

611

LETTER

ON

WALKER MINE

BY

V. A. HART

Salt Lake City, Utah.  
Sept. 19, 1915.

**International Smelting Company**  
**Tocole Plant**

WM. WRAITH  
GENERAL MANAGER

SALT LAKE CITY, UTAH, Sept. 19, 1915.

Mr. Wm. Wraith, General Manager,  
International Smelting Company,  
Salt Lake City, Utah.

Dear Sir:-

This letter states my impression and opinion at this time of the Walker Mine, located in Plumas County, California.

The reports on this property by Messrs Cowan and Hansen go into detail on claims, location, timber, wood and water, all of which is apparently as stated, although as yet I have made no investigation of claims, titles, &c. They also state the results on two flotation tests on the ore. This, also, has not been investigated.

The points on which I desire to lay special stress, and on which I may differ some from the statements in the above mentioned reports are relative to climatic conditions, ore, its deposition and tonnage, cost of mining and development, and cost of haul and freight.

CLIMATIC CONDITIONS: The mine is situated at an altitude of about 6700 feet or approximately 2000 feet above Portola, the shipping point. Portola has been known to have fourteen feet of snow on the ground at one time, and the intervening country and the mine can be safely estimated at from 6 to 15 feet of snow on the ground at one time per winter. If the roads can be kept open, this will materially help in the hauling although it will leave the roads across the numerous flats impassable for some months in the spring.

Mr. Wroith -2.

The attached memorandum shows my hauling estimate from which I have my hauling charge of at least \$6.50 per ton of concentrates.

WORKINGS, ORE, DEPOSITION, etc: The plan and sectional sketches which accompany this letter show the extent of the main workings. From these it will be seen that the ore has been developed for a length of about 110 feet on the 65 foot level and 13 feet on the 125 foot level.

This ore is a heavy primary sulphide (chalcopyrite with much pyrite) which occurs in two pronounced forms, first, as an impregnation of the diorite, so-called (a very hard dense black felsitic rock inclined to be very blocky), and, second, as a filling or cementing material accompanied by much quartz which has filled the interstices of the brecciated diorite along the fault. The first form shows only on the 65 foot level. The north end of this level has softened considerably, and the partially disintegrated diorite has been enriched by some secondary bornite. A small oxidized slip showing on the foot wall side.

A small half inch seam, without gouge matter, marks the hang wall side or east limit of the ore. This shows a pronounced strike of about N 10° to 22° W and a dip of about 75° to the east. This checks the location of the ore on the 125 foot level.

The amount of brecciation has been very small. Instead of much fine crushing near the slip, the tendency has been toward blocking and this is clearly shown by the vertical walls of the crosscuts, so

Mr. Wraith -3.

termed, on the two levels. These crosscuts really run with the formation and are, in my opinion, along cross breaks at approximate right angles to the main break. Sampling at these points is apt to give one an erroneous idea as to the width of mineable ore, hence, the only safe way to prove or disprove this contention is to perform the work as outlined by broken lines on the plan sketch.

This tendency towards large blocking and the exceeding hardness of this formation, together with no defined footwall are points that mitigate very much against the property.

Miners state that the quartz is "bunchy", a condition expected in a deposition of this sort. Ore is difficult to follow. (See sketch map showing where ore was evidently lost and they hunted for it.) "Two runners with butterfly valve type drills made from 5 to 7 buckets of muck (35 to 49 cu. ft.  $1\frac{1}{2}$  to  $2\frac{1}{2}$  tons) per shift on drifting on 65 foot level," - Workman. It took two good miners three shifts to put in one round of holes (14 holes  $3\frac{1}{2}$  to 4 ft. deep) on the 125 ft. level. Holes were loaded within 6" of collar with 50# powder in order to break wall. This was at a point near where sample No. 96 was taken. It required from 15 to 23 molls to cut some of the harder samples and then they were very shallow trenches. Shaft was contracted for \$30.00 per foot - power and hoisting muck furnished. Contractor worked three shifts and quit.

The above will show a condition which means high mining and development costs. Water is an unsolved problem. At present it is very easily handled. What it will do in depth is problematical.

Mr. Wraith -4.

From a tonnage standpoint, I at present would not feel safe in estimating over five to six feet in thickness of workable ore, and this would be Probably Ore only. I consider a primary ore such as this is to be good for great depths if the interstices or voids were present in which it could form. The chances are that the harder or non-disintegrated material at depth will not be impregnated and only ore of the second form mentioned above, will be found.

The attached memorandum shows probable and possible tonnage together with estimated costs and net profits per ton under different copper markets, based on Mr. Cowan's expressed willingness to contract work at the figures used.

As to the possible length of this ore shoot, I can only state this: The shaft is located on a likely gossin cropping. To the south is a flat which shows nothing. To the north the gossin shows up the hill for a total length of sixty to eighty feet. Above this or further to the north is a heavy iron capping of limonite and hematite. No gossin to be seen. This iron shows a width of from 60 to 150 feet and is easily traceable for at least 1500 feet and probably much more. The present ore shoot now extends slightly further north than the surface gossin. Whether it will continue on under the iron for a long distance, I cannot say, but I do not think that it will. If this iron cropping should be underlain by ore, the property would be an immense one.

The conditions under which you are investigating this property are, I believe, as follows:-

Mr. Wraith -5.

For \$65,000 you get 65,000 shares of preferred stock together with 65,000 shares of common stock as bonus. Total preferred stock issued 100,000 shares. This preferred stock is to be taken up from the first \$100,000.00 net proceeds obtained from the ore.

For an additional \$40,000 you are to obtain a further 250,000 shares of common stock, making you a total of 315,000 shares. This together with an equal amount held by other parties in a voting trust, giving you practical control of the property. This means a net expenditure of \$40,000 (after the \$65,000 for preferred stock has been returned) less smelting profits for 315,000 shares of stock or over one-fourth of the property - capitalization being 1,250,000 shares.

These conditions are such as to well merit the expenditure of about \$330.00 on the development now under way. An excellent gamble at the very worst.

Should this property prove up 12 feet of ore of average grade as sampled, I would not hesitate a moment on closing with the above conditions and optioning all other stock possible on nine months' and upward time without cash payments. If at a figure of 50¢ or less, I would feel that a 10¢ per share payment would be justified.

If the new work proves up 12 feet of ore, of grade used in memorandum, I would say that under better than a 14¢ copper market, you would have the required tonnage of very probable ore - over 20,000 tons - practically in sight.

Mr. Wraith -6.

Should, however, this thickness fall to six feet, it means that the present development must be extended for another hundred feet in depth, and an additional eighty feet in length or a total block of ore one hundred eighty-nine feet in length by two hundred feet in depth must be developed in order to expect \$100,000.00 net proceeds on a 14¢ copper market, proportionately less if market is higher.

This condition makes this proposition a gamble pure and simple, and one would hardly be justified in taking it unless a large percentage of stock could be optioned at a very nominal figure. A speculative value on the entire property, under this condition, of anything over \$250,000.00 to \$300,000.00 would be considered excessive and then it would be considered only a fair gamble.

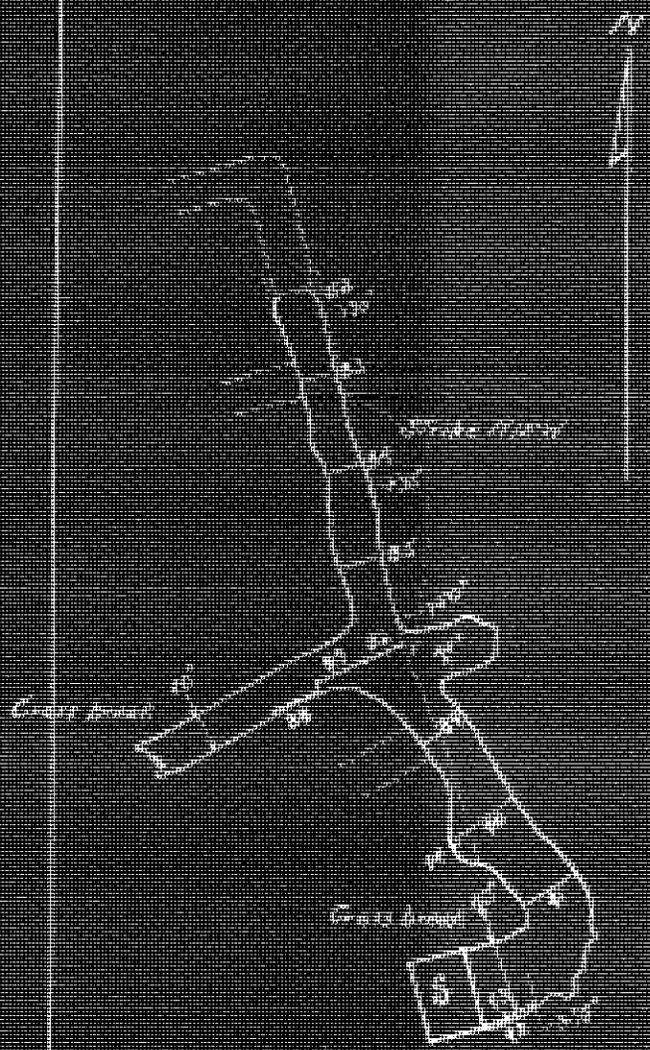
Respectfully submitted,

VAH:H

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PLAN  
WALKER PINE

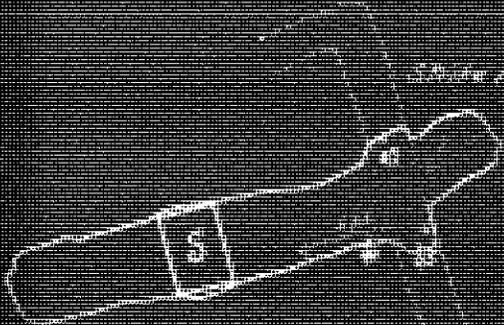
7" = 20'



PLAN 65' LEVEL

PLAN 65' LEVEL

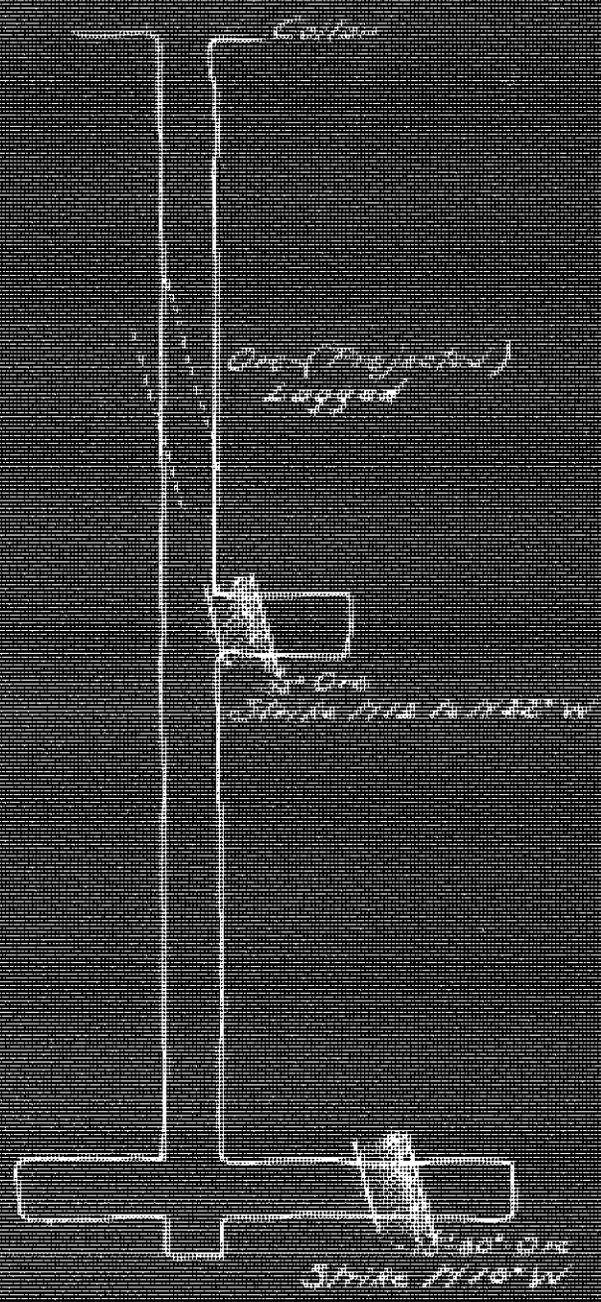
STATION	NORTHING	EASTING	BEARING	DISTANCE
70	1000	0		
81	5	0		1000
82	0	10		1000
83	0	20		1000
84	0	30		1000
85	0	40		1000
86	0	50		1000
87	0	60		1000
88	0	70		1000
89	0	80		1000
90	0	90		1000
91	0	100		1000
92	0	110		1000
93	0	120		1000
94	0	130		1000
95	0	140		1000
96	0	150		1000
97	0	160		1000
98	0	170		1000
99	0	180		1000
100	0	190		1000
101	0	200		1000
102	0	210		1000
103	0	220		1000
104	0	230		1000
105	0	240		1000
106	0	250		1000
107	0	260		1000
108	0	270		1000
109	0	280		1000
110	0	290		1000
111	0	300		1000
112	0	310		1000
113	0	320		1000
114	0	330		1000
115	0	340		1000
116	0	350		1000
117	0	360		1000
118	0	370		1000
119	0	380		1000
120	0	390		1000
121	0	400		1000
122	0	410		1000
123	0	420		1000
124	0	430		1000
125	0	440		1000
126	0	450		1000
127	0	460		1000
128	0	470		1000
129	0	480		1000
130	0	490		1000
131	0	500		1000
132	0	510		1000
133	0	520		1000
134	0	530		1000
135	0	540		1000
136	0	550		1000
137	0	560		1000
138	0	570		1000
139	0	580		1000
140	0	590		1000
141	0	600		1000
142	0	610		1000
143	0	620		1000
144	0	630		1000
145	0	640		1000
146	0	650		1000
147	0	660		1000
148	0	670		1000
149	0	680		1000
150	0	690		1000
151	0	700		1000
152	0	710		1000
153	0	720		1000
154	0	730		1000
155	0	740		1000
156	0	750		1000
157	0	760		1000
158	0	770		1000
159	0	780		1000
160	0	790		1000
161	0	800		1000
162	0	810		1000
163	0	820		1000
164	0	830		1000
165	0	840		1000
166	0	850		1000
167	0	860		1000
168	0	870		1000
169	0	880		1000
170	0	890		1000
171	0	900		1000
172	0	910		1000
173	0	920		1000
174	0	930		1000
175	0	940		1000
176	0	950		1000
177	0	960		1000
178	0	970		1000
179	0	980		1000
180	0	990		1000
181	0	1000		1000



PLAN 125' LEVEL

PLAN 125' LEVEL

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WALKER MINE  
SECTION THROUGH SHAFT  
EAST-WEST PLANE

8-17-10-11

WALKER MINE

Memorandum  
Sept. 15, 1915.

