dacite Porphyry) and quartz stringers Foot-wall Dip of Dyke 53 degrees N. Hanging-wall Dip of Dyke 65 degrees N.	10.0	6.50

Samples No.	Width Ft.	Ton Value	Width Value
68-128	15.0	$18.00	270.00
69-129-145	10.0	6.50	65.00
	25.0		$3 35.00

Average Ton Value - $\frac{\$335.00}{25}$ - $13.40

Hanging-Wall Cross-Cut - 100 Level

Samples taken in Hanging-wall Cross-cut - 100 Level are shown on Plates 22 and 25 and are listed below:

Sample No.	Description	Width Ft.	Gold & Silver Values per Ton
122	0-20 ft. N. of Sta. 101 E. side of cross-cut 20.0 ft. decomposed dyke and quartz stringers	20.0	$34.00
147	Same Place and material as sample 122. Dyke material only sampled. No. quartz taken		4.40

#51 RCM Co.

Sample No.	Description	Width Ft.	Gold & Silver Value Per ton
122-147	0-20 ft. N. of Sta. 101 E. side of cross-cut Decomposed dyke and quartz stringers average of the two samples	20.0	$19.00
121	20-40 ft. N. of Sta. 101 W. side of cross-cut decomposed dyke and quartz stringers	20.00	26.80
148	Same place and material as sample 121 dyke material only sampled No quartz taken		2.80
121-148	20-40 ft. N. of Sta. 101 W. side of cross-cut decomposed dyke and quartz stringers average of these two samples	20.0	14.80
120	40-60 ft. No of Sta. 101 E. side of cross-cut decomposed dyke and quartz stringers	20.0	13.30
149	Same place and material as sample 120 dyke material only taken no quartz taken	20.0	3.80
120-149	40-60 ft. N. of Sta. 101 E side of cross-cut decomposed dyke and quartz stringers. Average of these two samples	20.0	8.50

Sample No.	Width ft.	Ton Value	Ft. Value
122-147	20	19.20	384.00
121-148	20	14.80	296.00
120-149	20	8.50	170.00
			$ 850.00

Average value Per Ton - $14.16

#52 RCM

This block of ground (altered grano-diorite) between the Hanging-wall and Cross-cut No. land cross-cut No. 2, 200 Level, and the Hanging-wall cross-cut No. 1, 100 Level as shown on Plate 24, is designated as Block D, and is considered available ore. The average width and value of cross-cut No. 1 and No. 2 on the 200 Level were first calculated. The figures thus obtained were used with the average width and value of cross-cut No. 1, 100 Level, in determining the average value and average width of Block D.

The vertical distance 85 ft. between the 200 and 100 Levels has been considered instead of the distance on the dip of the vein, as the height of Block D, and Block D has been sampled on two sides only; Cross-cut No. 1 and No. 2 on the 200 Level, one side and cross-cut No. 1 on the 100 Level the other side. Large samples were taken the entire width of the dyke on the 200 Level and the width of the samples taken on the 100 Level was 20 ft., and all of these large samples were quartered down. On account of exceedingly high values of some of the samples these samples were checked at least once, and as often as four times in one case and the average value of the samples taken in each place used as the true value of the dyke at that place.

Place	Width Ft.	Average Value	Width Value
Cross-cut No.1 200 Level	25'	$8.00	$200.00
Cross-cut No. 2 200 Level	25'	13.40	335.00
	50'		$535.00

Average Width of Ore Sampled - $\frac{50}{2}$ - 25'

Average Value Per Ton - $\frac{\$535}{50}$ - $10.70

Place	Length	Width Ft.	Av.Value	Width Value
Cross-cut No. 1 and No. 2	200'	25'	10.70	267.50
Cross-cut No.1 100 Level	5'	60'	13.16	850.00
	205'	85'		$1,117.00

Average Length of Block - $\frac{205 - 102.5'}{2}$.

#53 RCM Co.

Average Width of ore Sampled - $\frac{85}{2}$ - 42.5

Average Value Per Ton - $\frac{1117.50}{85}$ - $13.15

Dimensions of Block, 102.5 x 85 x 42.5

Tonnage in Block - $\frac{102.5 \times 85 \times 42.5}{14}$ - 26,449 Tons

Average Value Per Ton $13.15

The gross value of Block D, is then - 26,449 Tons x $13.15
Value Per Ton - $347,804.35

Probable Tonnage

In calculating the tonnage of probable Ore in Block E, as shown Plate 24 the entire contents of Block A, B and E have been calculated, and the positive or available ore in Blocks A and B have been deducted; the result being the Probable Tonnage in Block E.

To arrive at the average width and value of Block E, the average width and value of Blocks A and B, has been calculated and these figures have been used as the average width and value of ore in this block.

Block	Tonnage	Width	Tonnage Width
A	4070	3.7	15059
B	973	2.93	2850.9
			17909.9

Average Width of Blocks A and B - $\frac{17909.9}{5043}$ - 3.55'

Block	Tonnage	Average Value	Gross Value
A	4070	15.32	$62,352.40
B	973	11.96	11,637.08
			$73,989.48

Average Value of Blocks A and B Per Ton; $\frac{\$73,989.48}{5043}$ - $14.67

Place	Length	Width	Value
Phelan Drift 200 Level	200'		
15 ft. above 50 Level	182	3.55' as calculated for Blocks A & B	$14.67 as calculated for Blocks A & B
	382		

#54 RCM Co.

Average Length - $\frac{382}{2}$ - 191

The distance between the 200 ft. Level and 15 ft. above the 50 ft. Level is 179 ft. on the dip of the vein.

Dimensions of Block - $\frac{191 \times 179 \times 3.55}{14}$ - 8,669 Tons

Less Available Ore in Blocks A & B - 5,043 Tons
Probable ore in Block E. 3,626 Tons

The gross value of probable ore, Block E is then:

3,626 Tons x $14.67 Per Ton - $53,193.42

In calculating the Probable Tonnage in Block F, as shown on Plate 25 the entire contents of Blocks D and F have been calculated and the available or positive tonnage in Block D has been deducted to obtain the probable tonnage in Block F. The Average width and value of Block D has been considered the width and value of Block F.

Place	Length	Aver. Width Block D.	Aver. Value Block D.
Distance between cross-cut #1 and Cross-cut #2	200'	42.5	$13.15
15 ft. above 30 Level	182		
	382		

The vertical distance between the bottom of the winze 24 ft. below the 200 ft. Level and the top of Raise 15 ft. above the 50 Level is 157 Ft.

Dimensions of Block - 191 x 157 x 42.5

Tonnage in Block - $\frac{191 \times 157 \times 42.5}{14}$ - 91,032 Tons.

Less available ore in Block D 26,449 Tons.

Probable ore in Block F 64,583 Tons.

The gross value of Probable ore, Block F is then:
64,583 x $13.15 Per Ton - $849,266.45.

#55 RCM Co.

Assays of samples taken in Kendall drift are shown on Plates 22 and 26 and are listed below:

Kendall Drift - 200 Level

Sample No.	Description	Width Ft.	Gold & Silver Value Per Ton
123	40 ft. S. of Sta. 209 E side drift sugary quartz	2.0	$22.40
124	25 ft. S. of Sta 209 W. side drift sugary quartz	1.5	18.90
125	10 ft. S. of Sta. 209 E. side drift crushed quartz and oxidized material	4.5	15.40
126	2 ft. N. of Sta. 209 W. side drift 0.5 ft. quartz 2 ft. oxidized material	2.5	13.80
126 A	20 ft. N. of Sta. 211 W. side drift crushed quartz	1.5	15.20
131	18 Ft. N. of Sta 211 W. side drift crushed quartz	1.0	17.62

Sample No.	Ft. Width	Ton Value	Ft. Value
123	2.0	22.40	44.80
124	1.5	18.90	28.35
125	4.5	15.40	69.30
126	2.5	13.80	34.50
126 A	1.5	15.20	22.80
131	1.0	17.62	17.62
	13.0		217.37

Average Width - $\frac{13.0}{6}$ - 2.16'. Average Value - $217.37 - $16.72

Kendall Vein on Surface

Sample No.	Description	Width ft.	Gold & Silver Value Per Ton
135	Cut No. 1 - Pershing Claim white oxidized quartz	1.5	0.80
136	Cut No. 3 - Independence Claim. White oxidized quartz	1.0	2.40

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Sample No.	Ft. Width	Ton Value	Ft. Value
135	1.5	0.80	1.20
136	1.0	2.40	2.40
	2.5		3.60

Average Width - $\frac{2.5}{2}$ - 1.25'. Average Value - $\frac{\$3.60}{2.5}$ - $1.44

The Block of probable ore designated at Block G is the ore between the top of the Kendall drift and surface cuts No. 1 and No. 3 as shown on Plates 22 and 26. While the location of the surface out No. 3 is about 100 ft. further South than the South face of the Kendall drift on the 200 Level, there is little doubt that it is the same vein; the general strike of the vein on the surface as well as on the 200 Level, being a little East of North, with a dip nearly East; while the rest of the veins observed on the property the strike is N. W. and dip N. E.; then again the character of the quartz is similar. In calculating the tonnage in Block G, the average width and values of the samples taken in the Kendall drift have been calculated with the average width and value of samples taken in cuts No. 1 and No. 3 on the surface. It is also extremely likely that when this block of ground is mined the value of the ore extracted will be of considerably higher value, on account of the fact that the average value of the samples taken in the Kendall drift was $16.72, while surface cuts were sampled 2 ft. below the grass roots where erosion has had its effects; therefore these samples were low in value, averaging $1.44 per ton.

Surface	Length	Width	Aver. Val.	Width Val.
Distance between cuts 1 and 3	96'	1.25'	$1.44	1.80
Kendalldrift 200 Level	116'	2.1	16.72	35.11
	212	3.35'		$ 36.91

Average Length of Block $\frac{212}{2}$ - 106.

Average Width of Ore sampled - $\frac{3.35}{2.0}$ - 1.67'

Average Value Per Ton - $\frac{\$36.91}{3.35}$ - $11.02

The distance between the Kendall drift, 200 Level and cuts Nos. 1 and 2 on the surface is 178 ft. on the dip of the vein.

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Dimensions of Block 106 x 178 x 1.67

Tonnage in Block $\frac{106 \times 178 \times 1.67}{14}$ - 2,250 Tons.

The Gross Value of Probable ore, Block G, is then:

2,250 tons x $11.02 - $24,975.00

Recapitulation

Gross Value of Available or Positive Tonnage

Block	Tonnage	Value Per Ton	Gross Value
A	4070	$ 15.32	$62,352.40
B	973	11.96	11,637.08
C	1757	20.00	35,140.00
	6800	16.05	$ 109,129.48
D (Altered Dyke)	26449	13.15	347,804.35
	33,249	13.74	$ 456,933.83

Gross Value of Positive ore - 33,249 x $13.74 Per Ton
- $456,933.83.

Gross Value of Probable Tonnage

Block	Tonnage	Value Per Ton	Gross Value
E	3626	$14.67	$53,193.42
F	64583	13.15	894,266.45
G	2250	11.02	24,795.00
	70,459	13.16	927,254.87
	33,249	13.74	456,933.83
Positive & Probable Tonnage 103,700		13.25	$1,384,188.70

Gross Value of Positive & Probable Ore - 103,708 tons x $13.25

The net profit to be gained from the positive and probable tonnage blocked out to date at the Sunday Hill Mine depends upon the cost of production, and the recovery of the values in the ore.

The following calculations are based upon a capacity of 100 tons per day, the cost of mining and milling ($6.00 per ton) and an extraction and recovery of 95% of the values in the ore.

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Positive

Gross value 33,249 tons @ $13.74 per ton	$456.933.83	
Extraction 95% of values of ore	$434,087.14	
Mining and Milling cost, 33,249 tons @ $6.00 per ton	199,494.00	
Net Profit		$234,593.14

Probable Ore

Gross value 70,459 tons @ 13.16 per ton	$927,254.87	
Extraction 95% of values of ore	880,892.13	
Mining and Milling cost, 70,459 tons @ $6.00 per ton	422,754.00	$458,138.13
Net Profit		$692,731.27

Total Net Profit of Positive and Probable ore

Miscellaneous Samples

Miscellaneous samples taken on the property as shown on Plate No. 22 are as follows:

Adit Tunnel - 200 Level

Sample No.	Description	Ft. Width	Gold & Silver Value Per Ton
99	25 ft. E. of Sta. 210 S. side drift, Iron stained quartz. Foot-wall dip 70 degrees N. E. Strike of vein N. 45 degrees	1.0	1.60
100	At Sta. 203 S. side drift 3 quartz stringers and oxidized material. Foot-wall dip 68 degrees N. E. strike of vein N. 57 degrees W	4.0	2.80
101	45 ft. N. W. of Sta. 203 E. side drift. o.5 ft. crushed quartz and oxidized material	1.0	0.80
102	70 ft. N. W. of Sta. 203 E. side drift crushed quartz and oxidized material.	4.0	0.80
110	10 ft. N. W. of Sta. 203 in back of drift. 2 ft. quartz	2.0	0.80

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Samples No.	Description	Width ft.	Gold & Silver Value Per Ton
109	50 ft. N. W. of Sta. 203 in back of drift. 1 ft. quartz. 3 ft. oxidized material	4.0	0.80
96	25 ft. N. of Sta. 208 E. side drift. Quartz stringers and oxidized material. Strike N. 45 degrees E. Hanging-wall dip S. E. 63 degrees	1.0	2.45
127	12 ft. N. of Sta. 210 W side drift. 1 ft. Hard white quartz. Strike N. 85 degrees W. Foot-wall Dip 75 degrees N. E	1.0	3.25
30 A	0-30 ft. W. of Sta. 211 S side drift. Foot-wall dyke Granodiorite porphyry, some quartz stringers	3.0	3.60
31	30-60 ft. W. of Sta 211S. side drift. Foot-wall dyke. Granodiorite Porphyry	3.0	0.80
32	60-65 ft. W. of Sta 211 S side drift 1.5 ft. sugary quartz and oxidized material Strike of vein N. 35 degrees W. Hanging-wall Dip 43 N. E.	5.0	3.00
95	Same place and material as sample No. 32	5.0	1.30
111	Same place and material as sample No. 32	5.0	1.30
32-95-111	60-65 ft. W. of Sta. 211 S. side drift 1.5 ft. sugary quartz and oxidized material. Strike of vein N. 35 degrees W. Hanging-wall dip 43 degrees N.E. Average of these three samples	5.0	2.35
70	28-32 ft. N. of Sta. 217 E. side of cross-cut. 0.5 ft. of white quartz. 3.5 ft. oxidized material	4.0	3.44

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Sample No.	Description	Width ft.	Gold & Silver Values Per ton
113	Same as sample 79 except no quartz taken	4.0	84.20
70-113	28-32 ft. N. of Sta. 217 E. side cross-cut. 015 ft. white quartz. 3.5 oxidized material. Average of these two samples	4.0	43.82
114	32-37 ft. N. of Sta. 217 E. side cross-cut. Quartzite.	5.0	1.60
115	37-42 ft. N. of Sta. 217 E. side cross-cut. Quartzite.	5.0	0.80
146	42-47 ft. N. of Sta. 217 in face of cross-cut. Quartz diorite	5.0	4.20