Average Ore 5 - 6 ft. width (less two high samples)

Cu 6.57%                      Ag 3.74 oz.                      Au .05 oz.

Conc.  $3\frac{1}{2}$  to 1 on 90% extraction

Cu 20.7%                      Ag 11.79 oz.                      Au .20 oz.

Smelter value: Cu - 20¢ -  $2\frac{1}{2}$ ¢

Ag 95% @ 50¢

Au @ \$19.00

	Cu @ 14¢	Cu @ 15¢	Cu @ 16¢
Ten Conc.	\$54.71	\$58.65	\$62.59
Deduction - Freight	\$6.40		
Treatment	<u>3.00</u>		
	9.40	9.40	9.40
Net smelter return	\$45.31	\$49.25	\$53.19
Haul	<u>6.50</u>	<u>6.50</u>	<u>6.50</u>
Net at Mill Ten Conc.	\$38.81	\$42.75	\$46.69
Net at Mill Ten Ore	11.09	12.21	\$13.34
Mining, Milling, develop- ment, tramming costs, on 12 ft. vein, minimum cost	<u>5.00</u>	<u>5.00</u>	<u>5.00</u>
Net value per ton -	<u>\$6.09</u>	<u>\$7.21</u>	<u>\$8.34</u>
Maximum cost	6.00	6.00	6.00
Net value per ton	<u>\$5.09</u>	<u>\$6.21</u>	<u>\$8.34</u>

On 6 ft. vein, minimum cost .....	16.00	16.00	16.00
Net value per ton .....	15.09	16.22	17.34
Maximum cost .....	6.50	6.50	6.50
Net value per ton .....	4.59	5.71	6.84
Average net value per ton 12' vein... 14% Cu	5.59	6.71	7.84
Average net value per ton 6' vein... 4.84	5.96	7.09	
Tons required for \$100,000.00 pre-ferred stock.....	20,660	16,780	14,100
This means a block 12' thick 100' deep, and	189 ft. long	154 ft. long	129 ft. long
This means a block 6 ft. thick and 200' deep and	189 ft. long	154 ft. long	129 ft. long

Block now partially developed -

Approximately 100' long

Opened at one point 125' deep (100' depth of ore)

and with 5 to 6 feet plus of thickness.

Mining, Development, Trimming, Milling.

Mining on basis of an ore sheet 12 ft. wide and 300 ft. long. Present shaft 125' deep, with 65 and 125' levels.

Development:

Shaft 100 ft. @ \$40.00	\$4000.00
Drift on 65 ft. level 220 ft. @ \$10.00 =	2200.00
" " 125 " " 300 " @ \$10.00 =	3000.00
" " 225 " " 300 " @ \$10.00 =	3000.00
Crosscut to ore on 225 ft. level 40 ft. @ \$10.00 =	400.00
Crosscuts on all levels 100 ft. @ \$10.00 =	1000.00

Raises:

125 to surface	
225 to 125 (two) 350 ft. @ \$6.00 =	2100.00
Chutes and Timbering 20 @ \$40.00	800.00
	<u>\$16500.00</u>

Block developed 300' long - 200' deep - 12' thick

Allowing 1/4 barren ground - approximately 50,000 tons ore.

Development cost approximately 33¢ per ton.

On six foot vein - same condition - cost 66¢ per ton.

Development -	.33	.66
Mining -	\$3.50 to \$4.50 per ton (12 to 6 ft. vein).	
Trimming	.15	.15
Milling	1.00	1.00
	\$4.98	\$6.31
Estimated	\$3.00 to \$6.50	

Hauling - 8 up - 8 tons per trip.

Cost:

8 horses @ \$1.00 (feed & shoes)	\$8.00
Driver	4.00
Driver's food and wagon upkeep	1.50
Man unloading 1/3 time (3 outfits running)	1.00
Profit on outfit	<u>2.00</u>
Cost to Company per day	\$16.50
Trips 3 to 4 days, depending on weather & roads.	
Total	\$49.50 - \$66.00
Cost per ton Conc.	\$6.20 - \$8.25

3 outfits, capacity 24 - 30 tons per day - practically no back freight. No rest days allowed. A man must be feeding a bunch of extra stock in order to keep a team constantly on the road.

Wastage used \$6.00 to \$8.00 per ton.

Average about \$6.50 with lots of good sleighing per year.

Concentrates @ \$6.50 per ton or \$1.00 per ton ore.

Ratio of concentrates 3 $\frac{1}{2}$  to 1.

Freight:

From Fortels on ore, the net realizer returns on which do not exceed

a valuation of -	\$40.00	\$50.00	\$60.00	\$70.00	\$80.00
Freight .....	\$5.30	\$6.00	\$6.40	\$6.75	\$7.00

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REPORT ON

WALKER MINING COMPANY

BY

V. A. HART

November 17, 1915.

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International Smelting Company  
Tunnel Plant

WM. WRAITH  
GENERAL MANAGER

SALT LAKE CITY, UTAH, Nov. 17, 1918.

Mr. Wm. Wraith, General Manager,  
International Smelting Company,  
Salt Lake City, Utah.

Dear Sir:-

The following report is on the property  
belonging to the Walker Mining Company, an Arizona  
Corporation.

This property is located about twenty-five  
miles north of Fortale, a station on the Western Pacific  
Railroad, in Pima County, California.

CLAIMS, TIMBER, FOOD, WATER:

The company has 54 or 55 claims, some fractions  
were recently taken up, 10 of which are in full, patented.  
Claims and surrounding country are covered by a heavy growth  
of pine, fir and balsam timber, sufficient to last the mine  
for an indefinite period.

The mill claims have ample spring water for all  
ordinary mill and domestic purposes.

CLIMATIC CONDITIONS:

The mine is situated at an altitude of about  
6700 feet, the mill some 500 feet lower and distant about 4700  
feet by tram. (Mill building partially completed - tram not  
yet erected.)

There are heavy snows to contend with in winter, the average depth being 8 to 10 feet, while as much as 15 feet has been known to be on the ground at one time at the mine and in Fortola.

If the roads are kept open by regular traffic, the winter time will be the most favorable for the hauling of the concentrates, as the roads are practically over level ground the greater portion of the way. No slides or heavy repairing of roads to contend with once they are in good condition.

WORKINGS, PLAN AND SECTION, ETC:

The property is opened up by a vertical shaft 125 feet in depth with a 95 ft. drift on the 65 foot level and about 45 feet of drifting on the 125 foot level besides numerous crosscuts. (See maps, plan and section.)

A tunnel driven sometime ago also is shown. This, however, did not cut the main ore body. Croppings are shown some 40 feet south of the tunnel face which, I believe, are on the continuation of the present ore sheet.

The vein is a fissure in a hard, heavy, dense, dark felsitic rock, very likely a diorite. The ore is a heavy primary sulphide carrying about 12% iron. The copper is in the form of chalcopyrite with gold and silver values. At places on the upper, or 65 foot level, a little secondary bornite was seen.

The diorite is very blocky, the interstices of which are filled with the silicious iron ore. The diorite is also heavily impregnated, possibly replaced, by the same material. Some portions, resembling massive diorite, I find to run ore. This class of ore should make to great depth.

The hang wall is very well defined and should be easy to mine to - the foot wall, however, of the ore is not easy to determine as the values grow less to the west (strike of the vein approximately east-west, dip 70° to 80° to the south). There is a wide mineralized zone lying to the north of the minable portion of the vein, that contains much low grade material. This, however, cannot be classed as ore at this time and will not be further considered.

On the edge of the slope of the hill which rises at an angle of about 15° is a very likely looking mass of gossin. Above this and extending for 1500 feet or more is a heavy iron outcrop, limonite and hematite. This outcrop is from 50 to 150 feet in width, very strong and promising.

A small portion, 10 feet in width, approximately above the continuation of the present ore shoot showed 0.20% cu.

The present ore shoot, as developed, is now beyond the limits of the gossin on the surface. If ore makes under this iron capping there is almost no end to the possibilities of the property. I do not think, however, that it will do so, but it is well worth proving up.

TONNAGE, GRADE, 140:

A study of the accompanying maps will show the following: Ore by weighted averages runs:

As .0899 oz., Ag. 3.29 oz., Cu 6.56%.

This includes only crosscut averages, all crosscut samples being weighted according to their length, four crosscuts on the 65 ft. level and three on the 135 ft. level being used. The two levels were then combined by straight arithmetical average, although the 65 ft. level is opened up for about twice the length of the 135 foot level.

The width of the ore is over ten feet. You will note crosscuts on the lower level that are still in ore. I use 10 feet, however, in tonnage calculations. This is very conservative.

You will remember that we suggested some development in this property to fully determine the width of the ore - the blocky condition being such that I was afraid that the crosscut, as run, was on a cross break. The later crosscuts still show the same blocky condition but they have the ore. The various crosscuts show as follows:

First or 65 ft. level.				
	Width ft.	As	Ag	Cu
(S) Shaft Crosscut	+ 7'	.05	3.35	4.97
(1) Crosscut No. 1	15'	.006	4.80	8.66
(2) " " 2	9.8'	.03	3.51	9.06
(3) " " 3	12.5'	.015	1.94	6.07
General Average for level	10.87'	.0399	3.41	7.35

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Second or 125 ft. level.

	Width ft.	Am	Ag	Cu
North crosscut	+11.0'	.044	3.24	5.108
Middle "	10.0'	.037	2.75	4.90
South "	+7.0	.04	3.70	6.45
General Average for level	+9.55	.04	3.18	5.37

Note: In shaft crosscut only 5.6 feet were sampled, but the ore extended into the shaft so 7 feet of ore was allowed.

In No. 1 crosscut 15 feet were sampled, but a width of only 15 feet was allowed.

The north and south crosscuts are still in use. General average of both levels.

Width 9.95 ft., Am .0399 Ag 3.29 Cu 6.36

I believe that a deposit of this nature can be safely estimated to a depth of fifty feet below the present workings, or to a total depth of 175 feet. The extreme length of the ore sheet as now opened up is 115 feet. Ore extends practically to the surface, but I deduct 10 feet, giving me a block 165 ft. deep x 115 feet in length by 10 feet in thickness. Allowing 11 cu. ft. per ton (it will run less) this shows 17,250 tons of very probable ore, a portion of which is already mined.

Under a 14 cent copper market, this ore should net in the mine \$5.07 per ton. To retire \$100,000.00 worth of preferred stock will, at \$5.00 net per ton, require 20,000 tons. A horizontal extension of the above ore body for 15 feet will

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bring the tonnage up to that figure. I feel that it will do much more than that.

On a 15 cent copper market, about 18,500 tons should net the \$100,000, while on a 16 cent market about 14,000 tons would be needed.

COST OF TUNEK AND WAGON HAUL:

Larger drills have shown that this ore can be handled at a lower figure than indicated by the results obtained with small butterfly type machine.

The country rock works very hard even with large drills but little of this need be moved except in shaft sinking and crosscuts to the ledge. I believe that the figures used, viz., sinking \$40.00, drifting \$10.00 and raises \$6.00 per foot can be bettered except possibly the sinking as the drifts and raises will either be in ore or be abandoned.

The hauling cost of concentrates was estimated at \$6.50 per ton. A contractor who has hauled in that country for 15 years estimates the cost at \$7.50 per ton under present road conditions, but he allows himself a clear profit of \$1.50 per span of horses.

The Feather River Lumber Company is very likely to extend their logging line about 3 to 9 miles into that section next year. This would mean a 15 to 16 mile haul which should reduce the cost to about \$5.00 per ton.

In any event, an expenditure of from \$8,000.00 to \$10,000.00 on roads along the soft Grizzly Creek Meadows will be advisable so soon as the tonnage will justify same.

RECOMMENDATIONS:

I would recommend the taking over of 65,000 shares of preferred stock carrying 7% interest and share per share bonus of common stock.

I would further recommend the optioning of 250,000 shares of common stock for the sum of \$40,000.00 due on July 1, 1916.

The optioning of 215,000 shares of common stock at one dollar a share seems at this time to be a high figure but I consider it advisable to tie it up as there is no telling what the development to the north may show.

Under these options we are to have the privilege of prosecuting development work as we see fit, i.e., the Walker Mining Company is to do this work for us at cost or not to exceed the figures above stated. We are to have the right to take the property over and push this development in case it is not crowded to suit us.

The first development suggested would be the sinking of the shaft to a depth of 175 feet or 50 feet further than it now is and then drive both ways on the 175 ft. level and to the north on the present 65 foot level which is now gaining about 1 foot of back for every 4 feet driven.

If ore of a commercial grade is encountered for a length of four hundred feet or more on these two levels then the sinking of the shaft for an additional two hundred feet with drifting both ways and continued drifting on the 175 foot level will be advised.

The first development suggested - 50 feet of sinking and approximately 700 feet of drifting with probably two raises for air of about 100 feet each will cost not to exceed \$10,000.00. This or even less will show us whether we wish to go further and will show whether or not the taking over of the 250,000 shares for \$40,000.00 is advisable. With proper equipment, this work should be done in about two and a half months. Work out here is still in the experimental stage so no accurate estimate as to how much can be done is possible.

The further sinking of 200 feet, if justified by the showing above, with some drifting on the 375 level and further drifting on the 175 foot level, will not show a net value of a million and a quarter dollars blocked, but there may be changes in width and values that may justify the taking over of this stock. Should the 375 level hold to grade and size and the drifts to the north still show well, the chances are that in a deposit of this nature, one would be justified in recommending the taking over of the 315,000 shares of stock.

I realize fully that the time is too short to expect

to block out the price at which the property is rated, but I do believe that it is possible to do sufficient work to justify the purchase price even if it is not completely blocked out.

Water is an unknown factor which may completely upset our calculations.

The proposition sums itself up to me as being well worthy of a trial.

All of the above is based on the supposition that titles, stock issues, etc., are all sound.

Respectfully submitted,

*V. A. Hart*

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BALTIMORE MINE

Memorandum

November 18, 1916.

Average ore - 10' + in width. All crosscut samples.

Au .0399, Ag 3.29, Cu 6.36%.

Iron on mill tests runs 12.73%.

Concentration 3 $\frac{1}{2}$  into 1 on 93% extraction on Cu, 85% extraction on Ag and 75% extraction on Au. (Mill tests show a greater extraction.)

Smelter Value:

Cu - 20¢ @ market - 2¢ cents.

Ag - 98¢ @ market (80 cents est.)

Au - 2 (\$19.00 per ounce).

Value per ton concentrates:

Cu @ 14¢	Cu @ 15¢	Cu @ 16¢
\$52.20	\$56.14	\$60.08

Fagon Haul 26.80

Freight 6.40

Treatment 3.27

\$16.17	\$16.17	\$16.17
---------	---------	---------

Net value per ton of concentrates at Smelter.

\$56.03	\$59.97	\$63.91
---------	---------	---------

Gross Value per ton-  
of ore at mine

\$10.28	\$11.62	\$13.55
---------	---------	---------

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Cu @ 14¢      Cu @ 15¢      Cu @ 16¢

Costs

Mining            3.75  
 Development      .35  
 Framing           .15  
 Milling            1.00

35.35            35.25            35.25

Net value per ton of  
 ore in the mine under  
 14 to 16 cent copper  
 market

36.07            36.17            37.30

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HAULING COSTS

Distance 28.4 miles to mill from Fortola.

(A possible reduction to 14 to 16 miles if Feather River Lumber Co. extends their line, as they will soon be compelled to do.)

Roads - part of the year a portion, or about 5 miles, will be soft, - should be graded.

Costs: On basis 10 up - 10 tons per trip.

10 Horses @ \$1.00 each, feed and shoes,	\$10.00
Driver	4.00
Driver's board and wagon upkeep	1.50
Man loading into cars 1/3 time (5 outfits)	1.00
Profit on outfit	<u>2.50</u>
	\$19.00

One round trip in three days, no rest days allowed. Extra horses must be fed and corral men paid.

10 tons @ \$57.00, or \$5.70 per ton of concentrates.

\* \* \* \* \*

Freight rates from Fortola to Keeble:

Valuation per ton	\$40.00	\$50.00	\$60.00	\$70.00
	\$5.80	\$6.00	\$6.40	\$6.75

American Geological Documents Collection, American Heritage Center, University of Wyoming

Mining, Development, Dressing, Milling.

Mining and development as on ore sheet 10 feet wide  $\pm$  500 feet long. Present shaft 125 feet deep with 95 feet of drifting on the 65 ft. level and 45 feet on 125 ft. level besides crosscuts.

Sinking 50' @ \$40.00 per foot	- - - - -	\$2,000.00
Drifting 500' @ \$10.00 "	- - - - -	5,000.00
Raises 200' @ \$5.00 "	- - - - -	1,000.00
Crosscut on 175' level 25' @ \$10.00 per foot	- - -	250.00
Chutes and Timboring, 20 @ \$40.00 each	- - - - -	<u>800.00</u>
		\$9,350.00

Block opened by the above 300' long  $\times$  10 ft. thick, by 165 ft. high - approximately 45,000 tons. Allowing 1/4 waste - Cost per ton 85¢.

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**WALKER MINING COMPANY**  
PLUMAS COUNTY, CALIFORNIA

FREIGHT ADDRESS:  
GULLING  
POSTOFFICE AND EXPRESS:  
PORTOLA

V. A. HART, MANAGER

Portola, Calif., Dec. 30, 1919.

Mr. M. H. Gidel,  
Geological Dep't., Anaconda Copper Mining Co.,  
Butte, Montana.

Dear Mr. Gidel:

I wish to acknowledge receipt of the 100-scale maps and sections. I should like very much to have a set of colored white prints of same. I note that some of the workings are beyond the bounds of the 40-scale set. Therefore, I believe it would be more satisfactory to return that set to us for posting before any geological data is placed on them.

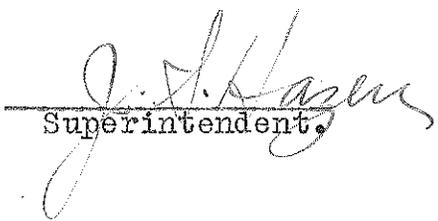
We now have a drill hole in 247' in the lower adit, and at a later date will send you a sketch of this, and the work of the last few weeks. We expect to reach the best portion of the vein within a short time.

With best regards.

Yours very truly,

WALKER MINING CO.

JSH-MWT

  
Superintendent.

611

11/10/07 187

①

# Anaconda Copper Mining Company

GEOLOGICAL DEPARTMENT

REPORT ON

RECENT DEVELOPMENT

IN THE

WALKER MINE

PLUMAS COUNTY, CALIFORNIA

BY

M. H. GIDEL

Butte, Mont.  
Oct. 1920.

16304.10

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REPORT ON

RECENT DEVELOPMENT

IN THE

WALKER MINE

PLUMAS COUNTY, CALIFORNIA

INTRODUCTION

A drill-hole from the main crosscut out 2' ...  
On August 23rd. and 24th., 1920, I took geologic notes in the new work in the Walker Mine. My previous examination was made in December, 1919, since which time considerable development has been done on the Third and Lower levels. The accompanying Long-Section has been prepared from data furnished by Mr. V. A. Hart for the purpose of showing the new ore developed on the Lower level in relation to the faults. In drifting north-westward on the vein, a large ore shoot on the upper levels. Geologic features such as faults and dikes are also shown, and portions of the vein averaging three percent or more in copper are colored red.

NEW DEVELOPMENT

Third Level

On the Third Level the main drift was extended 315 feet north-west on the vein. Three small shoots of ore having a combined length of 155 feet were developed here. See map. From this new drift, a 170 foot diamond drill hole into the hanging-wall cut no mineralization of consequence.

At a point 110 feet north of the winze beyond the intersection of the large ore-shoot and fault, another hole was drilled into the hanging-wall. No vein was found here. The purpose of this work was to determine whether or not the ore-shoot was displaced to the right by the fault.

The main drift southeast was extended 140 feet in irregular oxidized vein.

#### Adit or Lower Level

From the main crosscut on the Adit Level, the Walker Vein has been developed for a distance of 1400 feet, largely by drifting. A drill-hole from the main crosscut cut 2.1 per cent copper ore, which point marks the present southern limit of development on the vein in the property. The discovery of ore bunches in the first 60 feet of drifting from the crosscut was encouraging in view of the fact that the main ore shoot in the upper workings was several hundred feet farther northwest, and that it had a flat pitch northward between the Third and Fourth levels. In drifting northwest-ward on the vein, a granite dike 40 feet wide was cut. This dike cut the vein and contained inclusions of ore and gneiss near the south contact. The vein was displaced by the granite, presumably to the left, although another vein was found to the right in drill-holes. The vein exposed in the crosscuts to the left (west) north of the dike is quartzy and contains much less sulphide than that portion of the vein south of the dike. The vein cut in the drill-holes to the right or hanging-wall corresponds mineralogically to the vein in drift south of the dike.

In drifting north on the vein, another granite dike six feet wide was cut. Small lenses of ore were developed. It is probable that the south portion of the main ore shoot occurs in the drift between points that are 220 feet and 100 feet south of the raise. For about 100 feet on either side of the raise

the vein contains less than two percent copper. Ore in the raise begins at a point about 35 feet above the sill. From a point 100 feet to 270 feet north of the raise, the ore is 10 to 15 feet wide and averages 3.40 per cent copper. Northward beyond this limit, the vein shows an average copper content under 2.5 percent. A clay seam has appeared on the hanging-wall side of the vein. It is probably the same fault or wall that terminates the ore body on the upper levels.

A portion of the above described drift does not develop the full width of the vein. Assays shown on the map without widths were obtained on car samples from a drift of normal size, that is, five or six feet wide.

From the drift on the lower level five holes were drilled. Two holes 580 feet apart were drilled into the foot-wall. No veins were cut, which fact would lead one to correlate the foot-wall vein in the main crosscut with that drifted on north of the forty foot granite dike.

Three holes were drilled in the hanging-wall side of the drift. The first one is located about 90 feet north of the larger granite dike. A strong vein was cut in this hole which contains ore. Another hole 200 feet north of this cut lean quartz, and a third hole near the raise cut no mineralization. This hanging-wall vein is probably a branch of the main vein, diverging from same to the southeast.

#### CONCLUSIONS.

Oct. 1920. The ore developed on the Lower level beneath the ore shoot on the Fourth level totals 320 feet in length, has a width of nine to fifteen feet, and contains about 3.3 percent

copper. On the Fourth level the ore shoot is 700 feet long, is 15 to 30 feet wide, and is estimated to contain 4.53 per cent copper. The Lower level shows a split in the ore shoot with lean vein intervening. Briefly stated, the showing of ore on the new Lower level is not as good as that developed on the upper levels of the mine. There is more quartz in the vein on the Lower level than on levels above.

However, there remains the possibility that a flat pitching portion of the ore shoot lies northwest of the present face of the Lower drift on the hanging-wall side of the fault. This is suggested only by the meagre exposure of a wedge-shaped body of ore on the hanging-wall side of the fault near the winze on the Fourth level.

It is probable that more ore can be developed beneath the small shoots exposed in the north end of the Third level. Drifting should be continued in this direction on the Lower level with adequate drilling or crosscutting into either wall at intervals of four hundred or five hundred feet.

Respectfully submitted,

*M. H. Giddell.*

Butte, Mont.  
Oct. 1920.

Aug 1988

INSPECTION OF  
WALKER MINING COMPANY'S CONCENTRATING PLANT  
LOCATED NEAR SPRING GARDEN,  
PLUMAS COUNTY, CALIFORNIA

and

RECOMMENDATIONS FOR INCREASING CAPACITY  
OF  
THE PRESENT CONCENTRATOR

- - - - -

Byard S. Morrow, B.S.M.E.  
Superintendent of Concentration  
Anaconda Copper Mining Company.

- - -

Control File  
NOV 10 1988  
Frederick: Liles

In order that the Walker Mining Company's present concentrating problem may be intelligently discussed, the writer submits two flowsheets. Flowsheet No.1 is the one in use at the time of the writer's visit, and flowsheet No.2 is the flowsheet permissible with present equipment as installed.

As the Walker Mining Company's present concentrating problem is primarily one of increasing the capacity of the present mill with a minimum of expenditure it is advisable to present the possible means of increasing capacity.

The possible means of increasing capacity naturally fall into two distinct lines,-

- I. Introduction of gravity concentration;
- II. Increasing the present ball mill and flotation capacity.

These lines will be discussed separately.

#### I. INTRODUCTION OF GRAVITY CONCENTRATION:

The proper place to introduce gravity concentration apparatus would be between the rolls and the ball mills. Several schemes are possible, viz, -

1. Passing present ball mill feed over a 1" screen, sending the oversize to the ball mills and jiggging the undersize on a Hancock Jig.
2. Roll crushing to 1" and jiggging the roll product on a Hancock Jig.
3. Roll crushing to 1", sizing the roll product and treating as follows: Minus 1" and plus 1-1/2 m.m. to a Hancock Jig. Minus 1-1/2 m.m. to Wilfley tables.
4. Roll crushing all material to 1-1/2 m.m. and treating on Wilfley tables.

In each case the tailing from the gravity equipment would be sent to the ball mills and thence to the flotation circuit. In case 1, the oversize from the one inch screen would also be sent to the ball mills and flotation circuit.

Introduction of gravity concentration as outlined herein has many disadvantages. The disadvantages held  
NOV 10 1948  
L. H. Lister

-2-

common by the four schemes proposed are:-

a. Cost of installation of the gravity machines, the attending elevators and screens.

b. The cost of installing and operating sufficient dewatering equipment to eliminate, from the water required in gravity concentration, the water not required in the ball mill and flotation circuit. This is a decided factor and would have to be overcome.

c. Securing a suitable location for gravity equipment. The present building is not strong enough to support gravity equipment, other than tables, except on the lower floors. Such a location for jigs means more elevating, etc. The difficulties peculiar to the various schemes are, -

1. a. The 1" oversize in present ball mill feed is not less than 30% of the mill heads, therefore the jig feed would be not over 70% of the mill heads.

b. The 1" undersize would contain a very considerable amount of minus 20 mesh material from which a Hancock jig would not make a satisfactory recovery.

Therefore, the increase in capacity would be small because but a small percentage of the total feed could be removed as concentrate.

2. a. The increase in capacity would be greater than in scheme 1 but not marked.

b. There would be more minus 20 mesh material on which the jig would make a poor recovery.

3. a. This scheme means installing two sets of gravity machines, a jig and tables. While the weight of concentrate produced would be more than in two, the writer believes that the scheme is not warranted.

4. a. Another set of rolls would be required as well as trommels and tables.

b. A satisfactory increase in capacity could be obtained.

c. Almost any desired grade of concentrate could be obtained.

d. All disadvantages held in common by schemes 1, 2, 3 and 4 prevail.

Central File  
NOV 11 1948  
Production Unit

-3-

The writer believes this scheme to be the most feasible of the gravity schemes but that it is not warranted in the present mill due to the construction and operating difficulties involved in order to incorporate the necessary equipment into the present building. In addition, some additions to the present mill building might be necessary.

As a whole, gravity concentration is not warranted in order to increase the capacity of the present mill for the following reasons:-

1. Cost of remodeling present mill would be high as compared to increase in capacity effected.
2. Getting rid of excess water between the gravity machines and the ball mill and flotation circuit would entail extra equipment and would mean an additional operating expense.
3. Foundations and structure of present mill building are not strong enough to support any great additional weight.
4. Any increase in capacity will be less than the weight of the gravity concentrate produced because the gravity apparatus will reject, to a great extent, the material that is difficult to grind.
5. Table concentration, only, offers possibilities and this necessitates an additional set of rolls.

#### II. INCREASING THE PRESENT BALL MILL AND FLOTATION CAPACITY:

Increasing the present ball mill and flotation capacity can be accomplished in two ways.

1. Installing more ball mills and Callow cells.
2. Increasing capacity of present ball mills and installing sufficient additional Callow capacity to take care of the increased tonnage.

The installation of another ball mill would be expensive and the writer does not believe that it is necessary.