150 Level

Sample No.	Description	Width Ft.	Gold & Silver Values per ton
88	35 ft. N. of Sta. 105 W side drift. Dyke and oxidized material	4.0	2.40
87	28 ft. N. of Sta. 105 W. side drift. Dyke and ozidized material	3.0	1.80
84	23 ft. N. of Sta. 105 W. side drift. Dyke and oxidized material	1.5	2.45
86	20 ft. N. of Sta. 105 W. side drift. Dyke and oxidized material	2.5	1.20
83	8 ft. up Raise off of 150 Level S. side Raise 2 ft. quartz	2.0	11.30

Branch Raise-Filled

82	12 ft. S. E. of Sta. 105 S. side Raise Dyke	2.0	1.60

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Sample No.	Description	Width Ft.	Gold & Silver Value Per Ton
66	34 ft. S. E. of Sta. 105 Dyke	2.5	0.80
65	5 ft. below 100 Level N. side Raise. 1 ft. sugary quartz	2.5	11.18
	100 Level		
76	12 ft. of Sta. 34 W. side of drift. Foot-wall dyke porphyry. No quartz stringers	5.0	0.80
77	22 ft. S. of Sta. 34 W side of drift. No quartz stringers	5.0	1.20
74	Raise between 100 & 50 Level		
	10 ft. up off of 100 Level at Sta. 102 W. side Raise. Oxidized material	3.0	2.74
	Incline Raise between 50 Level and surface		
43	40 ft. S. of Sta. 28 E. side raise. 8 ft. from top of Incline Raise	6.0	.80
134	In Colt Drift 13 ft. N. of tunnel, same material as sample 132	2.5	9.20
134	In Colt drift 35 ft. N. of tunnel, same material as sample 132.	2.5	10.10

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Sample No.	Description	Width Ft.	Gold & Silver Value per ton
	Quartz Quartzite Outcrop on Pershing Claim		
137	Trench No. 4 surface cut 19 ft. quartz strike of vein N. 33 degrees W. Dip 72 degrees N. E	19.0	$2.40
138	Trench No. 5 surface cut 4 ft. quartz. Strike of vein N. 33 degrees W. Dip 74° N. E.	4.0	
139	Trench No. 6 surface cut 1 ft. quartz. Strike of vein N. 35° W. Dip 76° N.E.	1.0	----
140	Trench No. 7 surface cut on Pershing claim. Grab sample. From bottom of Trench Quartzite	----	----
141	Discovwry shaft on Pershing Claim Strike N. 25° W. Dip 80 degrees N. E	4.0	0.80
142	Trench No. 8 surface cut on Royal Flush Claim 10 ft. quartz	10.0	
143	Trench No. 9 surface cut on Royal Flush Claim 10 ft. quartz strike N. 25° W. Dip N. E.	10.0	.40

#63 RCM Co.

Estimated Cost of Production

Power is furnished by the Idaho Power Company, and under the present month to month contract the cost is exorbitant. It is upon this basis that the cost of power is calculated.

It is believed that a contract can be arranged with the Idaho Power Company, such as was in force during operation during the years 1912-1915, in which case the power cost will be materially reduced.

Common lumber for construction and mine timber costs at present $17.00 per M. delivered. The cost of round stull timber and pole lagging is 7¢ and 3¢ per lineal foot delivered, respectively.

A small saw mill can be installed at the mine, and it is thought mine timber can be cut for $13.00 per M. thus reducing the cost of timber.

The cost of mining will depend to a large extent upon the production, and the following costs have been based on an output of 100 tons per day.

Mining

Foreman and Shifter	$ 0.14½ per ton
Hoisting	.15 per ton
Mining (breaking ground)	.92 per ton

Stope Filling	.22½ per ton
Tramming	.22½ " "
Timber Labor	.19 " "
Track and Pipe Maintenance	.19 " "
Blacksmithing	.19½ " "
Timber (framing)	.19½ " "
Machine maintenance	.19½ " "
Pumping	.10 " "
Electrical maintenance	.06 " "
Assaying	.05½ " "
Management (superintendency, Engineering and office expense)	.41½ " "
Power	.15 " "
Timber	.25 " "
Explosive (powder, caps and fuse)	.35 " "
Accident- Fire insurance	.15 " "
Supplies- Incidentals	.14 " "
	$ 4.00 per ton

The above estimate includes 50½ per ton for development of future ore reserves, after the development recommended in the text to follow has been completed.

Tests were made on the ore from the Phelan drift by the students of the engineering department, at the Oregon Agriculture College, and am advised that an extraction of 96.6% of the values was made, using a combination plate amalgamation, gravity concentration, cyanide process. The final grinding was to 200 mesh.

A cost estimate on a plant of this design, having a capacity of 100 tons per day, has been calculated.

Milling

General	$ 0.15 Per ton
Coarse Crushing	.05 " "
Coarse Grinding	.33 " "
Fine Grinding	.43 " "
Amalgamation	.05 " "
Concentration	.05 " "
Cyaniding	.45 " "
Trailing Disposal	.04 " "
Clarification	.03 " "
Precipitation	.10 " "
Sampling	.05 " "
Assaying	.05 " "
Retreating Tailings	.01 " "
Mill Heating	.03 " "
Solution Recovery	.01 " "
Experimental Work	.02 " "
Forwarded	$ 1.85 Per Ton

Brought Forward		1.85
Power		.10 per ton
Water Supply		.05 per ton
		$ 2.00

Total cost of Mining	$4.00
Total cost of Milling	2.00
	$6.00 per ton

In calculation the above costs no allowance has been made for depreciation of machinery nor Federal and State taxes.

Recommendations

And Costs For Six Months Development

The location of the proposed new shaft (as shown on Plate No. 21 the elevation of the collar of which is 4,975 ft. or 30 ft. vertically above the elevation of the portal of the Adit Tunnel), was chosen because of its position in relation to the Phelan vein with the view of prospecting the Phelan vein at depth at the least possible expense.

A careful study of the topography, as shown on Plate no. 33, and vein system of the property should be made before a final decision is made so that the most advantageous location of the shaft, with referrence to future operations ban be obtained.

There is no available water supply at the present for mill operations at the Sunday Hill property.

It is reasonable to presume that sufficient water will be encountered in sinking the proposed shaft for mill operations. This assertion is based on the fact that at the bottom of the winze 24 ft. below the 200 Level the mine is making 6 to 8 gallons per minute, while no water was encountered above the 200 Level; also the fact that at both the Humboldt and Rainbow Mines, neighboring properties, sufficient water was encountered in sinking the shafts on these properties for mill operations.

Proposed New Shaft

230 ft.	Sinking two compartment shafts (10 x 6.5), location of which is shown on Plate No. 21 @ $50.00 per ft.	$11,500.00

400 Level

The development outlined below may be best followed by reference to plate No. 22 and 23.

	Station 400 Level - 10 x 10 x 20	$ 745.00
185 ft.	Cross-cut form West side 400 Level Station to cut Phelan vein @ $10.00 per ft. This cross-cut will cut the Noon vein and pass through the granodiorite porphyry Hanging-wall dyke before encountering the Phelan vein, thus determining the continuity of the Noon vein, and the duke ore body.	1,850.90
200 ft.	Drift S. E. from Cross-cut on Phelan vein @ $10.50 per ft.	2,100.00
200 ft.	Drift N. W. from cross-cut on Phelan vein @ $10.50 per ft.	2,100.00
750 ft.	Three Raises on Phelan vein from 400 Level to 200 Level @ $12.50 per ft.	9,375.00
1335 ft.	400 Level Total	$16,170.00

200 Level

100 ft.	Drift on Noon vein N. W. from hanging-wall Cross-cut No. 2 @ $10.00 per ft.	1,000.00
100 ft.	Drift on Noon vein S. E. from hanging-wall Cross-cut No. 2 @ $10.00 per ft.	1,000.00
200 ft.	Drift on Phelan vein N. W. from Sta. 217 @$10.00 per ft.	2,000.00
100 ft.	Drift on Phelan vein S. E. from Sta. 212 @ $10.00 per ft.	1,000.00
450 ft.	Three Raises on Phelan vein from 200 Level to 50 Level @ $12.00 per ft.	5,400.00
300 ft.	Drift on Kendall vein S. from 45 ft. S. of Sta. 209 @ $10.00 per ft.	3,000.00
375 ft.	Two Raises on Kendall vein from 200 Level to surface @ $12.00 per ft.	4,500.00
355 ft.	Cross-cut West from Sta. 217 to cut Colt Quartzite vein @ $9.00 per ft.	3,195.00
70 ft.	Drift on King vein S. E. off of Cross-cut @ $10.00 per ft.	700.00

70 ft.	Drift on Colt-Quartzite vein S. E. off of Cross-cut @ $10.00 per ft. The Colt and quartzite veins will probably have united and be one and the same vein on this level.	$700.00
35 ft.	Cross-cut N. from 45' N. of Sta. 212 @ $9.00 per ft.	315.00
50 ft.	Cross- cut N. from Sta. 215 @ $9.00 per ft.	450.00
25 ft.	Cross-cut N. into dyke from 100 ft. N.W. of Sta. 217 @ $9.00 per ft.	225.00
25 ft.	Cross-cut N. into dyke from 200 ft. N. W. of Sta. 217 @ $9.00 per ft.	225.00
2255 ft.		$23,710.00

100 Level

320 ft.	Drift on Phelan vein N. W. from Sta. 104 @ $10.00 per ft.	$ 3,200.00
60 ft.	Cross-cut N. in Hanging-wall dyke 100 ft. N. W. of Hanging-wall Cross-cut No. 1 @ $8.00 per ft.	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 300 ft. N. W. of Hanging-wall Cross-cut No. 1 @ $8.00 per ft.	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 100 ft. N. W. of Hanging-wall Cross cut No. 1 @ $8.00 per ft.	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 400 ft. N. W. of Hanging-wall Cross-cut No. 1 @ $8.00 per ft.	
560 ft.	100 Level Total	$ 5,120.00

50 Level

340 ft.	Drift on Phelan vein 20 ft. N. W. from Sta. 31 @ $10.00 per ft.	$ 3,400.00
60 ft.	Cross-cut N. in Hanging-wall dyke 40 ft. S. E. of Sta. 31 @ $8.00 per ft.	480.00

60 ft.	Cross-cut N. in Hanging-wall dyke 60 ft. N. W. of Sta. 31 @ $8.00 per ft.	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 160 ft. N. W. of Sta. 31 @ $8.00 per ft.	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 260 ft. N. W. of Sta. 31 @ $8.00 per ft	480.00
60 ft.	Cross-cut N. in Hanging-wall dyke 360 ft. N. W. Sta. 31 @ $8.00 per ft.	480.00
		$ 5,800.00

Summary

Place	Distance	Expenditure
400 Level	1,335 ft.	$16,170.00
200 Level	2,255 ft.	23,710.00
100 Level	560 ft.	5,120.00
50 Level	640 ft.	5,800.00
	4,790 ft.	$50,800.00

The above outlined work should be completed, with a full crew, within six months after work is started. Two thousand five hundred and sixty (2,560) ft. of this development is on the Phelan vein and six hundred and seventy-five (675) ft. on the granodiorite porphyry Hanging-wall dyke.

Plate No. 29 shows mouth of Adit tunnel and adjoining blacksmith shop.

Additional Equipment Necessary

The additional machinery and equipment necessary to carry on this work is as follows:

Hoist, including motor (800-1000 ft. capacity)	$6,000.00
800 ft. 7/8 inch, 6 wire, 19 strand steel cable	200.00
Compressor - Ingersoll Rand 18 x 11 x 14 R. B. 2 stage including motor	5,750.00
Drill sharpener - No. 50 Ingersoll Leyner	2,000.00
2 D. C. R. W. 13 Ingersoll Leyner	1,085.00
6 Jack Hammers D. C. No. 430 Ingersoll Rand	1,020.00
5 stope C. C. 11 Ingersoll Rand	1,150.00
10 mine cars	1,500.00
Drill Steel, hose, etc, machine parts	1,000.00
1 Transformer 1 - 200 K. W. G. E.	1,090.00
1 Pump	750.00
1 Blower	150.00
Forwarded	$ 21,695.00

	Brought Forward	$21,695.00
100 vent pipe canvass		500.00
2000 ft. 2 pipe Aire Line		200.00
2000 ft. Track 12 Lb.		210.00
200 4" Waterline		50.00
1 Mine cage		300.00
2 Tugger - hoist and cable		350.00
2 Air receiver		300.00
Small tools and miscellaneous equipment		1,395.00
	Total	$ 25,000.00
Blacksmith Shop, Hoist house and additional camp buildings to accomodate 50 men		10,000.00
		$ 35,000.00

Mill

The present 5 stamp mill on the Sunday Hill is inadequate and not suited for the treatment of the ore, and need not be considered other than utilizing the equipment, most of which is in good repair.

Comprehensive tests, both cyanide as well as flotation, should be made separately on the ore from the Phelan vein above the 200 Level, the ore encountered on the 400 Level and the dyke ore, and a flow sheet constructed to be most applicable for the composite ore.

If the ore is adaptable for a flotation process, the cost of mill operations should not exceed $1.25 per ton.

The cost of a cyanide process should not exceed $2.00, but there is no freight rate to contend with in an cyanide process, as bullion is recovered, while in flotation the concentrates have to be shipped and this freight rate and smelter charge might over-balance this difference in cost of operation. This should be given consideration in the final analysis.

The cost of 100 ton flotation unit should not exceed $50,000.00 while a 100 ton combination amalgamation, concentration cyanide unit will cost approximately $105,000.00.

Report has it that tests have been made which showed an extraction of 96.7% of the values in the ore, by a combination concentration, cyanide process while the flotation tests showed a much lower saving. For this reason an estimate of $105,000.00 has been made for a cyanide mill, and the necessary ore bins and fire protection is also included in the cost.

The decision as to the size of the plant and flow sheet should not be made until after the exploratory work and the comprehensive mill tests recommended, are completed.

#70 RCM Co.

Results to be expected from development

The West faces of the 50, 100 and 200 Levels on the Phelan vein are in ore. The development outlined on the Phelan vein calls for the continuation of the Phelan drift 200 ft. N. W. on the 200 Level and the advancement N. W. of both the 50 and 100 Levels, a distance that will make the faces of these Levels vertically over the 200 Level.

If the ore shoot continues west this distance, as is anticipated, then an additional tonnage, 10,000 tons, equal to what has already been calculated as positive and probable tonnage, will have been blocked out.

In the development outlined on the Phelan vein in the 400 Level, the east and west faces of the drift on the 400 Level will be directly below these respective faces on the 200 Level.

The vein being of dee--seated origin and the anticipation of the King and Phelan veins joining 20 ft. vertically above the 400 Level, it seems reasonable that the vein on the 400 Level will be of greater width than on the 200 level, and that the length of the ore shoot on the 400 Level will be approximately the same as on the 200 Level.

If the development outlined verifies this, then an additional 20,000 tons will have been blocked out, or a total of 30,000 tons of additional ore will have been developed by the 2,560 ft. of exploratory work recommended on the Phelan vein.

The development outlined also calls for cross-cuts, the distance depending upon the continuation of the values, into the granodiorite porphyry Hanging-wall dyke every 100 ft. on the 200,100 and 50 Levels, and in the cross-cut from the shaft on the 400 Level.

If this development verifies the same persistency of values in the dyke as the development in the dyke completed to date shows, then an additional 150,000 tons of dyke ore from the 400 to the 50 Levels will have been developed from the 675 ft. of development recommended on the Hanging-wall dyke.