In the writer's opinion, the delivery of a 3/4" or 1/2" maximum sized particle in the feed to the two 64-1/2 Marcy ball mills should enable them to grind approximately 150 tons each or a total of 300 tons per twenty-four hours. The capacity would, therefore, be increased from 200 tons

per twenty-four hours to 300 tons or by 50 percent.

In order to insure a maximum tonnage of 3/4" or 1/2" maximum sized particles through the rolls it will be necessary to install one vibrating screen between the present elevator and the rolls. The oversize from the screen will return to the rolls and the undersize to the ball mill feed bin. Both the "Hummer" and "Mitchell" vibrating screens are efficient machines and the writer has no choice between the two.

In order to provide sufficient Callow capacity the writer proposes to install two additional Callow Skimmer Cells and three additional Callow Rougher Cells.

The writer's proposed flowsheet is submitted herewith. At this point remarks as to the methods of operation under the proposed flowsheet are pertinent.

First. Crushing from run of mine to 1-1/2" or 2". This operation can probably be handled in the same manner as at present.

Second. Roll crushing to 3/4" or 1/2".  
Crushing from 1-1/2 or 2" to 3/4" or 1/2" in one set of rolls is a difficult proposition and could not be accomplished in the present instance were it not for the fact that the 42" x 14" rolls are well over capacity and if operated three shifts per day should crush to 3/4" at least.

Third. Screening.  
One "Hummer" or "Mitchell" screen will have ample capacity and will remove nearly all - 3/4" or -1/2" material. The operating expense will be small and the repairs will not be an item of great expense.

Fourth. Fine Grinding.  
For a feed containing nothing larger than 3/4" particles, the writer recommends the following initial ball charge.

3-1/2" Balls,	35%	by weight
3" "	35%	" "
2" "	30%	" "
1" "	10%	" "

The following current ball charge is recommended,-

3-1/2" Balls,	35%	by weight
3" "	40%	" "
2" "	25%	" "

Central  
NOV 20 1911

The current charge can best be determined by Frederick L...  
trial or experiment. The idea is to maintain a condition

-5-

wherein the maximum contact between ore particles and balls is obtained.

The mill circuit should be maintained at a high density, say, 60% solids or better.

The Dorr Classifiers are capable of returning a greater sand load than at present. If coarse material short circuits through the mills the classifiers will return it to the mill.

Fifth. Skimmer Cells.

Under the new freight rates it seems feasible to produce a lower grade concentrate from these machines than now prevails.

The writer suggests that this be done in order to relieve the roughers and produce a tailing of lower copper content.

Sixth. Rougher Cells.

A fifty percent increase in the number of cells has been allowed for. By operating these cells to produce a low tailing and low concentrate an additional recovery is possible.

Seventh. Cleaner Cells.

A lower grade concentrate seems feasible and will naturally be produced from a lower grade rough concentrate. Of course the feasibility of shipping a lower grade concentrate should be determined by calculating the net returns per pound of copper to the Walker Mining Co.; As the writer is not in possession of all the terms of the smelter contract, he is unable to present this calculation.

Eighth. The present dewatering equipment is ample to care for the increased tonnage of concentrate.

Ninth. Elevators.

Should any elevators lack capacity space buckets at thirteen inch intervals, lower dump plates to 6' from center of head shaft and increase the belt speed.

Ansoonda uses following belt speeds for wet elevators, -

42" Head pulley 451' to 550'  
54" " " 580'

-6-

In case of the elevator between ball mills and Skimmer Cells, the writer suggests adding the flotation water between the elevator and the cells in order to increase capacity.

The writer believes that the proposed flowsheet will handle 300 tons of ore per twenty-four hours and that the concentrates produced will amount to not less than 80 tons per twenty-four hours on a 5.75% mill feed.

*Raymond W. Howard* S. E. M. E.

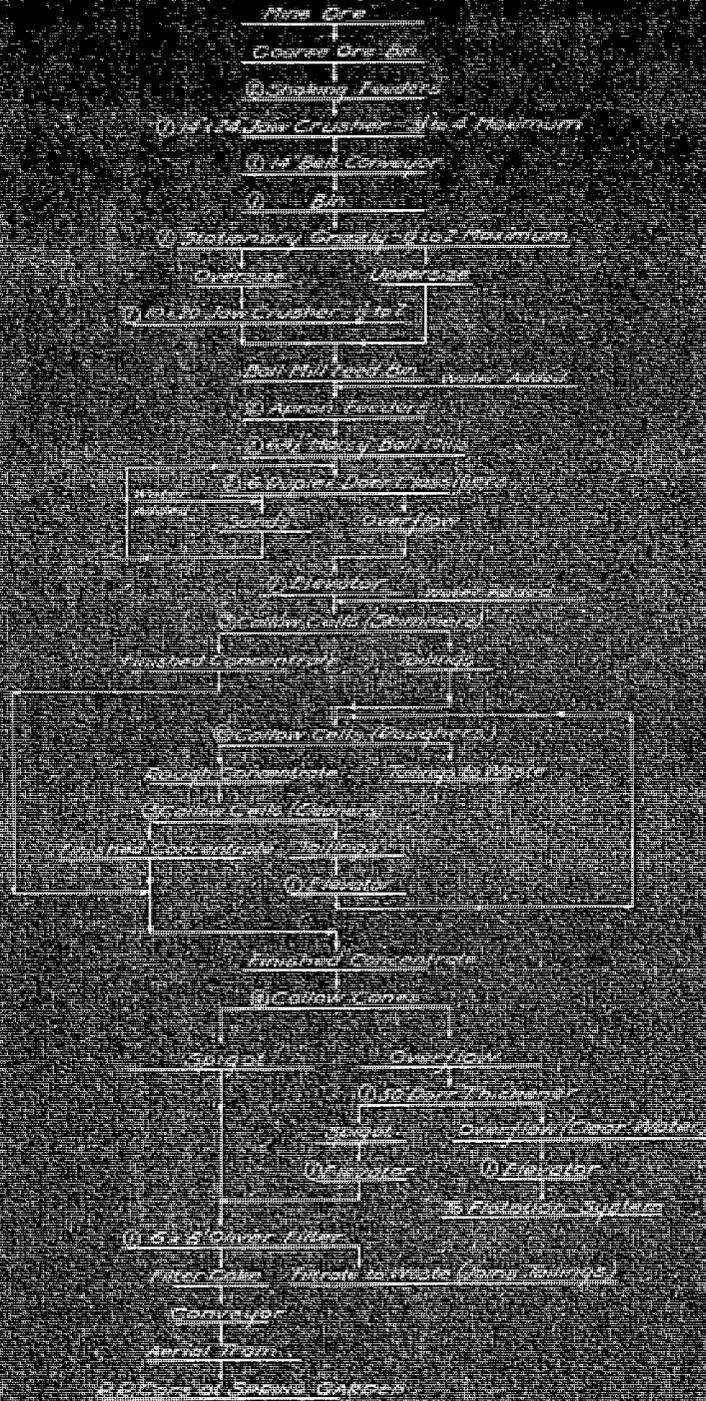
Supt. of Concentration,  
Anasanda Copper Mining Co.

Control File  
NOV 22 1940  
Frederick Laid

# — WALKER MILL —

FLOW SHEET IN USE AUGUST 2 - 1922

FLOW SHEET NO. 1







# WALKER MINE

Spring Garden California

COST OF PRODUCING 1 LB COPPER

A AT SPRING GARDEN CAL

B AT NEW YORK

Assuming Mill Operating at 150 tons per day (Capacity) and a Milling & Milling Cost of \$300 per ton of Crude Ore

B

A

Cost of 100 tons

Cost of Spring Garden

COST PER POUND OF COPPER - (CENTS)

15  
14  
13  
12  
11  
10  
9  
8  
7  
6  
5  
4  
3  
2  
1  
0

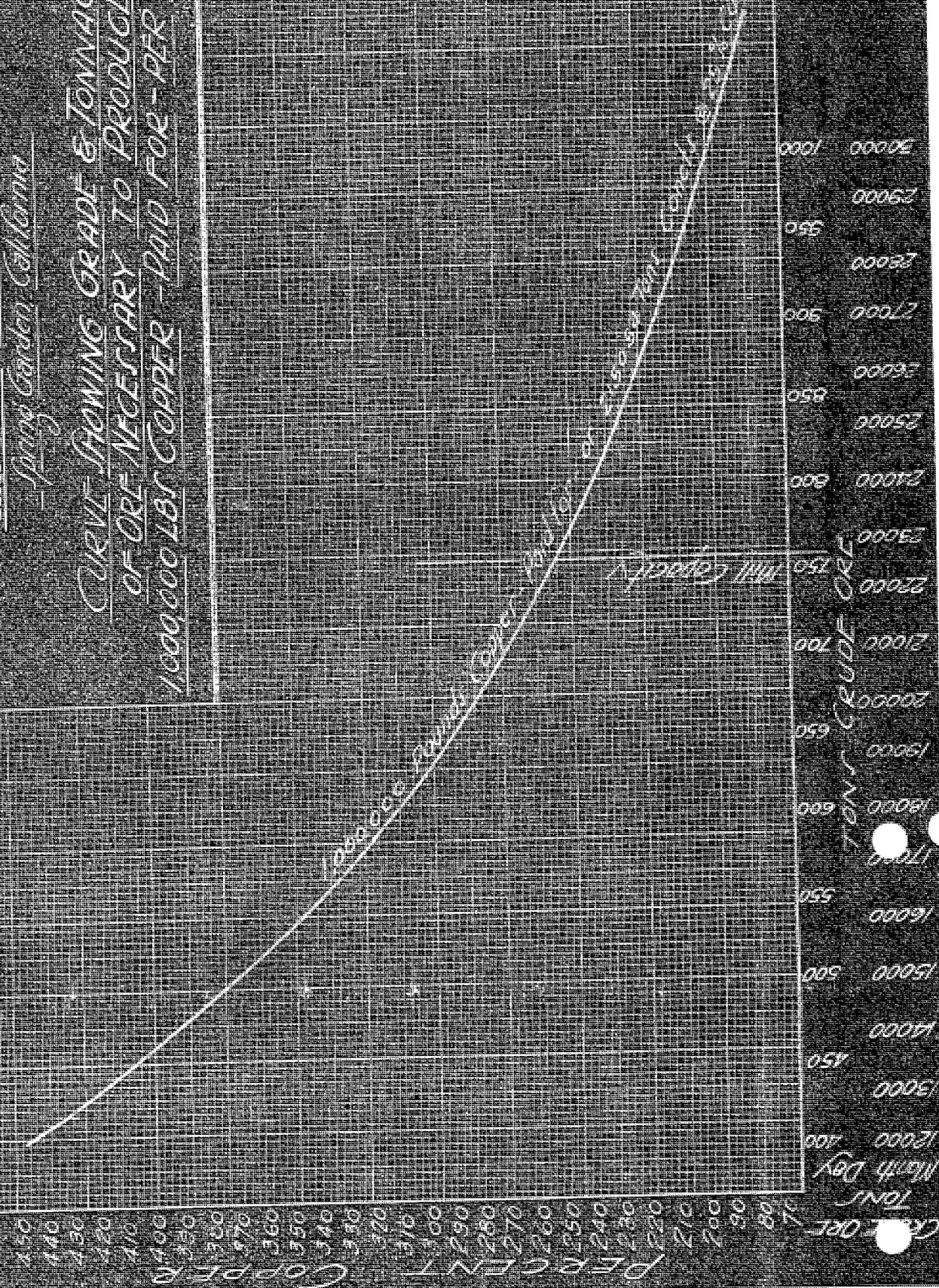
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

DIRECT COPPER IN CRUDE ORE

**WALKER MINING CO**

Spring Garden, California

CREW - SHOWING GRADE & TONNAGES  
 OF ORE NECESSARY TO PRODUCE  
 1000,000 LBS COPPER - PAID FOR - PER MONTH



# WALKER MINING CO

Spring Garden California

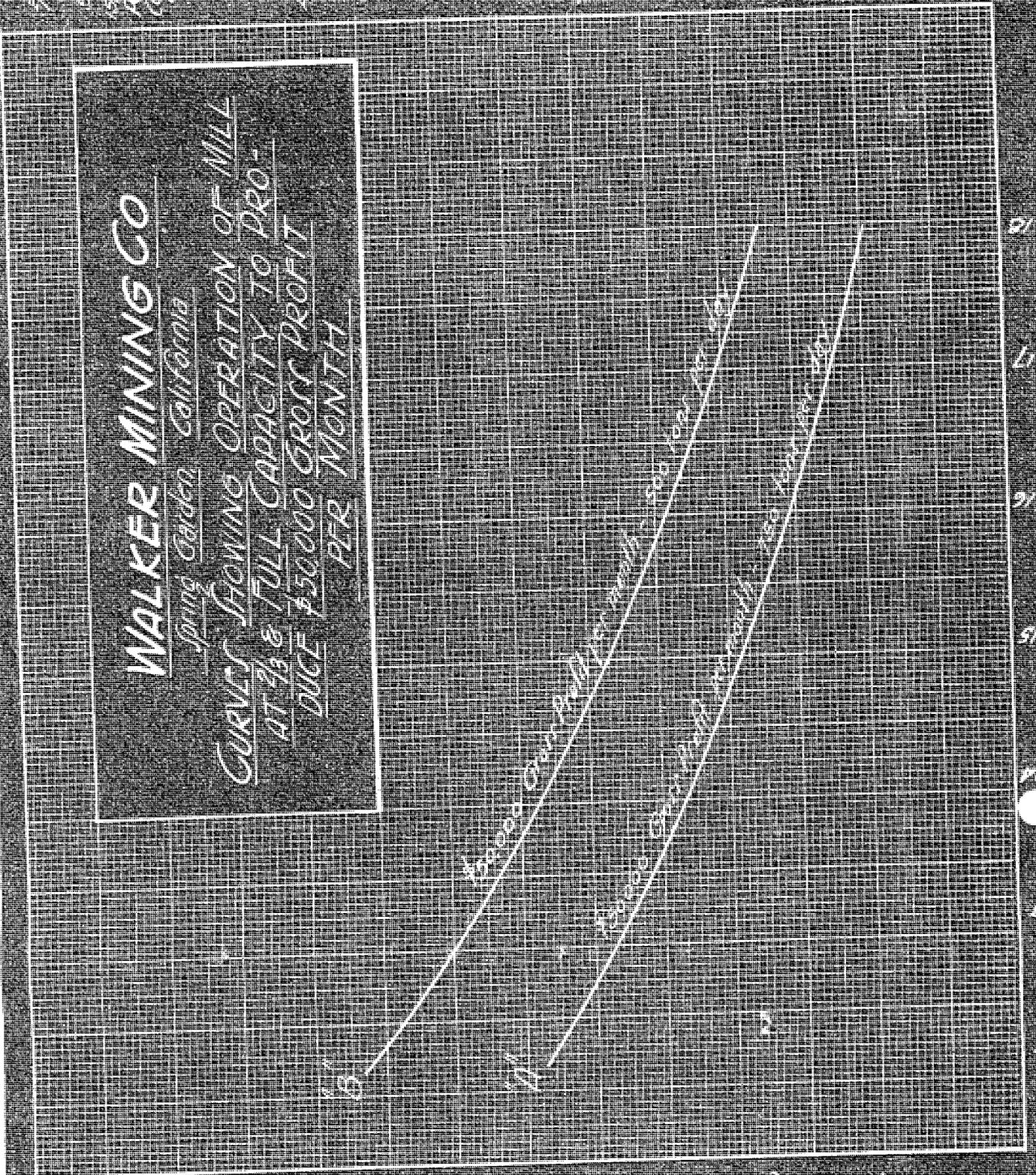
CURVES SHOWING OPERATION OF MILL AT 2/3 & FULL CAPACITY TO PRODUCE \$500,000 GROSS PROFIT PER MONTH