The development outlined at the Sunday Hill Mine should be completed, with a full crew, within six months after work is begun, and additional tonnage of 30,000 tons on the Phelan Vein and 150,000 tons of dyke ore blocked out.

Development on Veins

50 Level	Phelan	Vein	65 ft.
100 Level	"	"	80 ft.
200 Level	"	"	200 ft.
Raise above 50 Level	"	"	15 ft.
Incline Raise	"	"	112 ft.
Raise above 150 Level	"	"	10 ft.
Raise No. 1 - 200 Level	"	"	50 ft.
Raise No. 2 - 200 Level	"	"	110 ft.
Winze below 200 Level	"	"	30 ft.
			672 ft.
200 Level	Kendall Vein		120 ft.
200 Level	King Vein		305 ft.

Total development on Phelan, Kendall & King Veins- 1097 ft.

Additional Development

Adit Tunnel - 200 Level	290 ft.
Cross-cut filled- 200 Level	60 ft.
King Drift - 200 Level	75 ft.
Hanging-Wall Cross-cut #1	57 ft.
150 Level	35 ft.
Branch Raise - 150 Level to 100 Level	70 ft.
Raise 100 Level to 50 Level, Partially caved	45 ft.
Cross-cut to Shaft - 100 Level	70 ft.
Shaft	70 ft.
Total Cross-cuts, drifts and Raises	772 ft.
Total drifts and raises on veins	1097 ft.
Total Development	1869 ft.

This was the condition of the mine when the preliminary examination was completed in June 1926.

Milling Plant

In 1923 a 5 stamp mill, shown on Plate 32, was erected by the owners to treat the ore developed in the Phelan drift. This mill was operated a few months with indifferent success, owing principally to the plant, which was straight plate amalgamation, behind which were two No. 6 Wilfley Tables to save the concentrates, not being suited to the ore which contains only about 30% free gold. Another handicap was a lack of sufficient water. The only certain supply being derived from the winze previously mentioned, on the 200 level. The mine is making between six and eight gallons of water per minute in the bottom of the winze, the writer is told. No opportunity was afforded to measure the amount of this water however.

"The primary Minerals are: Andesine 70%; orthoclase 5%; quartz 20%; biotite and pyrrhotite.

"The Alteration Minerals are: actinolite, kaolin, sericite and limonite."

The analysis of the hanging-wall dyke is as follows:

"The specimen submitted is an altered granodiorite porphyry and is light grey in color, of medium grained porphyritic texture, with plagioclase altered biotite and pyrrhotite present.

"Under the microscope the thin section shows large crystals of feldspar surrounded by a mosiac intergrowth of quartz and feldspar. Remnants of ferromagnesium minerals, and diseminated pyrrhotite are present.

"The Primary Minerals are: plagioclase andesine 65%; orthoclase 10%; quartz 20%; biotite 5% and pyrrhotite.

"The alteration Minerals are: actinolite, limonite, kaolin, and sericite. The actinolite is in radiating bunches with biotite."

By comparison it seems that the composition of these dykes are similar, except the hanging-wall dyke shows a more advanced stage of alteration or deterioration.

Through the hanging-wall dyke are numerous stringers, the dip of any of which are more or less parallel to the dip of the Phelan vein, which seems to indicate that these small cracks or fissures were filled with the ascending quartz solutions at the same time as the deposition of the Phelan vein.

This same condition exists to a smaller extent in the foot wall dyke however that is, the quartz stringers are fewer in quantity.

From 3 to 18 ft. North of Sta. 217, in the Hanging-wall crosscut No. 2, shown on Plate No. 22, the dyke material is so altered that upon first glance it is not recognizable as the dyke, it being soft and of greyish, white color, but upon closer inspection it is found to contain feldspar, quartz and altered biotite, however, associated with considerable talc.

On account of the crumbly nature of the material it was impossible to have thin section slide made, but I am of the opinion that originally it was the same material as encountered in cross-cut No. 1, but has undergone very extreme alteration.

LOOKOUT – PEDRO MT. K MORMON BASIN DIST.

This is the principal mine of the district and is situated on the eastern rim of the Basin. It has been producing for a number of years and is at present operated by the United States Smelting, Refining and Mining Company of 55 Congress street, Boston, Massachusetts

The geology of the Rainbow mine is comparatively simple, the country rocks are chiefly slate with some granitic intrusives on the hanging wall side and some limestone and greenstones on the foot wall side. The greenstone is an intensely altered rock with an excessive development of secondary hornblende; its original character is difficult to make out.

The vein fissure has a strike of N. 60° E. and in the upper levels a dip of 66° N., while in the lower levels a dip of 54° N. Before the period of vein formation the fissure was filled with a porphyry dike locally known as the "spotted dike." A petrographic description of this rock is as follows:

It is dark brown and has a dense porphyritic texture. There are a few gash veins of quartz and minute reticulate veins of pyrite present. In thin section the predominant phenocrysts are badly formed feldspar crystals which for the most part owe their irregular outlines to resorption, or partial melting after they were formed. In composition the feldspars are of the soda-lime variety and the few that were capable of accurate measurement were found to be andesine. Some show zonal growth to a certain extent, thus indicating a change in the composition of the magma. The ferro-magnesian phenocrysts are hornblende and hypersthene, both occurring in very badly formed crystals, and intergrown with them are small crystals of biotite, some

RAINBOW MINE MALHEUR

COPY OF LETTER OF TRANSMITTAL

Messrs.

Chester A. Sheppard, Pres.,

P. P. King, Vice Pres.,

Rainbow Mining Company,

Portland, Oregon

Gentlemen:

Herewith is our report covering results of examination of Rainbow Mine.

The Report comprises 72 pages and 11 plates and has been written in quadruplicate.

This original and two copies, to all of which a copy of this letter has been attached and made a part, have been delivered to The Rainbow Mining Company.

The fourth copy is held in our office for our permanent files.

We have no interest, financial or otherwise, in Rainbow Mining Company, nor in the holdings of that Company.

Respectfully submitted,

Elmer and Hogg

Consulting Engineers

By (signed) Wm. W. Elmer

(signed) Geo. C. Hogg

Portland, Oregon

January 26th, 1923

INDEX

SUMMARY AND CONCLUSION

PAST RECORD

The Rainbow Mine has an excellent record for past production and continuity of ore shoot or shoots. Available records show that $2,373,092.46 has been taken from the property.

Prior to 1911 a total output of $242,000.00 was made but no records are now available to show what profit was gained.

From April 1911 to June 1912 an active campaign of development was carried on, concluding with the building of a mill having capacity of 100 tons per day or 24 hours.

The records of the holding company (at that time U. S. Smelting Refining and Mining Exp. Co.) submitted to the owning company, show that the expenditure for this 1½ years development and mill construction was $145,237.15.

This development and construction was completed in 1912, the mill being put in commission about November 30th, 1912, then operated continuously for three years by the holding company and two years by the owning company, the Commercial Mining Company, all on the ore known and outline when the mill was started.

As shown by the records for the five years milling period noted, that is from November 30th, 1912 to November 30th, 1917, the operating details were as follows:

Total Tons	174,789	Aver. Val. Recovered	$10.13	Total Recovered $1,770,196.19
Total Operating costs including interest on entire outlay of holding company from one day to four and one-half years.				1,050,069.45
Net operating profit for five years.				720,126.74.

Net operating profit for five years forwarded $720,126.74 or $144,000.00 per year.

Expenditure for development and mill construction prior to beginning of milling operations..... 145,237.15

Actual net profit for the five year period. $574,889.59

This was then, approximately $115,000.00 per year. Approximately three-fifths of this development and construction fund, or $87,000.00 was for permanent shaft and mill construction.

During the five years noted, development was negligible and at the end of that period the mine was practically where it was at the beginning, so far as deep development was concerned.

Operations of 1918-1919, were conducted under war, and after war conditions, no development of new ground at deeper levels was undertaken, mining costs were more than 100% above normal and in spite of a gross out put of $323,020.92, operations were conducted without profit.

Inspection of old stoped areas shows clearly that, presumably in order to keep milling operations up to full capacity, and with no development ahead of extraction, ore was not broken clean in the stopes and about one-third of the material handled was valueless.

The added costs due to handling this worthless material at post-war prices for labor and supplies was the difference between a comfortable profit and no profit.

Significant Vein Data

Earlier than the vein formation, the tilted sedimentaries were broken by a fracture, persistent for all of the length and to the greatest depth thus far developed. Subsequently this fracture was opened by an igneous dyke which fills the fracture for large areas, though not continuously.

The main vein is formed along this dyke and partially replaces it, sometimes on one and sometimes on both walls, with frequent occurences where the dyke itself is ore.

The vein system here consists of the steep-dipping (52 to 60 degrees) main or trunk vein, which to the eastward branches into two parts, and a flat-lying fault vein, dipping 16 and 20 degrees which intersects the main vein at all levels except the 500 level where development has not reached it.

The ore shoots occur as lenses that are continuous for lengths up to 350 ft. so far as records show, and are recurrent both on strike and dip. Although there have been consistent barren areas the vein system has been worked practically continuously, on one vein or another, for 1500 feet along the strike or longitudinal extension of the system.

From the highest elevation of ore in the vein to the lowest point worked, is a distance of approximately 500 feet measured on the dip of the vein.

The main vein crops at the surface at only one point, in the entire 1500 feet that has been worked. For the remaining portion of the worked length the apex, where determined, came no nearer than 60 feet from the surface.

It is clearly evident from this date that the deposit is not the remaining trunk of a vein, the top or upper portion of which has been eroded away.

East of the shaft the ore shoot has been worked continuously from the vein apex to the 400 Level, a depth of 500 feet.

As the shoot on its downward extension approaches the 400 Level East it is intersected by the fault vein dipping easterly on the plane of intersection. This fault vein is persistent at all levels and has been an important factor in forming the wide bodies of ore, which are worked to as great a width as 80 feet where the main fissure, the flat vein and the dyke are found in conjunction.

Below, that is under the fault, between the 300 and 400 Levels, the fissure and typical gouge persist but the vein has been displaced and has not yet been picked up.

So far as can now be determined the displacement is from East to West, but neither on this Level nor the 500 Level has proper development been done to prove the effect of the fault. Practically all of 400 Level West was inaccessible at the time of this examination but, so far as can be seen, that level was begun in the barren zone between two lenses and cut the lower edge of the upper lens at about 200 ft from the shaft, continuing from there to the face in ore. No separate records are available to show what has come from this ground. The winze to 500 level is not less than 400 ft easterly from a recurrent lens if its position be directly under the one discussed above. The occurrence of such a lens on the 500 ft level in this position is to be expected.

Ore Reserves

While the mine was practically depleted of ore reserves before the present owners took it over, there has been made available 2193 tons of ore blocked out on two sides in Hamm Drift above the 200 Level.

This includes ore already broken from the same ground and now stored on the surface, the total having a net value of $45,022.50 after paying cost of milling ore already stored, and mining and milling the stope ore.

The ore stored on the surface has assay value of $24.51 and the average value of the stope ore is $24.22.

Above this in territory that, according to old maps, is a continuation of a block stoped in the earliest day mining, is 4445 tons of ore that is considered possible ore of a good grade.

At the 400 level East a block of ground carrying the hanging-wall streak only, has been left unmined. This block contains 4160 tons of ore considered probable ore, having net value of $14,934.

Developed, probable and possible ore reserves are tabulated below.

Hamm Drift Developed Ore (two sides)	$45,022.50
400 Level East Probable Ore	14,934.44
Net Value, probable and developed ore.	$57,956.94

Hamm Drift possible ore 4445 tons to which no values have been ascribed.

Vein Geneses and Expectation with Depth

The vein genesis is that of ascending thermal waters from the underlying magma.

The values in the ores of Rainbow Mine occur very largely as free-gold with limited sulfides. This condition governs at the lowest level where ore has been found, precisely as on the surface levels.

At the 400 Level the gold is as free from sulfides as at 200 Level which is 250 feet above, measured on the dip of the vein.

The vein is of deep-seated origin and has been worked to only a comparatively shallow depth. At the point of lowest ore there has been found no diminution in value from the values reported. The ore here is, however, cut off by a well defined fault.

A winze has been sunk 100 feet below this Level but no drift or cross-cut has been run within a considerable distance of a point where the downward extension of the ore will, in the opinion of the writer, be expected.

The result of very careful study of conditions at and above the 400 Level is the belief, that systematic and intelligent work, not only below the 400 Level but on that Level, will quickly result in the development of ore.

There is no apparent reason, geological or mining, why the ores when found below the fault and for several succeeding lower levels will not be of as good value and quantity as those found and worked above.

It can be stated as a definite fact that ores can be as cheaply and more cleanly mined than they have been at any place in the mine now open for inspection, resulting in a decided saving in hoisting and milling costs.

Lack Of Development In The Past

It will be found in the body of this Report that on November 30th, 1918 the ore reserves were reported by the engineers in charge

To be 15,000 tons, that, during the 12 months following 59,259 tons of ore was mined and milled against which tonnage there was charged for development $0.082 per ton or a total or $5219.24, or; for the 24,259 tons that was developed, the cost of development was 10 1/3 cents per ton approximately. This fact shows most clearly how limited and insufficient development was done.

Requirements for The future

The following sums should be provided and held ready for use as required.

For immediate use for development and betterment as shown in report, all to be concluded within six months after actual work is begun with a full crew (this includes rehabilitation of shaft and head gear so far as requirements are now known). $55,000.

For investigation, preliminary development and nominal first payment on outlying prospects, subject to call. 55,000.

Reserve fund for sinking main shaft when and if required. 17,000.

Reserve fund for mill. - - 75,000.

Total $197,000.

Conclusion

The following facts are to be considered;

1-Economic conditions are excellent.

2-The past achievement of the property has been excellent.

3-The unchanged nature of the ore at the lowest level.

4-The effect of a fault which has not been given proper weight in its relationship to continuity of vein, and ore.

5-The fact that the last years' operations included a negiligible appropriation for new work at deep levels.

Based on the significance of these factors the futher development of the property to no less than the extent discussed in detail in the doby of the report is difinitely recommended as being fully justified, with the confident expectation that results obtained will be at least equal to the past achievement of the property.

Respectfully submitted

Elmer and Hogg

Consulting Engineers

By W. Elmer (signed)

G. Hogg (signed)

THE RAINBOW MINING COMPANY

The Rainbow Mining Company, owner of the Rainbow Group of Mines is an Oregon corporation, organized January 31st, 1922 with a capital stock of 1,250,00 shares, par value of $1.00 per share.

The officers of the Company are:

C. A. Sheppard, President

L. P. King, Vice Pres, and Manager

D. W. Pindell, Secy. and Treasurer

Titles to the patented claims are held in fee simple and to the unpatented claims by locations under the mineral laws of the United States.

All development work on locations has been done for the official, annual labor year, ending July 1st, 1923.

DERIVATION OF DATA

This report is based upon data obtained as follows:

First: From underground examination, sampling and survey, at the Rainbow Mine, made by Wm. W. Elmer, of the firm of Elmer and Hogg, from December 27th, 1922 to January 10th, 1923.

Second: From complete and detailed records of operations of U. S. Smelting R. & M. Company and Commercial Mining Company in the files of the latter Company.

Third: By inspection of various original papers and records in files of Rainbow Mining Company.