Capacity of Mill  
 200 tons per day  
 15000 tons per mo  
 Percent 2/3  
 Copper 1000000

10 1000000  
 20 2000000  
 30 3000000  
 40 4000000  
 50 5000000  
 60 6000000  
 70 7000000  
 80 8000000  
 90 9000000  
 100 10000000

Capacity of Mill  
 200 tons per day  
 15000 tons per mo  
 Percent 2/3  
 Copper 1000000

10 1000000  
 20 2000000  
 30 3000000  
 40 4000000  
 50 5000000  
 60 6000000  
 70 7000000  
 80 8000000  
 90 9000000  
 100 10000000



PRICE OF COPPER

PER MONTH

# WALKER MINE

Spine Corridor, Cell 1000

## CURVE SHOWING RATIO OF CONCENTRATION

### DIVIDED ON FOLLOWING ASSUMPTIONS

Percent Copper in Concentrate 25  
 Percent Copper in Tailings 15 for head under 50%  
 Percent Copper in Tailings 10 for head between 50 & 75%  
 Percent Copper in Tailings 7 for head over 75%

## RATIO OF CONCENTRATION FORMULA

$C = \frac{H}{100 - H} \times \frac{100 - C_1}{C_2 - C_1}$

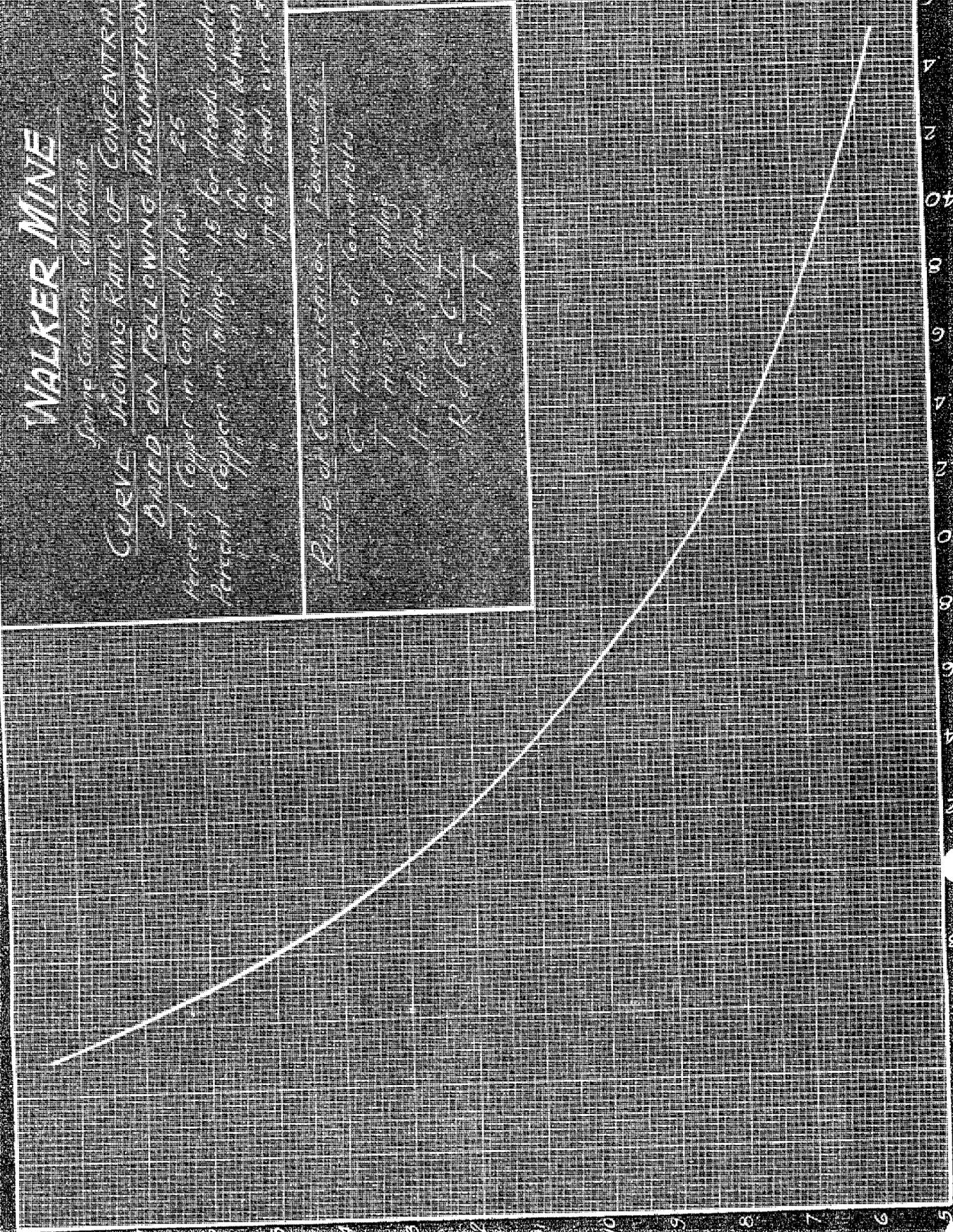
$C =$  Ratio of Concentration

$H =$  Head of Tailings

$C_1 =$  Head of Concentrate

$C_2 =$  Head of Tailings

$C =$  Head of Concentrate



TONS OF HEAD DIVIDED BY TONS CONCENTRATE

PERCENT COPPER IN HEADS

WALKER MINE

Spring Garden California

RELATION BETWEEN FREIGHT PAID  
AND COST PER POUND OF COPPER

FREIGHT  
PAID

WT  
26%  
10 600g  
11 500g

DIFFERENTIAL

WT  
26%  
10 600g  
11 500g

170 128

600 612

530 516

VALUATION  
FOR  
FREIGHT  
PAID

12 \$44.00  
13 50.00  
14 55.00  
15 60.00  
16 65.00  
17 70.00  
18 75.00

PRICE OF COPPER - CENTS PER POUND

1 TON CONCENTR @ 25%  
165 LBS COPPER  
PAID FOR  
FREIGHT PER LB @  
\$ 0.125

01556

01402

01230

**International Smelting Company**

25 BROADWAY

NEW YORK, August 31, 1932.

Mr. Frederick Laist, Manager,  
Anaconda Reduction Works,  
Anaconda, Montana.

Dear Fred:

I wish to acknowledge receipt of your letter of August 25th attached to which was Mr. Morrow's report on the Walker Mill. In order that you might get the right perspective on this proposition I think a little history would be beneficial.

This mill is a "botch", an inheritance from the previous management. It was designed by Allis-Chalmers Co. and erected during Hansen's management. Originally it had in it some Wilfley tables, which, however, produced no results by reason of the magnetite contents of the ore in the upper level. This magnetite made the ore very hard, in fact, so hard that frequently they unloaded pebbles of ore from the mills harder than the steel balls. The tonnage of the mill ran about 150 tons per day. I was naturally anxious to increase it and had Mr. Kuchs talk to Marcy as to the best method of accomplishing it. I held that the ratio of reduction on this ore in the Marcy Mill was entirely too high and that we should introduce another crushing step by means of rolls. Marcy held we would not get over 20% increase, but I insisted and we turned over the problem of putting in this extra crushing equipment to Mr. Capron. The rolls were installed and shortly after the mill closed down, owing to post-war conditions.

Further developments in the mine have, I am told, shown less magnetite and the grade of the ore has materially increased. Since we have begun operations, Mr. Elton tells me that the rolls as installed cannot be operated by reason of too flat a feed and the inability to clean up the spillage of the discharge. I note that Mr. Morrow in his flow sheet has introduced a belt feed and an elevator to handle the discharge.

I was not as optimistic as Mr. Morrow as to the increase in tonnage by additional crushing preceding the ball mill, but since there has been a change in the magnetite contents, he is probably right. Naturally with the higher copper content there will be needed additional mill capacity. The Walker Mine has now a developed tonnage that can support a 400-ton mill. The question came up as to why not build an addition to the present mill from which we expected to get 200-ton capacity with the additional crushing unit. I was opposed to this by reason of the inefficiency of the present mill and by reason that I did not feel the present mill would last for 5 years, and that repairs on a mill on its last legs would be excessive. At the end of that we would be confronted with the building of a new mill, anyway. However, I was confronted with the problem of financing, as the Walker Mining Co. being incorporated in Arizona had reached its legal limit of indebtedness. Mr. Kelley and I have had some discussions as to the refinancing in order

Mr. Frederick Laist

-2-

Aug. 31, 1933.

that we might <sup>get</sup> our money back and provide for a new mill. The problem can be brought under two headings:

- 1st - Refinancing and build a new mill to handle 400-tons per day.
- 2nd - Remodel the present mill and reduce the indebtedness by its earnings to a point where advances can be made for new construction.

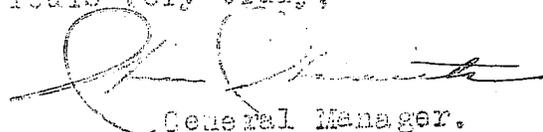
I am personally in favor of the second scheme, and particularly in view of Mr. Morrow's report that the present mill can be brought to 300 tons per day without great expense. This increase of capacity would tide us over to a point where we could build a new mill practically out of earnings. I do not believe, however, that the present mill would last over five years, - it slid down the hull several inches last year.

I would like Mr. Morrow's opinion as to what he considers the life of the present mill, and as to the advisability of a new mill.

I am asking Mr. Elton to request you to draw up the changes so that they can be installed at Walker, and your suggestion of sending a roll man there is a good one. We have a good mine and I would like to see everything else in line with our ways of doing things. Mr. Elton will take the matter up with you in the near future.

Thanking you for your interest, I remain,

Yours very truly,



General Manager.

Wraith/J  
cc - JOE

Control File  
76  
FEB 20 1934

6.46

WALKER MINING COMPANY

Spring Garden, Cal.,  
Nov. 4, 1922.

Mr. Frederick Laist, Manager,  
Anaconda Copper Mining Company,  
Anaconda, Montana.

*Walker M. Inc*

Dear Sir:-

I submit herewith a report of work done since Sept. 27th, to date.

The crushing division stands as per my report of September 27th. The Mitchell screen arrived last night. Began framing for the screen today.

The Callow cell bottoms and the 8 x 12 filter arrived here on the 17th and the 19th of October, respectively.

There was no work done on the regular construction job between September 30th and Oct. 18th.

I recommended to Mr. Elton that certain changes be made in the mill, and they are as follows:

A four by four man tunnel has been run under the Dorr Tank. Repairs on valve and piping can now safely be made. As it was before this change was made, a man had to crawl on his stomach in muck to get at the valve under the tank. Had a leak occurred when repair man was under the tank, he had no possible chance of escape.

A sump was built in such a position that the spill from the flotation machines can run into it, and then at will a gate can be opened and the spilled concentrates run into the elevator and returned to the flotation circuit. This spill occurs only when the power goes off, which it frequently does. The valves are then opened to let out the material contained in the machines, so that it will not clog the blankets. This material ran into the elevator boot and overflowed and ran down the tail race.

Large braces were placed in the mill foundation to keep shafting in line, and to stop excessive vibration. Bracing has been placed outside of mill to keep it from sliding down hill. The lower half of the mill has no cross bracing in at all, not even knee braces. This is being cared for now.

Control Files  
J.F.  
NOV 20 1922

-2-

The flotation elevator was found to be elevating the flotation feed and dumping a great deal of it back into the boot. This happened because the splash plate was placed sixteen inches from the buckets, instead of two inches, and more than half of the material would spill down between the buckets and splash plate.

The boilers had not been inspected since they were installed. The safety valves were two hundred pound valves, and in poor condition. I called Mr. Hart's attention to this and recommended that he write the State Boiler Inspector to come at once and look the boilers over. On Oct. 28th the boilers were inspected and found safe for only 85 pounds pressure. Four  $2\frac{1}{2}$  inch safety valves were ordered and set to pop at 85 pounds.

A crawl runway has been placed over the Marcy mills, and runs out of the mill to the road, so the ball mill liners can be brought in and out with ease. There was a great waste of time handling liners before.

The timing of the automatic valve on the Oliver Filter was found to be wrong, and the blow back air would get into the vacuum line and cause pressure in the barometric leg and thereby make an air lift of it; and consequently blow grit and water into the vacuum pump. This has been cared for.

The mine skip is unsafe. I mentioned this to Mr. Hart, and told him that if the Mine Inspector saw it he would condemn it at once. The skip has no guides, safety dogs or bonnet. A safety skip is being designed now.

A number of other changes have been made but are too small to mention in this report.

Mr. Elton instructed me to get the necessary data for a new mill. This I have been doing.

Weirs were constructed at various places so that an accurate measure of the available water supply could be had. I am enclosing weir reading for the first part of October. There is just enough water to treat 600 tons of ore per 24 hours, without reclaiming. These figures are conservative because they were taken at the time of the year when the flow is at its lowest.

Getting carpenters has been a difficult matter. Mr. Hart has exhausted all means at his command to get men for this job.

From Sept. 12th to Oct. 8th four carpenters were working. From Oct. 8th to Oct. 25th two carpenters were working. By this time it was found impossible to get carpenters, so Mr. Hart made a contract with Mr. Ratta (who built the Company houses on contract) to complete this work. To date Mr. Ratta has been able to get only two carpenters. These added to the two we had makes four now working. Mr. Ratta should have eight men working as his contract ends November 20th.