LOCATION, ACREAGE AND CLIMATE

The property of Rainbow Mining Company is situated in T. 13 S. R. 42 E., W. M. in Baker and Malheur Counties, Oregon. The mineral holdings consist of the following patented lode claims and lode locations, as shown on Map, Plate no. 1.

Patented Claims

Jim Crow	Lode	M.	S.	No.	719
Hattie B	"	"	"	"	661 A
Rainbow	"	"	"	"	662
Black Hawk	"	"	"	"	718
K. & K.	"	"	"	"	718
St. Croix	"	"	"	"	720
Tank	"	"	"	"	718
Rainbow Mill Site		"	"	"	661 B

Lode Locations

King Fraction	Lode	Claim
Lulu	"	"
Ratcliffe	"	"
Cayuse	"	"
Spring Gulch	"	"
Spring Gulch Fraction		"
Spring Gulch No. 2	"	"
St. Croix Extension	"	"
Cayuse Extension	"	"
Princeton	"	"

Lode Locations Continued

Maine	Lode	Claim
La Casa	"	"
Mohawk	"	"

The approximate acreage is 290 acres.

The Rainbow Mining Company also owns 640 acres of timber land, distant 3 miles from the mine. 320 Acres of this land is virgin timber, the remaining 320 acres having been cut over during the operations of the property to date.

The timber is high altitude Yellow Pine and Jack Pine with a scattering growth of Red or Douglas Fir.

There is sufficient stand of timber for eight years operations on basis of operations on the same scale as those of the past.

The nearest town and Post Office is Rye Valley, a village of 50 people, distant 9 miles from the property and the nearst R. R. point is Durkee a station on the O. W. R. and N. Co. branch of Union Pacific, distant from the mine about 22 miles. Mail Service to Rye Valley is daily except Sunday. Application for a Post Office to be known as Rainbow Mine, to be located at the property, has been granted and should begin to function officially within the next sixty days or by March 15th, 1923.

Transportation from the railroad is by means of motor trucks from May 1st to November 1st and by wagons and sleds for the remainder of the year. The district is known as Mormon Basin District and was a well known and profitable hydraulic mining district in the early days of Oregon.

The property is located on a high rounded mountain sparsely covered by sage brush and has an elevation of 5100 feet above sea level as shown by aneroid readings at the shaft.

No streams flow through the property but an ever flowing spring of pure water furnishes water through pipes under approximately 50 feet head to the camp buildings shwon on Plate No. 1.

The climate is delightful in the summer and fall, winters are not severe, the lowest temperatures, according to report, being about zero, and such weather being infrequent and of short duration.

Rainfall is limited, there being occasional rains during the spring months and late fall with but little precipitation during the summer months.

Snow falls from December 20th to March 1st, according to local report, lying on the ground for the period between these dates in normal years. The depth of snow seldom exceeds 3 feet on the level except in drifts where 4 to 5 feet lies until late spring.

When the property is in steady operation there is no difficulty in keeping the roads open at all times.

The general location of Rainbow Mining Co. holdings is shown on Plate No. 3.

HISTORY

The Rainbow Mine property was pruchased from the Discoverers in 1901, by the Commercial Mining Company, a corporation formed for that purpose, and was developed and operated by that Company up to the Spring of 1911.

In April of that year the property was taken over by the U. S. Smelting, Mining and Refining Company under a bond and option. The price for the property under this option was $550,000. A cash payment of $200,000 was made when the option was taken and the terms of contract were such that in Spril 1913 a balance of $350,000 could be paid and deed taken by the U. S. Co., or that company could exercise the alternative privilege of reimbursing itself for all moneys paid or expended, with interes , out of proceeds from operation of the mine with no stated period of time in which this must be accomplished.

The latter condition of the option was exercised by the U. S. Company, and all of the conditions of the contract having been satisfied and its expenditures with interest having been retunred from mine operations, the property was turned back to the Commercial Mining Company on November 30th 1915.

From that date to Nov. 1st, 1919 the property was operated by the Commercial Mining Company after which period the mine lay idle until January 1922 at which time it was taken over by Lorne King son of F. P. King, president of Commercial Mining Company for many years, deceased in 1921.

The Rainbow Mining Company, an Oregon corporation was

formed and the property conveyed to it in February 1922, since which date a force has been kept constantly at work.

During the period of shut-down the workings had filled with water up to 9 feet below the 300 Level and the first work of the new company was to realign and retimber, where necessary, the main working shaft and unwater the mine. Because of faulty pumping equipment the task of unwatering was prolonged and very expensive. Unwatering was completed in August 1922 and development of the flat or handing-wall vein was begun.

The mill was intermittently operated during a part of the months of September and October 1922 but, owing to limited reserves that did not permit of mill operation at an economic capacity the milling plant was closed down and has remained inactive since. Development since that date has been carried on at 200 Level West opening what is known as the Hamm Drift, removing caved ground and reopening the 400 Level East which at the close of this examination, January 9th, 1923, had been cleared of fallen ground to the 900 Raise on that level (which is within 250 feet of the face of 400 Level East) including the north crosscut from 900 Raise, as shown on Map, Plate No. 2, from surveys made in this examination.

NEIGHBORING PROPERTIES

Other than the Rainbow there are no operating mines in the district.

On the east, the nearest prospect where values have been found is the group called Mormon Basin Group now owned by Blake and Laidy, the opening of which is located about 4500 feet easterly from Rainbow working shaft.

No oportunity availed for inspection of this property.

To the West, about 1½ miles is the Humboldt property upon which considerable work has been done but which is now closed. No data is available regarding conditions nor values at this property.

Near the Humboldt is a prospect called the Monahan Group which is locally reported to have developed ore of good grade in a formation similar to that of the Rainbow Mine. Development has been carried on there with a small crew for more than two years and the property is reported to show excellent possibliities.

Near this property is the Fahlen Mine about which no definite information can be obtained other than that development is being prosecuted and ore from development is occasionally run through a small stamp mill.

GEOLOGY AND VEIN OCCURRENCE

No geological map of this district has been published. For identification of the points referred to in the following, reference may be made to Plate No. 3.

The snow mantle covering all of the territory southwest of Rye Valley prevented a study of regional geology for this report. The mine maps relatin to geology were destroyed by fire in 1922.

North of the property about 4 miles is Pedro Mountain a bare rounded peak with altitude of about 5600 feet. Dixie Creek rises on the northeast flank of this peak and flows southerly to Burnt River. To the west of Pedro the most easterly branch of Willow Creek rises and flows generally northeasterly then, joining the middle fork of the same creek, flows south southwesterly and joins the Snake River a few miles above Huntington.

The Rainbow Mine is located on the ridge lying between these two water sheds.

Lindgren refers to Pedro Mountain as of granitic origin and places the ages of the ridge between Burnt River and Willow Creek as pre-neocene.

The road from Rye Valley ascends the South Fork of Dixie Creek, crossing its divide at the property after passing through schists and greenstones. The elevation of the pass is about 5100 feet, the same as the collar of Rainbow Mine shaft.

For the last half mile of the distance the road traverses a narrow gluch which appears to be the dividing line between the altered sediments of the mine hanging wall and a rounded hill of

what is shown by cuts next to the road to be granitic material.

The local geology was studied in underground workings now open for inspection.

So far as can now be seen in the workings the formation here was originally argillaceous slates and shales, now altered in places in the case of the slates to highly siliceous material. Interbedded with these were limestone the true relationship of which rock cannot be determined by study of the mine workings now open. The entire series was tilted to a position of 50 to 60 degrees from the horizontal with inclination to the N. W. and strike N. E. and S. W., probably by the granite intrusion on the hanging wall side above the 400 Level, a tongue, at least, of which forms the footwall from 400 Level to 500 Level at the winze connecting these levels as shown on Plate No. 5A.

A later persistent fracture cut the formation relatively along the original planes of sedimentation above the 400 Level and along the contact below that level as referred to above.

This fracture was at a later period opened by an intrusive dyke following the fracture and, at places, along neighboring bedding planes as well as along the contract between the sedimentaries and the granite.

This dyke has a width of 4 to 6 feet and appears to be a granodiorite, which, where it is altered by later action, is known as the "Spotted Dyke."

The dyke material where least altered has a grey ground mess and granite texture. In powdered form, under the microscope the ground mass is shown to be finally divided quartz with rods of

plagioclase interspersed with minute crystals of pyrrhotite.

Where markedly altered the dyke material has a dark brown ground mass and porphyritic texture.

Thin sections of the unaltered rock have not yet been prepared. A petrographic description of the altered rock made by W. Harold Tomlinson as shown in Report of the Director of the Oregon State Bureau of Mines, is as follows:

"It is dark brown and has a dense porphyritic texture. There are a few veinlets of quartz and minute reticulate veins of pyrite present. In thin section the predominant phenocrysts are badly formed feldspar crystals which for the most part owe their irregular outlines to resorption, or partial melting after they were formed. In compostition the feldspars are of the soda-lime variety and the few that were capable of accurate measurement were found to be andesine. Some show zonal growth to a certain extent, thus indicating a change in the composition of the magma. The ferromagnesian phenocrysts are hornblende and hypersthene, both occurring in very badly formed crystals, and intergrown with them are small crystals of biotite, some grains of pyrrhotite, and a little magnetite, The groundmass is seen to be made up of very minute feldspar crystals with some quartz. The intergrowth of these minerals is in some places so close that it approaches a micrographic or micropegmatitic texture. The rock has suffered some alteration of the deep-seated type. Many of the feldspar phenocrysts show

fracturing and sometimes a development of sericite in these fractures. Other alteration minerals present are: uralitic hornblende, secondary quartz, some actinolite, and a small amount of chlorite."

The principal vein follows the fracture with a strike of northeast, southwest, and dip 50 degrees to 60 degrees to the N. W. The best width and values are found in the quartz under or against the foot-wall of the dyke-vein system. This is shown in Ideal Cross-Section in Plate No. 10.

This vein is very persistent and has been worked for a total length of approximately 1500 feet along the strike of the vein sometimes in two seams with occasional interruptions at different elevations, where, though both the dyke and the fissure existed, ore was not found for considerable distances.

On the hanging-wall side of the dyke quartz is frequently found carrying high values. The ore occurs as a crushed quartz and shale, usually, but not always, accompanied by the dyke with width or thickness of two to ten feetof ore andvein matter.

Frequently where decomposed and broken the dyke itself carries milling values and almost always weighable gold is found in the dyke material.

A secondary fracture or fault has followed the granite-slate contact and cut the sedimentaries east or northeast of the granite areas thus far exposed in the mine, terminating invariably against the gouge of the normal foot-wall of the main or dyke vein. Along this fault plane a

narrow and irregular but rich vein, called the flat vein has been formed, joining the main fissure along the line shown on Plate No. 2 as determined by inspection of the points of junction on with the foot-wall above 200 Level West and on 400 Level East.

This vein dips to the north 15 degrees to 20 degrees from the horizontal and has a strike approximately west from the point of junction. Slickensides in Raise 244 from Hamm Drift, within 60 ft. of the junction of the fault vein and main vein show a vertical rake on the hanging wall side against the dyke of 55 degrees to the N. W.? clearly enough evidencing two movements at different periods.

As shown on Plates 4 and 5 at 60 feet E. of Sta. 425 on 400 Level the vein has been abruptly cut-off.

At this point the foot-wall streak does not come down to the level but has been worked from a point 10 feet above the level continuously up to the 300 Level.

Slickensides or fault grooves 10 ft. east of Sta. 425 on, or in the hard, dense, metamorphic slate hanging wall show a rake of 16 degrees from the horizontal in a westerly direction agreeing with the rake grooves on the foot-wall at 244 Raise about 2500 ft. in elevation above and 800 ft. west of this point.

This data is, in the opinion of the writers, evidence that the flat lying fault occurred long after the main vein was formed and vein enrichment completed, that there was first an upthrust from southeast elevating all the hanging-wall of the foot-wall

streak including the dyke with the foot-wall streak as the plane of contact, and that this was followed at a later date by displacement of the entire vein and dyke material with the foot-wall gouge as the dividing plane.

The thrust of the final fault was from the northeast to the southwest on a line dipping 16 degrees from the horizon and affected all of the area lying below the point of junction of the flat vein with the main or dyke vein.

It is probable, judging from data given above, that the hanging-wall streak was formed subsequently to the foot-wall streak and the first uplift and that this uplift shattered and made more permeable the dyke, thus affording channels for the mineral-bearing solutions from the magma below to circulate through the dyke. This may, as well, account for the irregularities of the hanging-wall streak as compared with the foot-wall streak.

Plate No. 6 taken from the only available map of the old mine workings, dated January 1st, 1916, thirty days after U. S. Company had ceased operations, shows the condition of the mine as of that date.

On this map has been shown in tinted areas the ground worked out by subsequent operations of Commercial Mining Co. This is a combination plan and projection map and on it has been drawn the line of contact between the Main Vein and the Fault or Flat vein at different elevations and it is to be noted that, while large bodies of ore were worked above or to the East of that line, very appreciable areas, nearly or quite as great in extent as the former, were

worked under or to the west of the contact or point of junction. On this map the terms hanging and foot-wall veins refer to the two divisions of the main vein lying on either side of the dyke as referred to under Mining Operations of U. S. Smelting R. & M. Co., at Page 89 of this report.

In the following years a considerable tonnage, of which no separate record is available was taken from the flat vein below the point of intersection of the two veins.

Under the caption above referred to, at Page 51 of this report will be found Mr. Parker's statement regarding development on the 400 Level East as of date January 1, 1918.

Inspection of Plate No. 4 from actual surveys made for this report shows clearly that at that time (when the workings were in precisely the same condition as they were in 1912) formation conditions at this level were not clearly understood.

Later development from the first drift to the east, shown on the map, picked up the fissure at Sur. Sta. No. 409 of this Examination and the fissure was followed continuously, opening low grade quartz at Sta. 415, that was continuous to Sta. 421, above which, beginning at a height of 40 to 50 ft. above the level, pay ore was continuous to the 300 Level.

For a distance of 320 ft. eastward along the vein from Sta. 421 pay ore was continuous in longitudinal extension from the fault plane to the 300 Level.

Above Sta. 421, as stated above, this ore came down to within 40 ft. of the 400 Level. At 900 Raise E. ore was toped to the level.

timbers with about 8 sets along the level bfoken 10 ft. wide.

That this agrees with the line of demarkation determined by the fault plane should be apparent, and it is difficult to understand why the effect of the fault in the area above discussed was not given greater weight during final operations of 1918 and 1919 leading to continuous development at the 500 Level.

Ten feet E. of 910 Raise, 400 Level East, a cross-cut was run into the hanging-wall as shown on Plate No. 2.

At a distance of about 120 ft., in this cross-cut, measured perpendicualr to the strike, gouge was encountered having dip of 29 degrees to 47 degrees northerly and strike approximately parallel to the fissure from Sta. 429 to Raise 900 East.

The spotted dyke is continuous from a point 20 ft E. of Sta. 421 to 900 Raise, lying in its normal position on the gouge foot-wall of the vein though badly shattered by the action of the fault. East of the cross-cut the dyke disappears and both sides of the drift are shale or slate.

The cave that filled the level under 900 Raise at the time of this examination had only been cleared sufficiently to permit of difficult access to the cross-cut, the walls were covered and obscured by mud and slime from the stopes above and it was impracticable to determine features of the rock in the cross-cut at or near the 400 Level Drift.

From the position of the dyke in this cross-cut it appears probable that this is the hanging-wall part of the vein referred

to in Mr. Parker's report under sub-caption of 200 Level.

At 27 ft. west of Sta. 427 a crushed quartz and dyke vein intersects the hanging-wall but does not cross the fissure. As shown on Plate No. 2 the foot-wall of this vein is slate and the hanging-wall is spotted dyke, the strike as exposed in the limited (two feet) section is N. 10 degree W. from the intersection, and dip is 56 dgrees nearly east.

Value for the 2 ft sampled is $9.20.

This is a most interesting point having normal vein characteristics with decided reversion of strike and normal dip.

The hanging-wall side of the drift had, at this point, sloughed off the vein, apparently not having been exposed when the drift was run.

Because of the nature of the ground it was not practicable to determine the significance of this exposure nor whether it may be a resultant from displacement of the vein farther east and development to determine this is to be undertaken at once.

To the west of the shaft, except in the Hamm Drift and the flat vein, practically no old workings could be entered because of caved levels and stopes.

MINING OPERATIONS OF U. S. SMELTING R. & M. CO.

The entire matter under above caption is taken in the form of verbatum abstracts from General Statement Of Operations of Rainbow Mine and Mill signed by Frank W. Parker, ex-superintendent for U. S. Company and dated Jan. 1st, 1916.

Mining Operations

At the time the property was taken over by the United States Smelting, Refining and Mining Exploration Company the development of the mine consisted of an Incline Shaft 300 feet in depth, measured on the dip of the vein, (52 degrees) the collar of this shaft being located underground near the face of an Adit Cross-cut about 400 feet in length, and at a point where said Adit intersects the vein some 150 feet below the surface and outcrop.

Three Levels had been driven along the vein in both directions and at varying distances apart, the longest less than 700 ft. in length, and considerable stoping had already been done, the ores being treated in a mill operated by the commercial Mining Company, owners of the property.

This old mill was located about 2000 ft. from the mine and on the opposite slope of a hill, or ridge, over which the ores were transported by a Halliday Aerial Tramway, power being required to operate the cable.

Tests of the ores showed that improved methods of treatment would result in higher saving of the contained values at reduced costs, and the outline of operations decided upon by the U. S. Co. was therefore; the active development of the ore reserves in the mine

and the installation of a modern reduction plant, or mill located in closer proximity to the mine workings.

Before the construction of the new mill, work was confined in the mine to development only, and to a Vertical Shaft from the surface connecting with the 300 Level.

No new machinery was installed during this development period.

The Incline was continued for a depth 105 ft, measured on the dip, to what is now the lowest level of the mine, called the 400 Level, and which is 395 feet in depth vertically below the collar of the present main working Vertical Shaft.

The material hoisted to the 300 Level by a small hoist was there transferred and hoisted to the Adit level by means of a larger hoist located at that place.

Development was continued on the 400 Level until December, 1911, at which time excessive flow of water and the small capacity of the pump and water column caused cessation of work on this level, which was not resumed for a period of about one year or until about the time the mill was started.

During March, 1912, work of raising a vertical shaft through to the surface from the 300 Level was started. This work was completed in about ten weeks, June 1st, 1912. The total distance raised was 310 feet. The average cost $22.50 per foot, including cutting for stations on the 300 and 200 Levels, all timbers, guides, chairs, etc. All timber used was Oregon Fir. The Shaft was timbered in the usual manner, with 8 x 8 in. square timber for plates, placed 5' 4" centers, and lagged with 2" plank.

It is of two compartments: Hoist-way 4 x 5 ft., and Man-way $2\frac{1}{2}$ x 5 ft.

The center piece is a 6" x 8" set edge ways.

While the above mentioned work was being done, all faces of the upper levels were being advanced and connections made between the levels at convenient distances.

The ore accumulated from development, 9353.3 tons, was afterwards raised by a surface tram and conveyed to the mill bin at a cost of 44 cts. per tons.

Drifting costs were $10.64 per foot, including labor, explosives, mucking, hoisting etc.

Sinking Winzes cost $12.70 per foot, including everything.

During the winter of 1914-1915, by upraising from the 400 Level, the Vertical Shaft was completed to its present depth and condition.

About June, 1912, all work in the mine was stopped, except pumpting, awaiting the completion of the mill. During this period, a Hoist-Compressor building, Blacksmith-Machine Shop-Warehouse building, and Timber Framing building were erected and equipped with machinery and materials for their respective purposes, all being located near the collar of the Vertical Shaft recently completed, so that by the time the mill was ready for operations, December 1st, 1912, the mine was prepared and in shape to deliver the required amount of ore daily. Hoisting was discontinued at the Incline shaft, and all work transferred and carried on at the Vertical Shaft. Since which time the Incline and Adit have been

used only as a secondary exit and entrance, for ventilation and discharge water pipes, etc.

Power

Electric Power is furnished by the Idaho-Oregon Light and Power Co., now known as the Electric Investment Company, supplying both mine and mill, and is based on Meter readings at the mine at a rate of $.00765116 per Kilowatt Hour, for Power, and $.05 per Kilowatt Hour, for Lighting.

The length of line is about 19½ miles. The system is 3 Phase, 60 Cycle, carrying 23000 Volts, which latter is reduced at the mine to 440 Volts for all Power purposes, and to 110 Volts for Lighting. The line is equipped with the regulation Lighning Arrestors, Swithhes etc. 3- 75 Kva Transformers are used.

The most serious delays experienced have been on account of Lightning; and the Power Company have at times not shown an ability to make quick repairs.

The amount of Power consumed approximates an average of 4300 Kw per day, or a rate of 50 cts. per ton of ore treated, including all mining, milling, camp lighting, plant comsumption, etc.

The pumps are all of them located on the 400 Level, between the Vertical and Incline Shafts, and are so arranged that either or both the 5" and 4" water collumns may be used.

Most of the water encountered flows on the 400 Level. But little trouble is experienced on account of water in the upper levels or stopes.

The water for the mill is supplied from this source. The dis-

charge water columns are so arranged that water is forced to the surface for use in the mill, and also distributed to surface tanks for camp and fire purposes, or merely forced to the Adit level and there discharged and run to waste.

Timbering

On account of the character and dip of the vein nearly all work in the mine requires timbering and lagging on at least two sides.

In the Drifts, square sets, with sills, are used; 8" x 8" and 8" x 10" material for Posts, Sills, and Caps, and 4" x 8" for spreaders or girts. 2" plank for lagging. Sets are placed 5' 4" centers. Posts are 6' 10" in height. Frequently round timbers are used for Posts and Caps instead of square.

In Upraising and Sinking, square sets placed 5 ft centers are used, and offset to correspond with the dip of the vein. Lagging used where necessary, sometimes on all four sides.

When Stoping was started it was found necessary to use the square set method of timbering where stulls could not be depended upon. This method has been continued,-but at present applies more expecially to the stopes above the 200 Level. Below this level large areas have been mined on stulls.

On account of the heavy loose hanging wall it is necessary to keep all the stopes well filled.

The square sets are made of 8" x 8" and 8" x 10" sawed timbers. The Posts are cut 6' 10" long and are placed 5' 4" centers. 2" plank, cut 5' 4" long is used for overhead lagging and floors. In places,

round timber 6" to 8" diam. is used for girts, but it has been found that 4" x 8" sawed material gives better service.

Slabs, split lagging and poles are used as side lagging. Stulls range from 8" to 14" dia., and cost 7 cents per running foot.

Sawed Timber is delivered at the mine for $16.00 per M. board feet.

Poles cost 3½ cents per running foot. Slab Lagging 4 cents. Split Lagging 5 cts. each. Cord wood, for heating purposes, is $4.75 per cord delivered at the camp or plant. Slab Cord wood is $3.50 per cord.

Piping

A 3" pipe line conveys the air from the receiver on the surface to a smaller receiver on the 200 Level. From this latter, 2" and 1½" pipes conduct the air to different portions of the mine and along the Levels. From these, 1" pipes branch at intervals and are kept to within 50 ft of the working faces, where they in turn are reduced to 3/4" pipe. Mulconroy Hose Spuds and connections are used, with 3/4" -4 ply Kortlandt Steel Armored Hose in 50 ft length connecting the air line with drills. This Armored Hose has proven the most servicable of several other kinds tried.

After the main air lines are placed, the miners under the direction of the foreman or Level-boss maintain and keep the branch lines to within a reasonable distance of the working faces. Pipe of proper length is delivered by the nipper, who also looks after the steel and other tools, takes the orders for explosives and

delivers same at the proper places and time for loading etc.

The average Piping costs since the mill started have been $.008 per ton of ore treated.

Explosives

The costs for Explosives, since the mill started, have been $.106 per ton of ore treated.

Drilling.

The running time of all machines working in the mine will not exceed an average of 4 hrs daily. A relatively large amount of ore is broken per foot drilled. About 65% of the time of the miners is consumed in picking and barring down loose ground, timbering, sorting and mucking.

Occasionally very hard rock, full of open seams and blocky, lying next to soft talc or gouge slips, is encountered. On account of the frequency of this occurrence, as well as time lost in setting up, repairs etc. the C-110 or 2 3/4" Piston Machine has been discarded in favor of the lighter Stopers and Jack Hammer Drills in all sinking and drifting. These light machines are used in all portions of the mine and are giving eminent satisfaction.

Drilling costs, including labor supplies and air used, for the past three years, have averaged $.946 per ton of ore treated.

Mucking

All vein matter broken is allowed to fall on platforms, or floors, and there sorted. The wasts, consisting mostly of coarse dyke material from the center of the vein, is separated and thrown back into the fill.

The ore chutes along the Levls are placed 25 ft apart. On account of the shallow dip of the vein, in places as low as 20 degrees, the ore at times requires excessive handling. Wherever possible the chutes are carried on the hanging wall, with intermittent platforms to assist in carrying the ore downwards to the chutes.

The Mucking costs, since the mill started, have been $.702 per ton of ore treated. This includes labor and supplies.

Hoisting and Tramming

Anaconda Type Wheels and Axles are used on all the cars, the capacity of which is 16 cu. ft., size 2' x 2½' x 44". The cars are loaded by shovel from the faces of drifts, or by means of sliding doors from the chutes along the Levels and are trammed by hand to the respective stations.

The costs of Handling the ore, since the mill started, have been $.349 per ton of ore treated. This amount is divided to; Underground Tramming $.189, Hoisting $.096, and Top Tramming $.062.

Mine Work And Workings

Altogether there have been about 7000 feet of drifting in the mine, not including the Adit Tunnel.

The Main Vertical Shaft is 395 feet in depth, with levels at 217 ft, 310, ft. and 395 feet respectively called the 200 Level, 300 Level and 400 Level.

A prospect-ventilation Shaft, 750 ft East of the Main vertical shaft, is connected with the stope from the 200 Level East.

Of the 7000 ft. of drifting, 1800 ft was done above the 200

Level, and is now caved and abandoned.

The 200 Level West was driven 450 ft., and considerable stoping done above the leve. The face still shows some ore of varying width and values. On account of the loose and heavy ground this portion of the mine was abandoned, no work being carried on there now, except that the level is kept open by heavy timbering for ventilation and a secondary exit and entrance to the stopes below. The dyke still continues in the face, in loose shale or slate, and there is a possibility of ore yet beyond and above the present face. To explore this ground it is considered more advisable to raise from the level below.

The 200 Level East has two paralled drifts driven for a distance of about 650 ft each. For 450 ft the distance apart is quite regular, 15 to 20 ft., and from this point a divergence to 60 ft occurs, to where the right hand drift was stopped. The left drift continues an additional 550 ft, having a total length from shaft of 1200 feet.

Along the level where the drifts are parallel ore occurs the entire distance and has been stoped to the level above.

The right hand, or foot wall, drift followed the foot wall fracture; the left hand, or hanging wall, drift followed the hanging wall side of the dyke.

At a point about550 ft. to 650 ft from the shaft the dyke was broken and irregular. From 650 ft to within 50 ft of the face the dyke is strong and well defined, and beyond this point, while the dyke has disappeared, the fracture continues with regular course and dip and carries some values.

The work of driving this face has been discontinued the past three years, but recently has been started again and exploration beyond this point, which is the farthest East of any in the mine, will be continued.

A stope about 400 ft in length is now working above this level, from which 40 to 50 tons are daily extracted.

Just above the 200 Level, where the two drifts are paralled, the dyke enters the foot wall fracture, and above the point the ore was taken from a single stope.

The 300 Level West has been driven 570 feet. The drift follows the foot wall fractue the entire distance. When advanced about 100 ft the dyke entered the fracture and remained for 350 ft, at which point it disappears, and from there to the face the values are erratic. Considerable stoping has been done above the level and a stope about 100 ft in length is now working.

Whether or not the face of this level has reached the end, or limit, of the dyke and no further ore may occur beyond the present face should be determined by further exploration work.

The 300 Level East is driven along eh hanging wall a distance of 250 ft. This drift follows the dyke, which is here encased in granite both sides. Stoping is now being done both above and below this drift.

The foot wall drift has been driven a distance of 800 feet. For 495 ft it follows the foot wall fractu e, and but little ore was encountered. At 495 ft a short cross cut to the left, or hanging wall, exposed the dyke with normal dip and strike, and from that point to the face, a distance of 300 ft. both dyke and vein are well

defined, and a good body of ore has been uncovered.

A similar condition is here noted to that on the 200 Level above, and it is expected that this body of ore will continue in length as far as that of the upper level.

The 400 level west has been driven nearly 500 feet. It has followed the Foot Wall Fracture. At a point 200 ft from the shaft the dyke was encountered and from there to the face the dyke follows the fracture, with varying amounts and grades of ore between.

At a point where the dyke was encountered a drift was run back diverging into the hanging wall and following the dyke, a distance of 125 ft, and at this point an upraise made to connect with a sub-level 60 ft above.

Some stoping is being done above this level.

The 400 Level East has been driven 200 feet.

At this level the bottom of the vertical shaft has been cut into the Foot Wall Fracture. A Crosscut extends 85 ft into the hanging wall and an inclined upraise at the end cuts the formation an additional 30 ft. No where in this crosscut is any dyke found, although the West back-drift referred to above follows the dyke, well defined, and is within 100 ft of the crosscut, and if the present course continues should cut, or cross, the crosscut at about 60 ft from the shaft.

The formation of the 400 West level is shale and slate, except the so-called "black-drift" which is granite.

The formation of the Crosscut is metamorphosed shales, with

some granite near the end, and that of the upraise is granite.

At about 60-65 from the shaft a slip or fracture occurs that is about in line with the dyke along the back-drift and also with the dyke and ore in the sub-level 60 feet above. It carries, at this point, neither dyke nor values.

At 80 ft from the shaft the crosscut encounters a wider and more open seem, apparently a contact, and this was followed for about 40 feet West and 200 ft East.

This entire 200 ft East Drift is in granite. Occasional small bunches of dyke have been encountered, but neither dyke or ore of consequence.

At upraise 60 ft East of the Crosscut, from this level, to a sub-level 40 ft above, and thence to the 300 level hanging wall drift, exposes a vein of varying width, 2 to 4 feet. This raise and the ore follows the dyke.

The sub-level referred to here and elsewhere as 40 and 60 ft above the 400 level is 325 feet in length, is in granite and contains the dyke the entire distance.