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I have two muckers doing carpenter work. They are not good carpenters, but better than none at all.

Instead of purchasing a new 75 HP motor for the blower as I recommended, I am using the saw mill motor. This is not used on the saw mill in Winter. In the Spring this motor will be sent back to the saw mill and an old hoist motor out of the mine will be used on the blower. This motor is belt connected to the blower. Pulleys of proper size to give the right speed to blower are used. This arrangement saves the cost of a new motor.

A new vacuum pump and receiver was ordered Oct. 14th but is not yet here.

We are pushing this job with all possible speed.

My wire of November 7th is misleading. This report explains what is meant by "No material or machinery and only two carpenters."

New estimate attached.

Very truly yours,

FCT:MWT

(Signed) F. C. Torkelson

P. S. Snow is 26 inches deep and still coming.

COPY.

Central File

# Anaconda Copper Mining Company

Washoe Reduction Works

COPY

Anaconda, Mont.  
January 11, 1923.

Mr. B. S. Morrow,  
Superintendent of Concentration,  
Washoe Reduction Works.

Dear Sir:-

SUBJECT:

POWER CONTRACT, GREAT WESTERN POWER COMPANY OF  
CALIFORNIA and the WALKER MINE PROPERTY.

My interpretation of the contract is as follows:-

Readiness to Serve Charge is based on the Maximum Demand as recorded by a recording wattmeter and not on connected load. Charge is covered by schedule under "If Maximum Demand is less than 2000 H.P." Energy Charge under same heading.

It is possible that the Maximum Demand of this property comes under the heading "Special Conditions" and is based on a 3 minute instead of 15 minute interval.

Minimum Charge is based on highest monthly Maximum Demand during current month or preceding 11 months. Minimum charge not less than \$50.00 per month.

I would suggest that you get information regarding Readiness to Serve Charge, how it is metered and the Time interval of Maximum. Also minimum Charge in case of shut-down of Property.

Yours very truly,

L. E. Larsen,

Asst. Electrical Supt.

Central File  
NOV 12 1923  
Frederick Labl

COPY OF BILL RENDERED BY THE GREAT WESTERN POWER CO. OF  
CALIFORNIA TO THE WALKER MINING CO. FOR  
SEPTEMBER, 1922

GREAT WESTERN POWER CO.

SEPT. 30, 1922

K.W.Hour, - - - - -	231,600
Estimated Transformer loss at 2-1/2%	<u>5,790</u>
Total K.W.Hr.	237,390

1st 100,000 at \$0.012	\$	1,200.00
137,390 at 0.010		<u>1,373.90</u>

Readiness to serve charge maximum demand, -

403.2 K.W.

200 K.W. at \$1.50	300.00
203.2 K.W. at 1.25	<u>254.00</u>

T o t a l	\$	3,127.90
-----------	----	----------

Authorized additional charge 6%	<u>187.67</u>
---------------------------------	---------------

Total Charge	\$	3,125.57
--------------	----	----------

Refund for Sept. at 33-1/3%	<u>1,107.52</u>
-----------------------------	-----------------

Total as rendered	\$	2,108.05
-------------------	----	----------

The refund of 33-1/3% is to reimburse the Walker Mining Co. for building the power line into the mine. When the Walker Co. has been reimbursed title to line will pass to the Power Company.

Central File  
 NOV 30 1940  
 Frederick Lutz

COPY

GREAT WESTERN POWER COMPANY  
OF CALIFORNIA  
14 Sansome Street,  
San Francisco, California.

Revised Sheet C.R.C.No.366-E  
Cancelling Revised Sheet C.R.C.  
No.345-E

SCHEDULE P-11

GENERAL POWER SERVICE

SERVICE:

This schedule applies for general power service where the total connected load of the power installations exceeds 25 H.P. (511)

Energy supplied under this schedule shall be of such character and voltage as is standard at that point on the company's primary lines which is nearest the consumer's premises.

TERRITORY:

This schedule applies in all territory traversed by the power company's service lines in Butte County and Plumas County in which the Great Western Power Company of California is permitted to serve.

RATE:

If Maximum Demand is less than 2,000 K.W.

Readiness to Serve Charge:

\$1.50	per month per K.W. for the first	200	K.W. of Demand.
1.25	" " " " " " next	300	" " "
1.00	" " " " " " "	500	" " "
.75	" " " " " " "	1000	" " "

Energy Charge:

1.2¢	per K.W.H. for the first	100,000	K.W.H. per month
1.0¢	" " " " next	150,000	" " "
.8¢	" " " " "	175,000	" " "
.7¢	" " " All Over	425,000	" " "

If Maximum Demand is 2,000 K.W. or over.

Readiness to Serve Charge:

\$1.00 per month per K.W. of Maximum Demand

Energy Charge:

1.2¢	per K.W.H. for the first	50	K.W.H. per	kilowatt of Max. Demand
1.0¢	" " " " next	50	" " "	" " "
.8¢	" " " " "	100	" " "	" " "
.7¢	" " " All over	200	" " "	" " "

Central File  
NOV 20 1940  
Federal Lab

SCHEDULE P-11 Continued.

MINIMUM CHARGE:

The monthly minimum charge shall be a sum of money calculated by applying the demand charge to the highest monthly maximum demand which may have occurred during the current month or during the preceding 11 months, but in no event less than \$50.00 per month.

SPECIAL CONDITIONS:

The maximum demand in any month shall be the average number of kilowatts indicated or recorded by the above meters in that 15-minute interval in which the consumption of electric energy hereunder is greater than in any other 15-minute interval in the month; provided that in the case of hoists, elevators, welding machines, furnaces and other installations where the energy demand is intermittent, or subject to violent fluctuation, the company reserves the right to require the consumer to provide at his own expense suitable equipment to reasonably limit such intermittence or fluctuation, and will base the consumer's maximum demand upon a 3-minute instead of a 15-minute interval.

TERMS AND CONDITIONS:

See Preliminary Statement, Application and contract forms and Rules and Regulations.

Date Issued December 22, 1920.      Date Effective December 24, 1920.  
Issued under special permission of  
the Railroad Commission of the State  
of California No. 191227.

Issued and Approved by  
J. B. Black, General Sales Manager,  
San Francisco, California.

Central File  
Nov 10 1920  
Edward L. ...

# Anaconda Copper Mining Company

Washoe Reduction Works

Anaconda, Montana,  
January 12, 1923.

Mr. Frederick Laist,  
Manager,  
Anaconda Reduction Works.

Dear Sir:-

Complying with agreement made at recent conference in your office in regard to the design of a Concentrator for the Walker Mining Company, I submitted Schedule P-11, General Power Service of The Great Western Power Company of California to Mr. L.E. Larsen, Assistant Electrical Superintendent.

Mr. Larsen has furnished me with his interpretation of Schedule P-11. A copy of Mr. Larsen's letter is attached.

After examining Schedule P-11, I have come to the conclusion that this schedule is not the contract under which the Walker Mining Company purchases electric power, but that it is the schedule governing conditions under which power is used. My decision is further influenced by a diagnosis of a copy of the bill rendered to the Walker Mining Company for the month of September, 1922. The bill referred to is in reality a copy of the actual statement, as rendered, made by Mr. Torkelson while at the Walker. Copy of statement is enclosed.

The following comparisons between bill and Schedule P-11 will serve to clarify the above decision.

K.W.Hours per meter reading,	231,600
Maximum demand charge	403.2 K.W.
200 K.W. at \$1.50	\$ 300.00
203.2 K.W. at \$1.25	<u>254.00</u>
Maximum demand charge	\$ 554.00

Above agrees with Schedule P-11.

Energy Charge,

K. W. Used, -	231,600
Estimated transformer loss account metering on low tension side of transformer, 2-1/2%	<u>5,790</u>
Total K.W. Hours charged	237,390

Control File  
NOV 20 1923  
Frederick Laist

2-Mr. F. Laist  
Jan. 12, 1923.

Please note that an allowance for transformer loss is not mentioned in Schedule P-11.

Calculation of energy Charge:-

100,000 K.W.H. at 1.2¢	=	\$ 1,200.00
137,390 K.W.H. at 1.0¢	=	<u>1,373.90</u>
Total Energy Charge		\$ 2,573.90

The above charge is as per schedule P-11:

SUMMARY

Maximum demand charge,		\$ 554.00
Energy charge,		<u>2,573.90</u>
Total		\$ 3,127.90
Authorized additional charge at 6%		<u>187.67</u>
Total charge as rendered		\$ 3,315.57

Please note that there is no statement of an additional charge mentioned in Schedule P-11. It is therefore evident that Schedule P-11, while furnishing the general conditions governing the purchase of electric power from The Great Western Power Co. by the Walker Mining Co. is not a copy of the contract under which the power is purchased.

In order that the contract may be more fully analyzed, I would suggest that you ask Mr. Elton to send you a copy of the actual contract.

In addition to the information given in Mr. Larsen's letter, he tells me that at least one Power Company in California, The Pacific Gas & Electric Co. will not furnish power for certain installations if squirrel cage motors are used. This condition applies principally in instances where lighting circuits, etc. come of the line that furnishes the industrial company. In cases where the power is taken off the high tension lines and is stepped down at the plant, Mr. Larsen states that the Power Company would probably furnish power but would attach certain penalties which would increase the rate.

The reason for such action is that squirrel cage motors have a high starting torque, Mr. Larsen

Control File  
NOV 1923

3-Mr. F. Laist  
Jan. 12, 1923.

suggests that wound rotor motors might be a more satisfactory installation at the Walker.

In view of the fact that the power problem at the Walker is an electric problem, I would suggest that this phase of the Walker design be placed in the hands of Mr. Woodward and that he be furnished with all details as to the estimated power consumption, schedules under which power is furnished, etc.

Very truly yours,

  
Supt. of Concentration.

CC. Mr. Tanner  
Mr. Forsyth

BSM-RL

Encl.

Central File  
NOV 20 1940  
Frederick Laist

WALKER MINE

Excerpts from letter to

V. A. Hart

May 1, 1923

DEVELOPMENT

There are three main areas to explore:

1st - The north mineralized zone already explored on the 3rd level. This was weak and low grade on the 3, only at two places exceeding 3%, but the main orebody shows so much improvement below that level that it is quite possible the north mineralized zone will contain ore on the lower levels. The present work on the north end of the 600 is well calculated to test this possibility. The drift should be run straight, with a course about N 20° W, which will keep it within the vein. Crosscuts should be run to foot and hanging wall at 100 ft. intervals.

2d - The southward extension of the main mineralized zone. The main orebody becomes weak and lean at its south end, and remains so for 700 or 800 ft, but on the tunnel level there are indications at the extreme south of an improvement in grade. It is possible that still farther south the zone will open out into another orebody. This should be determined by a thorough exploration of the vein south of its intersection with the adit tunnel. The vein must be recovered beyond the fault which there cuts it off, and followed by a drift, with frequent crosscuts to the walls.

2- May 1, 1923

3d - The main orebody terminates to the north against a north-west fault, the intersection following closely the line of No. 2 raise. On the lower levels at least this fault looks as if it were post mineral. There may therefore be a chance of recovering the vein beyond it.

Other faults have complicated the situation, and have made it doubtful if the missing segment can be found on the upper levels. On the Tunnel level, however, the chances are better, and I recommend that this level be extended beyond the North-west Fault for about 150 ft.

There is also a slight possibility that the impoverishment found on the tunnel level will not persist below. This should be tested by a winze, sunk from the tunnel level in the best part of the ore shoot. It should be sunk for a depth of at least 200 ft, with appropriate crosscuts and drifts, in order to make a conclusive test.

All the work above recommended is indicated in red on the accompanying composite map.

Very truly yours,

Paul Billingsley

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2

Anaconda Copper Mining Company

GEOLOGICAL DEPARTMENT

W A L K E R M I N E

SITUATION AS OF APRIL 15, 1923

Letter to

V. A. HART, MANAGER

By

Paul Billingsley

May 1, 1923

P L A T E S

- Plate 1 - Long Section showing grade
- Plate 2 - Long Section showing widths
- Plate 3 - Long Section showing tonnage
- Plate 4 - Composite map showing suggested development

T A B L E S

- Table 1 - Operations
- Table 2 - Calculation of tonnage
- Table 3 - Calculation of grade

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Salt Lake City, Utah.

May 1, 1923.

Mr. V. A. Hart, Manager,  
Walker Mining Company,  
Spring Garden, California.

Dear Sir:

During my recent visit to the Walker mine I was much impressed with the extent to which the stoping has encroached upon the ore reserve blocks. A surprising proportion of the ore-body, as viewed on a long section, has already been broken. To check the accuracy of this impression I have made some calculations, regarding which I will be glad to have your opinion.

GRADE:

Before outlining my ore reserve blocks I determined the average grade of ore for each portion of each level and raise, using the samples on the 20 scale map at the mine. The results are indicated on the accompanying long section (Plate 1). For emphasis I have colored the areas of the different grades. According to the car samples, therefore, there is an ellipsoidal area in which the ore averages about 6%. This area covers only the north end of the 4th level, but extends from No. 2 Raise on the 5th to beyond No. 1 Raise, and on the 6th to beyond No. 3. It does not reach the Tunnel level; terminating below the 600 level about 50 feet down No. 2 Raise and 75 feet down No. 3. Above this 6% ellipse, and to the west of it, are areas of 4% and 5% ore, and beyond these in turn are zones of 2% and 3% material.

For the whole ore body below the 300 level, as it exist-

ed prior to stoping, I found an average grade of 4.35% copper - which checks remarkably closely your figure of 4.36% for the same area. (Blocks 4, 5, 6, 7 & 8). The significant point is that this average on which we agree is the result of a lot of 6% ore at the north end balancing a lot of 2% and 3% ore at the south end. Your stoping has thus far been done almost entirely in the 6% area, and the ore drawn from these stopes has averaged about 5.75% (a weighted average of crude and mill ore since June 1st - See Table 1).

TONNAGE:

I laid out my ore reserve blocks as shown on Plate 1, endeavoring within reason to make each block represent material of uniform grade. Following is a list in parallel of your blocks and mine:

ORE BELOW 3rd LEVEL PRIOR TO EXTRACTION.

Hart.

3rd - 4th Level.

Billingsley.

3rd - 4th Level.