Another upraise 140 ft East of the crosscut following the seam along which the East Drift has been run, encounters the dyke about 30 ft above the level and in this seam which will undoubtedly connect with the sub-level dyke and ore above.

Some stoping of good ore is being done above the sub-level.

Another Drift has been started from the crosscut, about 40 ft from the shaft, is now advanced 100 feet. This drift will be continued, will follow the foot wall fracture and later explore the

ground under where the ore and dyke are in place and defined on the 300 Level above.

The ore so far encountered on the 400 Level is low grade. While conditions for deposition, according to our theory, seem ideal in the west end, surface waters and zone enrichments may here reflect. The ore has never been so strong on the West side of the "later uplift" as on the East.

This concludes abstract from Mr. Parker's statement.

The succeeding years' operations of Commercial Mining Company followed the same general system as that outlined in above abstract and no separate data will be given.

OUTPUT

Records of the Comercial Mining Company show that the output from operations of that company prior to 1911, was $242,000 but no records are available to show the tonnage nor the value of the ore treated.

During the tenure of the U. S. Smelting, R. & M. Company the mill was operated exactly 36 month or 3 years.

In this period 103,547.5 tons of ore was treated, an average of 2880 tons per month. Of this amount 9717.1 tons was obtained from development prior to the time the new mill was made ready for operation, hence 93,803.4 tons represents the amount actually mined during the three years milling period.

The very complete records of the U. S. Company operations show a recovery in form of mint returns of $1,111,796.76 from the 103,547.5 tons treated or $10.737 per ton and a metal loss in tailings of $0.50 showing value of ore sent to the mill to have been $11.24 per ton.

From December 1st, 1915 when the property reverted to the Commercial Mining Company to September 30, 1919 when milling operations ceased, the Commercial Mining Company records show a recovery in form of mint returns of $969,295.70 from 113,064 tons treated or $8.57 per ton and a metal loss in tailings of $0.22 per ton or value of ore sent to the mill of $8.79 per ton.

Study of the workings that can now be entered show clearly that, in order to keep the mill operations up to maximum capacity the ore was not kept clean from waste during the last two years work at least and it seems fair to assume that this condition govered during all of the nearly four years's operations of Commerical Mining Company. For further discussion of this point see item Costs for Future Operations.

Summarized the total gross output of record to this date is as follows:

To 1911	$242,000.00
To Nov. 1915	1,111,796.76
To Sept. 30, 1919	969,295.70
Total Gross Output	$2,323,092.46

NET OPERATING PROFIT

Commercial Mining Co.' Early Operations

Prior to 1911 no records are available

U. S. Smelting R. and M. Co.

Gross output from U. S. Co. operations	$1,111,796.76
Total Mining and Milling costs	548,618.39
Possible net earnings	$ 563,177.37

The final (Nov. 1915) record rendered by that company to the Commercial M. Co. at Page 3, shows net returns from operations, which must be taken as correct. $ 517,522.95

The records show that expenditures made by U. S. Co. for development and mill construction were as follows:

To. Nov. 1st, 1912	142,435.15
To Dec. 31st, 1913	2,802.00
	$145,237.15

No further expenditures are shown in available records.

Net returns available from milling operations of 3 years would then be as follows:

Net returns from operations	514,522.95
Development and construction	145,237.15
Net after all deductions	$372,285.80

Commercial Mining Company Latter Operations

The net earnings from operations by this company for the first two years after taking over from U. S. Co.,

that is from Nov. 30th, 1915 to Nov. 30.30th, 1917,

inclusive, were $202,603.79

In this period two yearly dividends were

paid eaggregating 167,775.00
and a total reserve fund was held of $ 34,828.79

The final two years operations by that company were made at a loss and the total net profits as shown by records as at end of milling operations were, for the entire four years. 154,427.41

The final two years mining costs were extraordinarily high, due to the after war conditions of 1918 and 1919 and to working out the remainder of known ore without real development on lower levels as discussed under proper caption.

Total Net Operating Profit For Five years

For the five years active operation fo the property where ore was kept in sufficient reserve to permit of mining at a profit the actual net profit from operations exclusive of prior development and construction were as follows:

Nov. 30th 1912 to Nov. 30th 1915 inc.	$517,522.95
Nov. 30th 1915 to Nov. 30th 1917 inc.	202,603.79
Total Net Operating Profit 5 years	$720,126.74

ORE RESERVES

The reserves of the Mine were depleted in the final year's operation of the Commercial Mining Company.

Above the 400 Level east from Sta. 421 to R. 910 E., only the foot-wall streak of the vein was worked for 60 ft. of the stope, beginning at and going up from the 400 Level.

The hanging-wall portion was left intact though it was known to contain good mill values.

An attempt to work this remaining portion was made from up in old stopes in 1922 but the work was abandoned because of breaking through the dyke into old caves.

It is believed that if stopes are started from the Level a considerable tonnage can be recovered from this area. See Ideal Cross-section Plate No. 10. It is not practicable to sample this material above the 400 Level because of caved old foot-wall stopes.

The hanging-wall streak shows on the level at Sta. 425 A; at 22 ft E. of that Station; at 30 Ft East of that Station; at 11 ft. W. of Station 427 and at 7 ft. E. of Sta. 429 all as shown on Plate No. 2.

The remaining samples shown in this area were taken from holes drilled into hanging-wall dyke in endeavor to cross that dyke and cut the hanging-wall streak but without crossing the entire dyke material.

All 400 Level East Samples are listed as follows:

No.	Description	Width Ft.	Per Ton Value Gold
10	Drillings into hanging dyke 54.3' W. of Sta. 427	4.2	$4.00

No.	Description	Width Ft.	Per Ton Value Gold
11	Same as # 10 continued deeper	2.6	$2.60
12	78.5' W. Sta. 427 drillings into hanging-wall dyke	4.1	2.80
13	No. 12 hole continued deeper, all dyke	3.0	1.60
14	12' W. of 12 and 13 drilling into hanging dyke, should have reached first of hanging-wall vein.	2.0	4.40
15	No. 14 hole continued into vein matter of hang-streak.	3.1	6.40
16	Drillings into actual hang-streak at contact with fault plane all qtz.	4.2	10.80
17	No. 16 hole continued, partly qtz.	2.8	2.80
18	61.4 ft E. of Sta. 425 drillings into hanging, all dyke.	3.0	Trace
20	51.2 ft E. of Sta. 425 drilling into hanging, all dyke.	3.4	0.40
21	At Sta. 425 A. 2.3 ft all sugar qtz. hanging streak	2.3	6.80
22	Normal hang-wall above No. 21	3.5	0.40
23	Fault Vein, crushed qtz.	1.0	0.80
24	27 ft W. of Sta. 427, Hanging-wall qtz.	1.5	8.80
25	Drillings into hang-wall at Sta. 423.	3.5	1.20
26	Hard qtz. Foot-wall vein next to No. 25	3.5	3.20
27	11 ft W. of Sta. 427 vein coming in from hang-wall see Plate No. 2	2.0	9.20
28	30 ft E. of Sta. 427 Dyke material	2.3	4.00

No.	Description	Width Ft.	Per Ton Value Gold
11	Same as # 10 continued deeper	2.0	$2.80
12	78.5° E. Sta. 427 drillings into hanging-wall dyke	4.1	2.80
13	No. 12 hole continued deeper, all dyke	3.0	1.60
14	12° W. of 12 and 13 drilling into hanging dyke, should have reached first of hanging-wall vein.	2.0	4.40
15	No. 14 hole continued into vein matter of hang-streak.	3.1	6.40
16	Drillings into actual hang-streak at contact with fault plane all qtz.	4.2	10.00
17	No. 16 hole continued, partly qtz.	2.8	2.80
18	61.4 ft E. of Sta. 425 drillings into hanging, all dyke.	3.0	Trace
20	51.2 ft E. of Sta. 425 drilling into hanging, all dyke.	3.4	0.40
21	At Sta. 425 A. 2.5 ft all sugar qtz. hanging streak	2.5	6.00
22	Normal hang-wall above No. 21	3.5	0.40
23	Fault Vein, crushed qtz.	1.0	0.80
24	27 ft W. of Sta. 427, Hanging-wall qtz.	1.5	8.00
25	Drillings into hang-wall at Sta. 423.	3.5	1.20
26	Hard qtz. Foot-wall vein next to No. 25	3.5	3.20
27	11 ft W. of Sta. 427 vein coming in from hang-wall see Plate No. 2	2.0	9.20
28	30 ft E. of Sta. 427 Dyke material	2.5	4.00

No.	Description	Width ft.	Per Ton Value Gold
29	42 ft E of Sta. 427 crushed material in dyke.	2.0	$1.60
30	3 ft W. of Sta. 429 hard qtz. streak in middle of dyke matter	1.5	2.80
31	4 ft E. of Sta. 429 Vein matter of hang streak from slate hang to dyke foot-wall	1.2	14.80

The area between samples 24 and 28 was not sampled because of tight lagging and loose ground.

Probable Ore 400 East

Hanging-wall streak only as shown in samples listed below.

No.	Ft. Width	Ton Value	Ft. Width X Value
15	3.1	$6.40	$19.84
16	4.2	10.80	45.36
21	2.3	6.80	15.64
24	1.5	8.80	13.20
31	1.2	14.80	17.76
	12.3		$111.80

Average Width - $\frac{12.3}{5}$ - 2.6 Average Ton Val. $\frac{111.80}{12.3}$ - $9.09

Dimensions of block, 320 x 70 x 2.6.

Tonnage in block $\frac{320 \times 70 \times 2.6}{14}$ - 4160 Tons

Because of crushed and loose nature of ore a factor of 14 cu ft. per tons is used.

If this can be handled at all it will be from new raises, in narrow stopes, without breaking through to the old fill and cost of mining and milling should not exceed $5.50 per ton leaving net profit of $3.59 per ton and the total net profit should be

4160 x $3.59 - $14,934.40.

This area can be proved ahead of mining by means of a short raise and cuts from old R. No. 700 and old R. 910 and its classification as probable ore is fully justified.

The Hamm Drift.

The Hamm Drift is 36 ft vertically above 200 Level West, as shown on Plates No. 2 and No. 11. In abstract from Parker's General Statement on Page 29 of this report is found the following:

"The 200 Level West was driven 450 ft., and considerable stoping done above the level. The face still shows ore of varying width and values. On account of the loose and heavy ground this portion of the mine was abandoned, etc., etc.,"

No work was ever done in this ground after the date of Parker's report until 1922 when a diagonal cross-cut was run from the shaft to avoid passing through caved old workings. At 124 ft from the shaft a raise was put up connecting with a sub-level from which level a final raise was extended to the height shown on the old maps as being the top or back of the stopes of former workings.

The present superintendent of the property had worked in this ground and the territory above and knew that good ore existed in old Raise 310W. and in the western faces of the stopes above. The drift, now known as Hamm Drift, was run west from the top of the final raise and picked up unbroken ore at the point shown on the Plates. The ore was continuous from this point to the face as of date January 9th, 1923, when the drift had reached a length of 112 ft.

Car samples along this opening are recorded as assaying from $8.40 to $37.20.

Ore broken from this drift and the limited stoping done above, which had been stored in the mill bins, was sampled in this examination and gave results as follow:

Tons	Class of Material	Per Ton Value	Total Value
105	Ore through grizzley	$22.60	$2373.00
80	Coarse through crusher	27.00	2160.00
185 Tons	Totals		$4533.00

Assays From Hamm Stope

Assays of samples from these workings as shown on Plate No. 11 are listed below, gold values only being given, silver content being negligible:

No.	Material	Feet Width	Per Ton Value	Feet Width X Ton Value
1	Crushed dyke	2.00	$8.00	$16.00
2	" qtz.	1.10	65.20	71.72
3	Qtz. and dyke	2.75	30.80	84.70
4	Crushed qtz. and dyke	4.00	46.80	187.20
8	Face ore all crushed Dyke	3.50	6.40	22.40
32	Grab from borken ore face caved	1.50	62.40 Not Calculated	
33	Crushed dyke material	2.50	23.20	58.00
34	Crushed dyke material	2.50	3.20	8.00
34A	Hard quartz	0.25	548.80 Not Calculated	
	Total	18.50	Total	$448.02

Average Width $\frac{18.50}{7}$ - 2.64 ft. Ton Aver. Val. $\frac{448.02}{18.50}$ - $24.22

At sample No. 32 because of falling ground it was impracticable to reach the ore for sampling and the sample was taken from ore fallen on the floor. This was not included in value calculations. No. 34 A was a rich stringer not included because of its size and irregularity.

The old stopes below the Hamm Drift to the west were being worked and "considerable stoping being done above this level" according to Parker's report. These stopes were abandoned because of bad ground. This bad ground has continued up to the level of the second stope above Hamm Drift and requires constant attention and good mining to recover all of the ore. The ore below this drift cannot be recovered at a profit so has not been considered, but it is expected that, after the second stope above Hamm Drift has passed the old R. 310 W., there will be no difficulty in holding the ground and recovering all of the ore.

Because of the fact that Parker's report shows definitely that this area was abandoned while stoping was still going on the block of ground with in the lines drawn to show Block "A" is considered available ore.

This block has the following dimensions:

Length	Height	Width of Thickness
238 ft.	53 ft.	2.64 ft. Based on samples taken.

$\frac{238 \times 53 \times 2.64}{14} - \frac{33,3000}{14}$ -2378 Tons

The average value of the ore sampled in place agrees very closely with the value of the 185 tons of ore sampled in the bin.

The height ofore above the back of 244 Raise calculated in this block is 13 feet, and one half of the block calculated has been determined on one side. On the hanging wall side of the dyke, which is from 2 to 3 ft. wide, in the second stope where caved ground has exposed it, a hanging-wall stringer of good grade ore has been opened approximately one foot wide.

This could not be reached for sampling and is not included in this calculation.

For the reasons recited above the average value of the stopes and drift as sampled, neglecting the rich streak and grab sample, has been taken as the average per ton value of the block.

The gross value of this block is, then,

Tons		Value Ton	
2378			
Less 185	Broken		
2193 Tons	x $24.22	-	$53,114.00 Gross Value

Possible Ore

The block of ground above the Hamm Drift called Block "B" is considered possible ore and has dimensions as follows:

Length	Height	Assumed Width
205 ft.	115 ft.	2.64 ft.

$$\frac{205 \times 115 \times 2.64}{14} - 4445 \text{ Tons}$$

This territory is unworked ground lying west of old caved stopes and the value of the ore cannot be determined until it is entered by the raises or stopes from the Hamm Drift below.

NET VALUE OF ORE AVAILABLE IN HAMM STOPE

Gross Value 185 Tons stored at Mill	$4533.00	
cost of Milling, $2.00 per ton	370.00	
Net Value		$4163.00
Gross Value Block "A" Hamm Drift	53,114.00	
Mining and Milling 2193 tons @ $6.50	14,254,50	38859.50
		$43,022.50

There will be an added cost due to caved ground because of lack of continuous operation following fire in Jan. 1923.

Total Net Value

This is returned as the net value of ore now available at the property.

Summary of Ore,

And Probable Ore, Reserves

400 Level East probable Ore	$14,934.44
Hamm Drift Developed Ore (two sides)	43.022.50
Total	$57,956.94

DEVELOPMENT AHEAD OF MINING

Judge Wm. M. Cake of the Commercial Mining Company is authority for the statement that the choice of recovering monies expended by the U. S. Co. with interest, was made by that Company six months before the final payment was due or about the beginning of Milling operations by that Company.

The records show that during the three years mill operations of the U. S. Company, the cost for development per ton of the 94,194.2 tons milled was $0.171 per ton, or a total of $16,121.82.

The expenditure for development of this insignificant sum from a gross output of $1,111,796.76 with a net earning from operations of $517,527.95, was doubtless due to the fact that the choice of the option agreement as cited did not require development beyond a point required for satisfaction of the agreement.

The statement of Frank W. Parker who had been superintendent for the U. S. Company, dated January 1st, 1916 shows an approximate estimate of the ore reserves in the mine as of that date to be as follows:

200 Level	Stope	East end	4000	Tons
300 "	"	West "	1000	"
300 "	"	East "	6000	"
400 "	"	West "	2000	"
400 "	"	East "	1000	"
Scattering			1000	"
		Total	15,000	"

The fact that in the subsequent two years operations, when 71,242 tons of ore was sent to the mill, net earnings of $292,603.79 were made, is evidence that the possibilities of profit from proper explorations and development of the ores above 400 Level had not been exhausted.

Development done by the Commercial Mining Company for the final two years operation by that company was less than negligible, in so far as prospecting the deeper levels of the mine were concerned, as follows:

In 1918 94 ft. of drifting on 500 Level

187 " " development on 400 Level

" 1918 180 ft. " " " and above 400 Level

The total expended during that period on the lower levels was $2764.41.

The work done prior to that period on the 400 Level and 500 Level had not opened ore below the 400 Level and in spite of the very limited work done belwo the 400 Level with, presumably, the history of irregularities in the shoot and the effects of faults in the upper workings, no appropriation was made for a fully warranted and extensive development campaign of development at the 500 Level.

VEIN GENESIS WITH EXPECTATIONS AT DEPTH AND ON STRIKE

The genesis of the Rainbow Vein is simple, it having been deposited by ascending thermal solutions from the deep-seated underlying magma.

Only limited sulfides show in the vein material at any point now to be seen, and the ore is essentially free-milling of the California Mother Lode type.

Visible gold frequently occurs in quantities from minute specks to continuous threads along solutions seams as found at E. breast of Hamm Drift during this examination.

Gold is invariably shown by panning and this method of testing, in the hands of experienced operators, affords a satisfactory guide prior to assaying.

This condition abtains at the lowest level now open, the 400 Level, where samples Nos. 16 and 31, taken in this examination, show bright gold in pan tests and no appreciable sulfide content.

The ore occurs in lens lying with the loner axis nearly vertical, so far as can now be determined.

These lenses are recurrent both on their strike and dip and the faulure to find ore at the 400 Level west is probably due to the fact that the west openings have been carried along the lean zone between two lenses.

When this condition occurred in the upper workings, continued drifting opened succeeding lenses in all cases where development was continuously kept up.

The vein crops at the surface at only one point which is near

the air shaft as shwon on Plate No. 6. The uppermost outline of the vein is shwon in the same Plate, correct as to the west extension but incomplete as to east extension, according to Superintendent Hamm who is now in charge of the property and who worked in the upper east stopes.

That the vein is of deep seated origin does not appear to be questionable, that it is not the trunk of an old vein which has been eroded away for any portion of its earlier elevation is definitely shown and that its downward extension will be found in ore by proper development is certain in the opinion of the writers.

A drill hole put down on what is now Mohawk claim, at the point marked on Plate No. 1 was driven on a plane perpendicular to the dip of the vein which it cut at an incline depth of 167 ft., where it showed a width of 9 ft of quartz. No records are available to show the value of this quartz.

The drilling was done with Calyx Type Drill and no core was recovered, the quartz coming up in the form of powder and small fragments.

Whether or not the assays showed pay ore is not conclusive as to the value of the vein, for, in any gold quartz vein carrying spotted values, results from a single drill hole are, under the most favorable conditions, not a criterion to be depended upon except as to position and thickness of the vein.

In the report of Mr. Frank P. King, President of Commercial Mining Company, dated January 8th, 1918, the hole is referred to as follows:

"Nine feet of quartz was encountered some of which carried values.

The calculated position of the quartz, projected underground at normal dip, would be 100 feet in the foot-wall of the vein."

A cross-cut was started from the face of 300 Level west attaining a length not ascertainable at this writing, but was stopped before the vein was reached.

This Level is now caved and development to cut this vein can best be done from the 400 Level West which can be most cheaply cleared of caved or fallen ground. Unlike the eastern extension of the vein, the surface of which is cut by a number of sharp gulches, the western extension lies in unbroken territory and its proper development is fully warranted.

At the 400 Level East the vein occurrence has been discussed in detail under caption of Geology.

The effect of the fault here can be most clearly seen. Based on data now available the direction of the displacement of the hanging-wall of the fault is believed to be to the westerly and it is confidently expected that drifting along the fault in that direction will encounter the faulted extension of the vein which will have backs on an elevation above the plane equivalent to the original height of the fractured portion.

This fault cuts off the vein at about the Hamm Winze and the downward extension there must be found by proper development.

Expectations to the east of 900 Raise on 400 Level cannot be determined without an examination of that portion of the level now caved.

Because of water in winze to 500 Level that could not be re-

moved in time for this examination, winze could not be sampled.

It is shown by mine records to have depth of 100 ft and values under $4.00. The vein is hard quartz with no dyke material, as was to have been anticipated.

About 100 feet of drifting has been done here equally divided on either side or end of the shaft. The east drift cut vein and dyke material at the face, assaying $5.00 per ton according to report of the superintendent now on the ground, but the work was stopped by rush of water in 1917 and 1918.

The driving of this drift with a cross-cut into the area where the downward extension of the faulted portion of the main vein exists should be made as soon as data is available from work done at the contact between the fault and main veins at 400 Level.

There is sound geological reason to believe that the discovery of the downward extension can be made with no extraordinary expenditure of money and resonable assurance that where found the ore will be in as good quantity and quality as in stopes above the 400 Level, with a like assurance that there will be less effect from disturbances after the plane of rupture is passed.

PRESENT MINE EQUIPMENT

Electric power is purchased from Idaho-Oregon Light and Power Company whose line 19½ miles long delivers 3 Phase 60 Cycle current at 23000 Volts to the 3-75 Kva Transformers owned by the Rainbow Mining Company.

Current is here stepped down to 440 Volts for all mine motors and to 110 Volts for lighting.

The present mine equipment consists of,

1-17x10x14 belt driven Imperial Type XB.2 Compressor capacity 677 cu. ft. per minute at sea level or approximately 600 ft. at plant which has elevation of 5100 ft. above sea level.

1-75 H.P. Motor for driving compressor.

1-Single Drum Post Brake Hoist. Diam. of drum 50 ins. Speed of Hoist at present 270 ft. per minute. This Hoist was originally steam driven but cylinders have been taken off and the Hoist changed to chain belt drive by

1-75 H.P. Motor

1-7/8 in. 6 wire, 19 strand steel cable 800 ft. long.

1-Light Angle Iron Cage fitted with automatic safety devices.

1-Alberger Centrifugal Pump, installed at 400 Level as an alternative Pump delivering to sump of

1-Cameron Pump, air actuated, installed at 300 Level.

1-30 H.P. Motor direct connected with Alberger Pump.

1-Goulds Triplex Power Pump set on 400 Level and delivering water to surface driven by

1-25 HP Motor

1-Complete 5 inch water discharge column.

2.NO. 12 Ingersoll-Rand Stopehamer drills.

2-Ingersoll-Leyner Jackhammer Drills.

A Blacksmith and Toolsharpening Shop has full equipment for hand sharpening drill steel.

A timber framing house is in course of construction on site of the building, which, with complete equipment was destroyed by fire in November 1922.

The assay office and bullion melting room are very well equipped and use crude oil assay and tilting-crucible melting furnaces.

All of the mine equipment above listed is in excellent working order except the pumps which need repairs.

Pumping

Except at the time of melting snows most of the water is encountered in the winze to 500 Level. At the time of this examination all of the water was being delivered from the 400 Level to the surface by the Goulds Triplex pump which was operated 4 hours on each of two shifts daily.

In the 500 winze an air lift is installed to keep the water below the 400 Level and this is operated during approximately the same hours as the Goulds pump.

The approximate water flowing from the mine during this examination was 60 to 75 gallons per minute.

The air line now in use is the line installed by U. S. Company.

Camp Buildings

Camp buildings comprise a boarding-house well equipped to handle a crew of 75 men. Bunk-house accomodations are inadequate

and expensive to maintain. They comprise a number of small buildings of size to house one or two menand a larger bunk-house equipped for 25 men. The use of the small houses is expensive because of abnormal requirements for heating.

Quarters for married men have been provided to accomodate 10 small families.

The construction of a large and comfortably equipped bunk-house with provision for entertainment of the unmarried men is anticipated in the near future and is well warranted.

A part of the camp buildings are shown on Plate No. 7.

Milling Plant

Three days after the close of the examination for this report i.e. on January 14th, the entire milling plant was destroyed by fire so detailed description will not be given. It well suffice to say that the mill building was built of wood roofed with corragated iron. Retaining walls and foundations were of concrete. The capacity of the plant was 109 tons daily for 11 months of 1915 and about the same for a part of 1916. Sufficient other details may be found in Plate No. 8, taken from original in the files of Rainbow Mining Company.

The plant was well equipped and made an excellent saving as shown in detail under caption of Output in this Report.

Plate No. 9 is a photograph of the mine plant as it appeared before the fire and on this photograph are designated the buildings still standing.

THE FIRE OF JANUARY 14, 1923

AND FUTURE MILLING PLANT

This fire caused a very serious loss to the Rainbow Mining Company. The mill loss was complete.

The head frame and shaft house were destroyed, and according to long distance telephone message from the mine, six sets of timbers were burnt in the shaft.

The hoist house, transformer house, black-smith shop and compressor house were not injured. The cage can be repaired and only 20 ft. of the cable was injured.

Work of rehabilitation is under way at the date of this writing.

The destruction of the milling plant was most unfortunate at the time when the bins were full of an excellent grade of milling ore and a like grade was available in the Hamm Drift Stopes from all of which ore profits would shortly have been gained, the extraordinary cost of reopening the mine having been already completed.

As the matter now stands it is not advisable to reconstruct a plant at once, the determining of capacity and type of which should properly await the opening of greater ore reserves.

If operations are begun at once and continued on a scale warranted by expectations, development carried on for five or six months should open and block out sufficient ore to permit of determining this desired capacity.

In the meantime, because the Hamm Drift is in broken ground where complete cessation of operations for an extended period would permit the closing of the openings with consequent high expense of reopening, it is advisable to continue breaking all ore available which can be stored, together with ore broken in development, in a surface dump and subsequently hoisted for delivery to a new milling plant.

UNIT COSTS FOR FUTURE OPERATIONS

Power costs, under a month to month contract, have been exhorbitant during operations of 1922-23 but it is believed that, on basis of the campaign of development recommended, a contract can be arranged such as that in force during earlier operations, and on this assumption costs herein given are calculated.

Development will be calculated on basis of following costs for labor and supplies:

Foreman	$200. per month
Timber Framer	4.50 per day
Shift Bosses	6.00 " "
Miners	4.50 " "
Muckers	4.00 " "
Pumpmen	4.50 " "
Hoisting Engineers	5.00 " "
Blacksmith	5.00 " "
Carpenters	5.00 " "
Laborers	4.00 " "

Common lumber for construction and mine timbers costs at present $13.00 per M. delivered but can be cut at the mine with a small saw mill for $8.00 per M., the slabs furnishing all wood required for domestic use and mine heating.

Round stull timber costs 5¢ per lin. foot delivered. Six inch poles cost 2 3/4 cents delivered.

Sawed 3 inch lagging is used which if sawed on the ground, will cost 9¢ each.

New ground can be cheaply broken and when properly timbered headings are kept open without unusual expense.

It is not debateable that mining costs of Commercial Mining Company can be materially bettered. This should not be considered a senseless criticism, but is based on facts ascertainable from complete records and a careful study of underground conditions as shown in sufficient territory still open for examination.

The operations of that company after the U. S. Company's operations had ceased, began with 15,000 tons or about 4½ months milling capacity as ore reserves.

During the first 12 months a cost of $0.082 per ton mined was charged to development or a total of $3219.24.

In this period 39,259 tons was mined and milled so it is evident that at least 24,259 tons of ore was developed at a cost of $3219.24 or about 10 1/3 cents per ton.

This definitely indicates that wide bodies were broken and milled. Inspection of the stopes shows, that while wide bodies have been broken, the vein in the major part was not of great width and that at least one-third of the material broken was valueless dyke material.

Precisely this condition obtained with ore milled in 1922 when in the flat vein, having width of one foot and value of $15.00 to $20.00 per ton the overlying wall rock carrying $0.20 to $0.80 per ton was broken and only the larger pieces discarded.

Using the higher values, computed, this shows:

4 Feet	Value	$0.80	$3.20
1 Feet	Value	20.00	20.00
5	Totals		$23.20

$\frac{23.20}{5}$ = $4.64 Average Value per Ton.

- The inference permissable from above data is that, by breaking clean ore and filling stope openings at once with waste material, less timbering and timber renewals will be required, while percentage costs for profit recovered will be materially reduced.

Drifting in new ground will cost $10.50 per foot on 400 Level and $11.00 per foot on 500 Level including hoisting, pumping and timbering. Average cross-cutting will cost $8.00 and $8.50 per foot respectively on the 400 and 500 Levels.

Sinking in new ground as at 575 Winze from 500 Level will cost $18.50 per foot for the next 100 feet including everything underground.

Raises in new ground, including timbering will cost $12.00 per foot at 500 Level.

Mining costs will not exceed	$4.00
Milling costs will depend upon size and type of new plant and should not exceed.	1.75
Total Mining and Milling To depth of 500 Level.	$5.75

This does not include preliminary development but carries $0.50 per ton for development after expenditures recommended shall have been made.

RECOMMENDATIONS

AND COSTS FOR SIX MONTHS DEVELOPMENT

It is recommended that the available ore in Hamm Drift be broken and stored in a surface dump.

That after geological study and mapping of the surface, 400 Level west be reopened and extended to develop the vein cut by the drill hole on Mohawk claim.

That if, after proper study it is found that extension of the ore shoot may be expected to the East on the company's ground, development be continued from 400 Level E. to open new ore.

In connection with the two last named items the taking over of adjoining properties and the desirable outlying prospects should be carefully considered to the end that if desireable features are shown they may be purchased and developed for the delivery of ore to the new milling plant.

To the East the surface drops away rapidly from the southeast end of Jim Crow, patented, Claim and it is reported that a tunnel can be driven about 3500 feet that will drain the Rainbow Mine to a depth of 35 feet below the 500 Level.

The property or prospects to the west all lie at a greater elevation then the Rainbow Working Shaft and ore could be delivered to the shaft head by an aerial tramway gravity operated.

For immediate development it is urgently advisiable to drift westerly on the contact at Sta. 425 A on 400 Level East. The dis-

placement may not be very great but this drift should be continued with careful observation and precise mapping of local changes to a point of change from the present formation to granite.

The hanging-wall at the intersection is hard, metamorphic slate, and stringers entering from that side should be readily observed though crushed and distorted by action of the fault.

The foot-wall is softer dyke material and the end of the displaced vein may be more difficult to recognize but it is to be expected that at the point of contact between the fractured vein and the fault vein, there will be a decided "Bunching" of the ore, affording easy recognition.