Block	Tons	Grade	Block	Tons	Grade
4	215,430	4.48%	A	124,327	4.32%
5	2,500	4.48	B	28,437	3.26
			C	50,774	4.56
			S	11,270	2.00
<b>Total</b>	<b>217,930</b>	<b>4.48</b>	<b>Total</b>	<b>194,808</b>	<b>4.00</b>
<u>4th - 5th Level</u>			<u>4th - 5th Level</u>		
6	245,795	4.926	D	54,950	5.40
			E	44,128	5.23
			F	19,600	5.53
			G	37,905	3.27
			<b>Total</b>	<b>156,583</b>	<b>4.85</b>

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ORE BELOW 3rd LEVEL PRIOR TO EXTRACTION.

Hart. 5th - 6th Level.			Billingsley. 5th - 6th Level.		
Block	Tons	Grade	Block	Tons	Grade
7	169,886	4.40	H	34,504	6.24%
			I	32,683	5.72
			J	9,454	5.71
			K	26,295	3.38
			L	5,852	2.00
			Total	108,569	5.12
<u>6th Tunnel Level.</u>			<u>6th Tunnel Level</u>		
8	128,375	3.039	L	17,100	5.47
			M	9,705	3.96
			N	12,072	5.00
			O	18,630	2.00
			P	31,200	3.17
			R	14,114	2.00
			Total	102,821	3.47
Totals	759,966	4.36		562,781	4.35

In calculating my tonnages I used horizontal widths scaled off the 20 scale geologic notes at 20 ft. intervals. The figures are shown on slate 2. These horizontal widths I averaged and multiplied by horizontal lengths, and the resulting area by the vertical height of the block; the results being the volume of the block. This I divided by a factor representing Cu. ft. per ton of ore - 10 in the rich blocks, 11 in the medium, and 12 in the lean siliceous south end.

I next endeavored to find out what is left, as of April 15th, 1925. For this purpose I re-measured my blocks from the tops of the slopes, and added a reasonable allowance for pillars. The calculations are given in Tables 2 and 3 and the results in

summary are as follows:

ORE AS ORIGINALLY, AND AMOUNT BROKEN & LEFT

<u>500 - 400</u>	<u>Original Tons</u>	<u>Left Tons</u>	<u>Broken (x)</u>	<u>In Stoppes</u>	<u>Percent Broken</u>
A	124,327	110,050*	14,277	2,500	11.5
B	28,437	27,120	1,317	-	4.7
C	50,774	27,272	2,502	-	11.4
S	<u>11,270</u>	<u>11,270</u>	<u>-</u>	<u>-</u>	<u>0.0</u>
	194,808	175,712	19,096	2,500	9.8
<u>400 - 500</u>					
D	54,950	18,698*	36,252	15,674	66.0
E	44,128	16,216*	27,912	11,991	63.3
F	19,600	12,212*	7,388	7,295	37.8
G	<u>37,905</u>	<u>32,016*</u>	<u>5,889</u>	<u>1,252</u>	<u>15.6</u>
	156,583	79,142	77,441	34,220	49.4
<u>500 - 600</u>					
H	34,504	14,359*	19,945	6,451	58.2
I	32,683	12,620*	19,063	9,327	58.4
J	9,454	9,454	-	-	0.0
K	26,295	24,115	2,181	-	8.3
Q	<u>5,822</u>	<u>5,512</u>	<u>320</u>	<u>-</u>	<u>5.5</u>
	108,569	67,060	41,509	15,778	38.2
<u>600 - 700</u>					
L	17,100	17,100	-	-	0.0
M	9,705	9,705	-	-	0.0
N	12,072	12,072	-	-	0.0
O	18,630	17,077	1,553	-	8.4
P	31,200	30,428	772	-	2.5
R	<u>14,114</u>	<u>11,375</u>	<u>2,739</u>	<u>-</u>	<u>19.4</u>
	102,821	97,757	5,064	-	4.9
Total	562,781	419,671	143,110 x	52,498	25.5

\* Including pillars.

x Figures for ore broken obtained by deducting Tons Left from Original Tons.

-2-

These figures can be checked against other data, namely, the monthly returns from the mine, as tabulated in Table 1.

From June 1, 1922, to April 15, 1923:

About 110,000 tons were reported broken,

About 60,000 tons were reported drawn.

The tons broken were all between the Tunnel and 300 levels, but this does not include all rock ever broken in this area, since the tunnel, No. 2 Haise, No. 1 Haise, and parts of the 500 and 600 drifts were driven before June 1st. About 25,000 tons should be added to cover these workings, making a total of 135,000 tons broken as compared with 143,000 obtained by deduction.

During this interval 50,000 tons were left in the stopes 2500 tons were in 408 stope previously, making a total of 52,500 as compared with 52,498 above.

The ore drawn came from Blocks D, E, F, H, and I. It averaged 5.746% copper, while the average of these blocks is 5.53%. The ore has come from the better parts of Blocks D, E, and F, the remaining upper portions being lower grade than those stopes thus far.

If the long section is correct, and it was made carefully from Arieta's stope sections, there can be little error in the percentage which has been broken. It figures out 25.5% - roughly, one quarter. From the mine records it appears that this quarter has yielded about 135,000 tons of broken ore. At this rate the total orebody between the 300 and tunnel levels will yield about 540,000 tons.

There is still another angle to be considered. While only one quarter of the total has been broken, this quarter has included the very best ore in the deposit, so that the richer ore has been depleted to an extent far greater than 25%. The following tabulation shows this feature.

Tons Above.	Original below 300.	Left * Below 300.	w Above 300.	Percent left.
6%	34,304	14,359	-	41.8
5.5	96,041	49,645	-	51.6
5.0	224,291	113,731	-	50.7
4.5	255,065	141,005	-	55.2
4.0	379,392	251,053	-	66.1
3.5	389,097	260,758	-	67.0
3.0	512,955	374,437	60,700	72.9
2.0	562,781	419,671	60,700	74.5

Average grade of ore left in place - 3.9%

\* Including pillars.

w Hart's figures, excluding "probable ore".

The broken ore in stopes is of higher grade and will increase the reserves above 5% by about 50,000 tons, and those between 3 and 3.5% by 47,000 tons.

Including all these items, the following ore will be available for the future:

Above 5%	About 165,000 tons
Between 4% and 5%	About 140,000 tons
Between 3% and 4%	About 230,000 tons
Between 2% and 3%	<u>About 45,000 tons</u>
Total above 2%	About 580,000 tons.

I believe this is the maximum that can be counted on

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unless additional ore is developed. It is therefore essential that development work be vigorously pushed.

DEVELOPMENT:

There are three main areas to explore:

1st - The north mineralized zone already explored on the 3rd level. This was weak and low grade on the 3, only at two places exceeding 3%, but the main orebody shows so much improvement below that level that it is quite possible the north mineralized zone will contain ore on the lower levels. The present work on the north end of the 600 is well calculated to test this possibility. The drift should be run straight, with a course about N 20° W, which will keep it within the vein. Crosscuts should be run to foot and hanging-wall at 100 ft. intervals.

2d - The southward extension of the main mineralized zone. The main orebody becomes weak and lean at its south end, and remains so for 700 or 800 ft, but on the tunnel level there are indications at the extreme south of an improvement in grade. It is possible that still farther south the zone will open out into another orebody. This should be determined by a thorough exploration of the vein south of its intersection with the adit tunnel. The vein must be recovered beyond the fault which there cuts it off, and followed by a drift, with frequent crosscuts to the walls.

3d - The main orebody terminates to the north against a north-west fault, the intersection following closely the line of No. 2 Raise. On the lower levels at least this fault

-8-

looks as if it were post mineral. There may therefore be a chance of recovering the vein beyond it.

Other faults have complicated the situation, and have made it doubtful if the missing segment can be found on the upper levels. On the Tunnel Level, however, the chances are better, and I recommend that this level be extended beyond the North-west Fault for about 150 ft.

There is also a slight possibility that the impoverishment found on the tunnel level will not persist below. This should be tested by a winze, sunk from the tunnel level in the best part of the ore shoot. It should be sunk for a depth of at least 200 ft, with appropriate crosscuts and drifts, in order to make a conclusive test.

All the work above recommended is indicated in red on the accompanying composite map.

Very truly yours,



PB/CH.

T A B L E 1

## WALKER MINE OPERATIONS

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	1st half April	Total
Tons broken	3,176	5,158	7,547	9,501	7,000	7,700	15,400	16,500	13,800	15,600	8,000(e)	108,382
Tons drawn	3,047	4,270	5,717	4,420	5,170	5,402	6,167	6,949	6,417	7,135	3,500(e)	58,194
Tons milled (s)	4,575	6,224	6,372	4,866	5,308	4,856	5,118	5,390	5,136	7,469	3,500(e)	58,814
Crude ore	-	-	-	33	715	839	1,041	1,473	1,410	695	350(e)	6,556
% Cu. Heads	6.575	5.650	5.646	5.784	5.180	4.684	4.933	4.555	4.204	4.600	4.600(e)	
% Cu. Crude	-	-	-	10.335	11.865	11.769	11.867	11.182	10.568	11.000 <sup>o</sup>	11.000(e)	
% Cu. Mine Run	6.575	5.650	5.646	5.815	5.974	5.728	6.105	5.977	5.574	5.144	5.200(e)	5.746

(e) Estimated

(s) 10,000 tons on stock pile June 1 available for  
milling in addition to ore drawn.

TABLE 2.

WALKER MINE

ORE RESERVES

CALCULATION OF TONNAGE  
IN PLACE

\* Exclusive of pillars.

Block No.	TOP			BASE			Total Area	Ave. Area	Ave. Height	Volume	Cu. ft per ton Factor	Tons*
	Length	Width	Area	Length	Width	Area						
A	330	40.3	13,299	300	27.4	8,220	21,519	10,760	110	1,183,600	11	107,600
B	110	18.1	1,991	220	15.6	3,432	5,423	2,712	120	325,440	12	27,120
C	210	13.9	2,919	100	20.8	2,080	4,999	2,500	120	300,000	11	27,272
D	130	30.0	3,900	130	32.5	4,225	8,125	4,062	40	162,480	10	16,248
E	140	27.2	3,808	130	22.3	2,899	6,707	3,354	40	134,160	10	13,416
F	55	15.0	825	130	16.0	2,080	2,905	1,452	60	87,120	10	8,712
G	280	18.0	5,050	180	12.3	2,214	7,264	3,632	100	363,200	12	30,266
H	120	28.7	3,444	120	28.0	2,160	5,604	2,802	45	126,090	10	12,609
I	160	16.0	2,560	160	20.0	3,200	5,760	2,880	40	115,200	10	11,520
J	200	10.4	2,080	0	0	0	2,080	1,040	100	104,000	11	9,454
K	160	10.8	1,728	220	17.2	3,784	5,512	2,756	105	289,380	12	24,115
L	120	17.8	2,136	120	20.0	2,400	4,536	2,268	75	170,100	10	17,100
M	120	20.0	2,400	125	23.5	2,938	5,338	2,669	40	106,760	11	9,705
N	165	18.3	3,019	0	0	0	3,019	1,509	80	120,720	10	12,072
O	0	0	0	180	20.7	3,726	3,726	1,863	110	204,930	12	17,077
P	225	17.2	3,870	160	15.5	2,480	6,350	3,175	115	365,145	12	30,429
Q	0	0	0	90	14.0	1,260	1,260	630	105	66,150	12	5,512
R	90	14.0	1,260	90	15.0	1,350	2,610	1,305	105	136,500	12	11,375
S	140	16.1	2,254	0	0	0	2,254	1,127	120	135,240	12	11,270

Total in place

402,871

Original Blocks.

											Hart's Factor	Our Tons	Hart's Tons	Hart's Grade	
(4)	300-400	800	25.7	20,560	600	22.2	13,200	33,760	16,880	125	2,110,000	10	211,000	215,430	4.48
(6)	400-500	600	22.2	13,200	630	15.4	9,702	22,902	11,451	140	1,603,140	10	160,314	243,795	4.926
(7)	500-600	530	15.4	9,702	550	16.9	9,295	18,997	9,498	115	1,092,270	10	109,227	169,866	4.40
(8)	600-700	550	16.9	9,295	570	18.9	10,773	20,068	10,034	120	1,204,080	10	120,408	128,375	3.04

600,949      757,466

÷ 11 =

546,317

T A B L E 3

## WALKER MINE

## ORE RESERVES

## CALCULATION OF GRADES

Block No.	TOP			BASE			Total Product	Total Area	Average Grade
	Area	Grade	Product	Area	Grade	Product			
A	13,380	4.12	55,145	7,660	4.38	33,560	88,705	21,040	4.22
B	1,991	3.00	5,973	3,260	3.42	11,180	17,153	5,251	3.26
C	2,919	5.00	14,595	2,288	4.00	9,152	23,747	5,207	4.56
D	4,020	4.47	18,000	3,830	6.38	24,440	42,440	7,850	5.40
E	3,640	4.27	15,560	2,665	6.53	17,427	32,987	6,305	5.23
F	700	5.00	3,500	2,100	5.71	12,000	15,500	2,800	5.53
G	4,770	3.37	16,110	1,728	3.00	5,184	21,294	6,498	3.27
H	3,830	6.38	24,440	2,136	6.00	12,816	37,256	5,966	6.24
I	2,665	6.53	17,427	3,019	5.00	15,095	32,522	5,684	5.72
J	2,100	5.71	12,000	-	-	-	12,000	2,100	5.71
K	1,728	3.00	5,184	3,760	3.29	12,380	18,564	5,488	3.38
L	2,136	6.00	12,816	2,400	5.00	12,000	24,816	4,536	5.47
M	2,400	5.00	12,000	2,938	3.16	9,284	21,284	5,338	3.98
N	3,019	5.00	15,095	-	-	-	15,095	3,019	5.00
O	-	-	-	3,725	2.00	7,452	7,452	3,726	2.00
P	3,760	3.29	12,380	2,480	3.00	7,440	19,820	6,240	3.17
Q	-	-	-	1,260	2.00	2,520	2,520	1,260	2.00
R	1,260	2.00	2,520	1,450	2.00	2,900	5,420	2,710	2.00
S	2,254	2.00	4,508	-	-	-	4,508	2,254	2.00

NOTE

To be appended to Walker report of April 15, 1925.

In determining available tonnage, there must be deducted from the above figures a certain quantity represented by pillars of ore which cannot be recovered until it is no longer necessary to maintain the shaft and chutes. This time will come only at the last stage of operations.