This work will probably open pay ore in the flat or fault vein which may very well pay all expenses of development along that vein.

If study of surface and 400 Level East geology (East of 900 Raise) shows that the displacement was from west to east then crosscutting into the foot-wall of 400 East beyond 900 Raise will cut the displaced portion but it is considered probable or even certain, by the writer, that the displacement has been in the opposite direction, from East to West, as discussed under proper caption.

Of equal importance to the above development is the running of a drift on the unknown vein sampled at 11 ft. West of Hamm Winze on 400 Level East.

Drifting on 500 Level should be carried on as soon as that level can be unwatered and while development is going on above, first extending the East drift along the dyke into unproved terr-

itory and later cross-cutting to open the vein in the position work done on 400 Level will have shown it to occupy.

The 500 Level E. drift should be continued as far as values are shown and formation changes her should be noted with precision.

Named in order of their importance the openings will cost as listed below: 400 Level

Point	Feet Minimum	Cost Per Ft.	Total Cost
Drift W. At	200	$10.50	$2100.00
Sta. 425 ft.			
Drift N. at	100	10.50	1050.00
Sample # 27			
New drilling equipment for these openings will consist of 2-D.C.R.W. 13 Ingersoll-Leyner Drills, complete.			1085.00
Total Cost of Footage Recommended			$4235.00
400 Level E.			500.00
retimbering			
Cross-cutting	200	10.50	2100.00
or drifting			
400 Level W.			
Removing caved			
ground and retim-			
bering	300	5.00	1500.00
Cross-cutting to			
Mohawk Drill Hole			
Vein	650	8.00	5200.00
		Forwarded	$13,535.00

Point	Feet Minimum	Cost per Ft.	Total Cost
		Brought Forward	$13,535.00
Drifting on vein	200	$10.50	2,100.00
500 Level E. Drifting.	500	11.00	5,500.00
500 Level E. Raising to 400	100	12.00	1,200.00
500 Level Cross-cutting	100	8.50	850.00
Cost of new equipment including pumps, piping, winze hoist and 6 Jackhamer machines for development, exclusive of that included in sub-total of $4235.00, cannot be stated definitely until prices asked for from dealers are available, but may be placed at, approximately			8,000.00
Saw Mill and Timber framing machine and house			3,000.00
Truck and Trailer for logging and general freighting			3,000.00
This work should be completed in 6 months operating time and power costs under present contract would be, additional $400 per month.			2,400.00
Superintendence, engineering and general.			4,500.00

If work done during the first three months shows the winze to 500 Level to be properly located for economic extraction of the greatest body of ore, it should be extended 200 feet deeper.

This could be done and 200 feet of drifting completed in the last three months of the given development period.

Cost of Winze			3,700.00
Cost of Drift			2,300.00
		Total Forwarded	$50,085.00

Total Brought Forward	$50,985.00
Shaft house and head frame	2,000.00
Retimbering shaft, so far as known,	400.00
Bunk house. (This sum subject to call)	2,500.00
Total	$54,985.00

The completion of the work noted, exclusive of the winze, will permit of decision regarding a milling plant which can be put in operation within 4 to 5 months later.

The sinking of the Main Shaft should await developments of the lower levels.

TOTAL APPROPRIATION WHICH

SHOULD BE MADE AVAILABLE

As noted above for immediate use	$55,000.00
For use investigation, preliminary development and nominal first payment on outlying prospects, (subject to call).	55,000.00
Reserve fund for sinking Main Shaft when and if required.	17,000.00
Reserve fund for mill	75,000.00
Total	$197,000.00

RESULTS TO BE EXPECTED

FROM DEVELOPMENT

The yearly report of the President of Commercial Mining Company, dated January 8th, 1918, shows that during the fiscal year, there had been mined and milled 31,983 tons of ore, an average of 2665 tons monthly. From this was made bullion recovery of $311,725.90, an average of $9.75 per ton. The stopes above 400 Level East are shown to have finished all of the ore treated during the last few months of that period.

The ore treated came from above the fault which does not appear to have been the channel through which the enriching thermal water traveled. For this reason it may be assumed that ore below the fault will have about the same value as that worked above the 400 Level East.

The tonnage cannot be estimated from data available but there is no sound reason why the block of ground between the 500 and 400 Levels East when found below the fault will not have width and values equivalent to the ore broken between the 400 and 300 Levels.

Records show that this ore paid an excellent profit. Any estimate of probable tonnage or values of the ores between 500 and 400 Levels can be based only on past performance in areas of like dimensions above.

This performance has been distinctly favorable and expectations are that it will be repeated.

BLANK B—ANNUAL REPORT

Rainbow - Regal Randall

This report must be properly executed and filed with the Corporation Commissioner on or before July 1, 1930, in order to entitle a corporation mining for any of the precious metals, coal, or prospecting or operating for oil, or operating an oil well, to pay a license fee of only $10. If not so filed, such corporation must pay the same license fees as are required to be paid by other corporations for gain.—Section 6890, Oregon Laws.

Annual Report to the Corporation Department

FOR THE YEAR ENDING JUNE 30, ~~1930~~ 1937

Of MORMON BASIN MINES, INC.,
(Give legal name in full)

a corporation organized and existing under and pursuant to the laws of the State of Oregon.

The location of its principal office is at No Hotel Baker *Street, in the city of* Baker, *in the state of* Oregon

The names and addresses of principal officers, with the postoffice address of each, are as follows:

NAMES	OFFICE	BUSINESS ADDRESS
F. W. McDonald	President	Seattle, Washington
W. J. Noon,	Secretary	Baker, Oregon
W. J. Noon	Treasurer	do

The date of the annual election of officers is 3d Thursday in January

The date of the annual election of directors is do

	Common With Par Value	Common No Par Value	Preferred
Amount of authorized capital stock	$500,000.00	Shares	$
Number of shares of authorized capital stock	500,000		
Par value of each share	$ 1.00	xxxxxx	$
Amount of capital stock subscribed	$ 200,000.00	Shares	$ none
Amount of capital stock issued	$ 200,000.00	Shares	$
Amount of capital stock paid up	$ 200,000.00	Shares	$
Price at which no par value stock issued	xxxxxx	$	xxxxxx

State amount of capital, represented by stock of no par value, with which the corporation began business $

Total amount of its properties in Oregon (name of claims, lodes, or placers)

The Rainbow Mine of 6 patented & 18 unpatented claims,

The Rainbow Extension Mine of 5 unpatented claims

The Regal Mine of 5 unpatented claims

The Randall Group of 4 unpatented claims

The location of its properties Baker & Malheur Counties, Oregon

The amount of work done thereon and improvements made thereon since the time of filing last report

The amount of output or products of the mines or wells of such corporation from January 1, 19~~2~~36, to December 31, 19~~2~~36, inclusive, none

The value of output or products of the mines or wells of such corporation from January 1, 19~~2~~36, to December 31, 19~~2~~36, $ none

IN WITNESS WHEREOF, I, W. J. Noon, Secretary *of said corporation, have signed this report, this* ..... *day of* ....., *A. D. 193*.....

[CORPORATE SEAL]

W. J. Noon, Sec.

STATE OF OREGON,

County of ..... } *ss.*

I

it passes over amalgamating plates and then to a Dorr classifier. The sands are returned to the tube mill for regrinding from which the pulp goes to the Dorr thickener and then to Pachuca tanks. After agitation in cyanide solution the pulp goes to a Kelly filter press, from which the cake is sluiced to the tailing pond and the clear solution going to gold solution tanks. Precipitation is made with zinc dust and a Merrill filter press is used. The mill is very compact and is a model for this type of ore. The recovery is about 97 per cent. In addition to the mill there is a complete assay and experimental laboratory and also furnaces for refining the precipitate and bullion.

A very complete system of costs is maintained both for mine and mill, so that one may tell at a glance the cost of the different operations. This may vary with the time of year or on account of irregularity of the power. Assay stope maps are kept up to date. Both mine and mill are run in a thoroughly business-like manner.

RAINBOW MINE

(2)

LOOKOUT — PEDRO MT. R MORMON BASIN DIST.

grains of pyrrhotite, and a little magnetite. The groundmass is seen to be made up of very minute feldspar crystals with some quartz. The intergrowth of these minerals is in some places so close that it approaches a micrographic or micropegmatitic texture. The rock has suffered some alteration of the deep-seated type. Many of the feldspar phenocrysts show fracturing and sometimes a development of sericite in these fractures. Other alteration minerals present are: uralitic hornblende, secondary quartz, some actinolite, and a small amount of chlorite.

Judging hastily from the hand specimen alone one might possibly call this rock an andesite. But even then the dull appearance and irregular outlines of the majority of the feldspar phenocrysts are indicative of its intrusive rather than extrusive nature. In thin section the mineral composition at a hasty glance might also appear to be that of an andesite. But, on closer inspection the amount of primary quartz in the groundmass, the microgranitic texture even approaching micrographic in places, and the predominance of feldspar make it clearly evident that this rock is a porphyry genetically related to an intrusive magma that is probably a basic granodiorite or quartz-diorite or perhaps even a diorite in composition. Of course the structural occurrence of this rock is that of an intrusive dike and for this reason unless it were evident that the dike was a feeder to an andesite flow it could not be called an andesite.

The Rainbow vein is not of the fissure type but of the brecciated zone type. The fractured zone varies from a few feet in width in

LOOKOUT - PEDRO MT. MORMON BASIN.

some places to over 50 feet in others. It is made up of fragments of country rock cemented by quartz. The porphyry dike is included in the brecciated zone to a large extent. On both walls of the lode there is a quartz vein. The foot wall vein of the lode is the best developed and has been the most worked. The vein quartz is fine-grained and contains but a very small amount of arsenopyrite and pyrite in which there is some gold. Some of the free gold in the vein is large enough to be distinctly visible, but for the most part it can not be seen. A small amount of actinolite and a little chlorite occur with the quartz, and when these minerals are present the gold values are said to be greater. This is noteworthy as it points toward the precipitating action of the ferro-magnesian silicates.

There has been some movement since ore deposition, as is shown by the gouge and slickensides. The quartz, however, is not fractured to any great extent.

The genesis of this vein is simple, that of ascending thermal solutions from the underlying magma. The presence of the porphyry dike shows that the vein fissure followed this line of weakness.

The mine is worked through a shaft about 500 feet deep but most of the development has been done on the 200 level where the vein has been drifted upon for 1,700 feet. Mine and mill are operated by electricity with power furnished by the Idaho-Oregon Light and Power Company.

The mill has 15 stamps and handles over 100 tons a day. Forty-five per cent of the ore is free-milling. The stamps crush to about 12 mesh from which the pulp goes to a tube mill. From the tube mill

[OVER]

State Department of Geology and Mineral Industries

1069 State Office Building
Portland 1, Oregon

RAINBOW MINE (Gold)

Baker and Malheur Counties
Mormon Basin District

Owners: Mormon Basin Mines

"Location: The Rainbow mine is just north of the divide between California Gulch and a southern tributary of the south fork of Dixie Creek, locally known as Rainbow Gulch.

"History and production: The deposit of the Rainbow mine was discovered about 1901, and the Commercial Mining Co. was organized to develop it. By 1907 the mine was a large producer, with a mill of 19 stamps. The capacity of the mill and concentrator was 50 tons a day in 1909. In 1911 no ore was raised, although development work went forward, and a fair production was made from cyaniding tailings. In 1911 the mine was sold under option to the United States Smelting, Refining & Mining Co., of Boston, Massachusetts. This company operated the mine for 32 months until December, 1915, when, by failing to take up the option, it permitted the mine to revert to the original company. In 1916 the mine had a 400-foot shaft, a 1,500-foot adit, and 3,700 feet of drifts and crosscuts. A 100-ton mill and cyanide plant was on the property. A 100-foot winze was sunk from the 400-foot level. In 1918 the mine was closed and dismantled. A small production was made in 1922 and again in 1925 from dump rock worked in a 10-ton mill. In 1926 the mine was sold to the present owners, the Rainbow & Sunday Hill Mining Co.

"The production prior to 1911 was $242,000. The United States Smelting, Refining & Mining Co. produced $1,083,360 from 95,747 tons of ore, saving $11.40 a ton from $12 mill heads. During 1913 to 1915 the mine was the largest producer in the state, but the production since December, 1915, has been small.

"The mine buildings and shaft timbers have been destroyed by fire, and many of the old stopes have caved to the surface, so that the mine was entirely inaccessible at the time of this survey.

"Geology: The geology of the Rainbow mine has been described by Swartley (14:220) as follows:

"The geology of the Rainbow mine is comparatively simple; the country rocks are chiefly slate with some granitic intrusives on the hanging wall side and some limestones and greenstones on the footwall side. The greenstone (shown on pl. 2 as gabbro and related ultrabasic rock) is an intensely altered rock with an excessive development of secondary hornblende; its original character is hard to make out.

"The vein fissure has a strike of N. 60 degrees E. and in the upper levels a dip of 66 degrees N., while in the lower levels a dip of 54 degrees N. Before the period of vein formation the fissure was filled with a porphyry dike locally known as the "spotted dike". * * * This rock is a porphyry genetically related to an intrusive magma that is probably a basic granodiorite or quartz diorite or perhaps even a diorite in composition. * * * The Rainbow vein is not of the fissure type but of the brecciated vein type. The fractured zone varies from a

few feet in width in some places to over 50 feet in others. It is made up of fragments of country rock cemented by quartz. The porphyry dike is included in the brecciated zone to a large extent. On both walls of the lode there is a quartz vein. The footwall of the lode is the best developed and has been most worked. The vein quartz is fine grained and contains but a very small amount of arsenopyrite and pyrite in which there is some gold. Some of the free gold in the vein is large enough to be distinctly visible, but for the most part it can not be seen. A small amount of actinolite and a little chlorite occur with the quartz, and when these minerals are present the gold values are said to be greater. This is noteworthy as it points toward the precipitating action of the ferromagnesian silicates.

"There has been some movement since ore deposition, as is shown by the gouge and slickensides. The quartz, however, is not fractured to any great extent.

"The genesis of this vein is simple, that of ascending solutions from the underlying magma. The presence of the porphyry dike shows that the vein fissure followed this line of weakness.

"The mine is worked through a shaft about 500 feet deep, but most of the development has been done on the 200 level, where the vein has been drifted upon for 1,700 feet. Mine and mill are operated by electricity with power furnished by the Idaho-Oregon Light & Power Co."

Reference: Gilluly, Reed and Parks, 33:37 (quoted): U. S. Geological Survey Bull. 846-A, Some Mining Districts of Eastern Oregon.

Oregon Department of Geology and Mineral Industries Bull. 14-A, Oregon Metal Mines Handbook, Baker, Union and Wallowa Counties, p. 81-82, 1939.

Rainbow Mine (Gold) | Mormon Basin | Malheur County

Charles H. Kapschull of Deerfield, Illinois, is operating the Rainbow gold mine in Mormon Basin near Huntington, Oregon, under a purchase contract with the owners of the property. Allen Russell, Ernest Boylen, both of Portland, and D. W. Briggs of Boise and E. B. Young of Baker, Oregon, are the principal owners. About 20 years ago the mine was operated with the Sunday Hill group of claims by the Rainbow Consolidated Gold Mining Company. In recent years individuals have worked the property intermittently.

Mining Journal
June 30, 1945