The management has determined that these pillars, as carefully measured, contain 75,751 tons.

INTERNATIONAL SMELTING CO.  
GEOLOGICAL DEPARTMENT

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*Anaconda Copper Mining Company*  
GEOLOGICAL DEPARTMENT

WALKER MINE

Situation as of April 19, 1924.

Letter to J. O. Elton.

By

Paul Billingsley.

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Anaconda Copper Mining Company

GEOLOGICAL DEPARTMENT

W A L K E R M I N E

ESTIMATE OF FUTURE OPERATIONS

Letter to

J. O. ELTON, VICE-PRESIDENT

By

PAUL BILLINGSLEY

May 3, 1923

Salt Lake City, Utah.

May 3, 1923.

Mr. J. O. Elton, Manager,  
International Smelting Co.,  
O F F I C E S.

Dear Sir:

The enclosed letter to Mr. Hart will explain fully my conclusions as to the tonnage and grade of ore remaining in the Walker mine. I do not believe Mr. Hart will be able successfully to challenge these conclusions. It is important therefore to forecast future operations on the basis of an assured ore reserve of 580,000 tons of ore divided as follows:

Above 5%	About 165,000 tons
Between 4 and 5%	About 140,000 tons
Between 3 and 4%	About 230,000 tons
Between 2 and 3%	<u>About 45,000 tons</u>
Total above 2%	About 580,000 tons

Average grade - 3.9% - say 4% in round numbers.

The first step is to find out what the mine is paid for. This varies with the grade of the ore, the figures being given in the following table:

T A B L E 1

WALKER MINE

CONCENTRATION RATIOS WITH PRESENT MILL ASSUMING 21% CONCENTRATE  
AND .25% TAILS.

% Heads	#Cu in heads	#Cu in Conc.	#Cu in Tails	Formula	Conc. Ratio	lbs. paid for per ton crude
6	120	420	5	$120x = 420 \text{ plus } 5x-5$	3.61	108
5	100	420	5	$100x = 420 \text{ plus } 5x-5$	4.37	89
4	80	420	5	$80x = 420 \text{ plus } 5x-5$	5.46	71
3	60	420	5	$60x = 420 \text{ plus } 5x-5$	7.54	52
2	40	420	5	$40x = 420 \text{ plus } 5x-5$	11.85	33

Pounds paid for in concentrate = 389.

The second step is to ascertain the operating cost per ton, and from this to determine the operating cost per pound of copper paid for. The costs at the mine are reported under the following heads:

Breaking ground,

Drawing,

Milling,

Tramming.

Table 2 gives these items for the period June 1, 1922 to April 1st, 1923.

T A B L E 2

## WALKER MINE

## OPERATING COSTS

	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
Breaking	\$ 9,073	16,824	14,192	15,172	15,033	14,811	23,023	20,890	18,507	N. R.
Tons Broken	3,176	5,158	7,547	8,501	7,000	7,700	15,400	16,500	13,800	15,600
Cost per ton	\$ 2.86	3.26	1.88	1.78	2.15	1.92	1.50	1.27	1.34	-
Producing Ore	\$ 3,411	5,960	6,579	10,466	7,887	8,476	8,172	7,351	6,142	N. R.
Tons Drawn	3,047	4,270	5,717	4,420	5,170	5,402	6,167	6,949	6,417	7,135
Cost per ton	\$ 1.12	1.40	1.15	2.37	1.53	1.57	1.33	1.06	.96	
Milling	\$ 9,678	9,497	13,771	9,860	13,038	19,708	15,657	15,884	14,702	N. R.
Tons Milled	4,575	6,224	6,372	4,866	5,308	4,856	5,118	5,390	5,136	7,469
Cost per ton	\$ 2.12	1.53	2.16	2.03	2.46	4.06	3.06	2.95	2.86	2.17
Tramming	\$2,346	2,418	1,953	3,481	2,440	3,104	2,918	3,008	2,383	-
Tons Trammed	3,330	2,950	2,178	2,934	3,030	2,625	2,145	2,655	2,359	2,070
Cost per ton	\$ .70	.82	.90	1.19	.81	1.18	1.36	1.13	1.01	-
Cost per ton of ore drawn	.75	.57	.34	.78	.47	.57	.47	.43	.37	
Total actual cost	\$6.91	6.76	5.53	6.96	6.61	8.12	6.36	5.71	5.53	
Total money spent at mine	\$30,707	36,624	38,256	42,490	42,445	51,557	54,629	47,133	42,549	
Total expense per ton drawn	10.07	8.57	6.69	9.61	8.21	9.54	8.86	6.78	6.63	

This indicates that with no allowance for development maintenance, or miscellaneous expense, a cost of about \$5.00 per ton is within sight with the present equipment. With these items included the total current expense per ton of ore may be brought down to \$6.00 per ton - with present equipment.

Table 3 works out the current cost per pound for the different grades of ore, and goes on to show the net operating profit per pound on copper at various market prices from 12 to 18 cents per pound.

T A B L E 3

WALKER MINE

COST PER POUND COPPER - CRUDE ORE ASSUMING MINING, MILLING AND TRAMMING COST OF \$6.00 PER TON.

NO DEVELOPMENT, CONSTRUCTION OR DEPLETION COSTS.

Grade crude ore.	Tons in reserve	Cost per ton.	Obs. Cu paid for per ton.	Mining & Milling cost per pound paid for.	Net Operating Profit						
					12¢	13¢	14¢	15¢	16¢	17¢	18¢
6% or better	12,000	6.00	108	5.55 cents	2.944	3.944	4.944	5.944	6.944	7.746	8.746
5% or better	165,000	6.00	89	6.74 cents	1.754	2.754	3.754	4.754	5.754	6.556	7.556
4% or better	305,000	6.00	71	8.45 cents	-	1.000	2.000	3.000	4.000	4.846	5.846
3% or better	535,000	6.00	52	11.53 cents	-	-	-	-	.964	1.766	2.766
2% or better	580,000	6.00	33	18.18	-	-	-	-	-	-	-
Net smelter returns per lb. in conc. *					8.494	9.494	10.494	11.494	12.494	13.296	14.296

\* Including credits for gold at \$20.00 and silver at 60¢; and deducting treatment charges, penalties, and freight.

It will be noticed that there is no operating profit on the 2% ore even at 18¢ copper, none on 3% ore below 16¢ copper, and none on 4% ore below 13¢. These figures do not include depletion or depreciation charges, nor interest on indebtedness - merely current costs on a basis of \$6.00 per ton for everything.

Table 4 gives the data upon which these depletion and depreciation charges should be based.

T A B L E 4

WALKER MINE

DEPLETION AND DEPRECIATION CHARGES ON BASIS OF 535,000 TONS OF ORE AVERAGING 4.06% COPPER.

Mines and Mining claims	\$1,331,925	
Plant and Equipment	<u>1,021,814</u>	
Total fixed charges	2,353,739	
Development costs should properly be treated as a suspense account to be charged off against total tonnage developed, but in practice they have been charged off currently against ore mined.		
Reduction during past operations	453,780	
Balance of fixed charges to apply against present ore reserve	1,899,959	
Depletion and depreciation	\$3.55	per ton or 5.16¢ lb.
Pounds of copper paid for	36,813,000	
Proposed new mill etc., will cost	382,942	
This means	\$.715	per ton or 1.04¢ lb.
Total proposed fixed charges	4.265	per ton or 6.20¢ lb.

Note - Depletion.

If, according to Table 4, a fixed charge of 6.20 cents per pound is included, no ore will show a profit at less than 16¢ copper and only 165,000 tons can be profitably mined at 17¢. See Table 5. Of course, the situation is not such that this fact is of importance. Actually, the depletion and depreciation charges have been paid represented by expenditures on the mine and equipment. The practical problem is to determine how soon and to what extent they can be earned back out of operations.

This calculation is made in Table 6, combining the proper figures from Tables 1 and 3. Table 7 in turn summarizes the results reached in Table 6.

T A B L E 5

WALKER MINE

ORE THAT CAN BE PROFITABLY MINED IF PROPER FIXED COSTS ARE CHARGED AGAINST IT.

FIXED COSTS TO DATE - 6.200¢ PER POUND.

	Net Operating Profit At different copper prices							
	12¢	13¢	14¢	15¢	16¢	17¢	18¢	
6% or better	2.944	3.944	4.944	5.944	6.944	7.746	8.746	
5% or better	1.754	2.754	3.754	4.754	5.754	6.556	7.556	Ore that can be profitably mined - At 16¢ - 12,000 tons At 17¢ - 165,000 tons
4% or better	-	1.000	2.000	3.000	4.000	4.846	5.846	
3% or better	-	-	-	-	.964	1.766	2.766	
2% or better	-	-	-	-	-	-	-	

T A B L E 6

WALKER MINE

NET OPERATING PROFIT AT DIFFERENT COPPER PRICES WITH PRESENT EQUIPMENT.

Grade	Tons.	Lbs. per ton paid for.	Total Pounds	Total Profit At						
				12¢	13¢	14¢	15¢	16¢	17¢	18¢
6% plus	12,000	108	1,296,000	38,154	51,114	64,074	77,034	89,994	100,388	113,348
5% - 6	153,000	89	13,617,000	238,842	375,012	511,182	647,352	783,522	892,730	1,028,900
4% - 5	140,000	71	9,940,000	-	99,400	198,800	298,200	397,600	481,692	581,092
3% - 4	230,000	52	11,960,000	-	-	-	-	115,294	211,213	330,813
	535,000		36,813,000	276,996	525,526	774,056	1,022,586	1,386,410	1,686,023	2,054,153

-6-

The simplest way to consider this total profit, which will be spread out over a number of years, is to determine its present cash value. This eliminates the question of interest - interest on money tied up in broken ore, interest on indebtedness etc.,. This step is taken in Table 8, assuming the present mill will treat 75<sup>0</sup>,000 tons per year.

These tables are based on the present equipment, with the costs, recoveries, and daily tonnages attained with it.

T A B L E 7.

WALKER MINE

ORE THAT CAN BE MINED AT A NET OPERATING PROFIT, IN ORDER TO REDUCE LOSS ON FIXED CHARGES  
ALREADY INCURRED.

THIS IS THE PRESENT ACTUAL PROBLEM.

Price of copper.	Tons.	Pounds paid for.	Average Profit per lb.	Total Profit.
18	535,000	36,813,000	5.58	2,054,153
17	535,000	36,813,000	4.58	1,686,023
16	535,000	36,813,000	3.58	1,386,410
15	305,000	24,400,000	4.19	1,022,586
14	305,000	24,400,000	3.19	774,056
13	305,000	24,400,000	2.19	525,526
12	165,000	14,850,000	1.86	276,996

T A B L E 8.

WALKER MINE.

LIFE AND PRESENT CASH VALUE OF PRESENT ORE RESERVE ASIDE FROM INDEBTEDNESS, AT DIFFERENT PRICES OF COPPER.

ASSUMING PRESENT MILL WILL TREAT 75,000 TONS PER YEAR.

Price of copper.	Tons that can be mined	Years Life	Average Annual Profit.	PRESENT CASH VALUE Assuming Interest	
				At 6%	At 8%
18	535,000	7.1	289,317	1,633,999	1,528,023
17	535,000	7.1	237,468	1,341,172	1,254,188
16	535,000	7.1	195,270	1,103,976	1,032,375
15	305,000	4.0	255,646	897,255	860,587
14	305,000	4.0	193,514	679,187	651,431
13	305,000	4.0	131,381	461,111	442,267
12	165,000	2.2	125,907	253,077	246,729

It is proposed to expend \$382,942 on improvements that will approximately double the capacity of the plant, and will result in a general reduction of costs. I can find no detailed estimate of the anticipated amount of this reduction, but estimate it as follows:

	<u>Presnet Costs</u>	<u>Best cost with present equipment</u>	<u>Best cost with new</u>
Breaking ground	1.30	1.25	1.25
Producing ore (a)	1.00	.50	.50
Milling	3.00	2.75	2.25
Tramming	.50	.50	.50
Miscellaneous	<u>1.00</u>	<u>1.00</u>	<u>.50</u>
	6.80	6.00	5.00

(a) Includes pulling stopes, sorting, tramming in mine, etc., Now high because much ore comes from sills, etc.,

Table 3 has given the cost and profit per pound of copper at a cost per ton of \$6.00. The following Table 9 gives the same calculations on a basis of \$5.00 per ton cost, which may be attained with the new equipment. Table 10 gives the total operating profit, with the new equipment, at different prices of copper, provided costs are brought down to \$5.00 per ton.

T A B L E 9.

WALKER MINE

COST PER POUND COPPER IN CRUDE ORE

ASSUMING MINING, MILLING, AND TRAMMING COST OF \$5.00 PER TON.

Grade Crude ore	Tons in ore reserve	Cost per ton	#Cu paid for per ton.	Cost per pound paid for	NET OPERATING PROFIT						
					12¢	13¢	14¢	15¢	16¢	17¢	18¢
6% or better	12,000	5.00	108	4.63	3.864	4.864	5.864	6.864	7.864	8.666	9.666
5% or better	165,000	5.00	89	5.62	2.874	3.874	4.874	5.874	6.874	7.676	8.676
4% or better	305,000	5.00	71	7.04	1.454	2.454	3.454	4.454	5.454	6.256	7.256
3% or better	535,000	5.00	52	9.61	-	-	.884	1.884	2.884	3.686	4.686
2% or better	580,000	5.00	33	15.15	-	-	-	-	-	-	-
Net smelter return per lb. in concentrate*					8.494	9.494	10.494	11.494	12.494	13.296	14.296

\* Including credits for gold at \$20.00 and silver 60¢ per ounce, and deducting treatment charges, penalties and freight.

T A B L E 10.

WALKER MINE

NET OPERATING PROFIT AT DIFFERENT COPPER PRICES  
WITH PROPOSED NEW EQUIPMENT.

Grade	Tons.	Lbs. per ton.	Total Lbs.	TOTAL PROFIT AT						
				12¢	13¢	14¢	15¢	16¢	17¢	18¢
6% plus	12,000	108	1,296,000	50,077	63,037	75,997	88,957	101,917	112,311	125,271
5% - 6	153,000	89	13,617,000	391,352	527,522	663,692	799,862	936,032	1,045,240	1,181,410
4% - 5	140,000	71	9,940,000	144,527	243,927	343,327	442,727	542,127	621,846	721,246
3% - 4	230,000	52	11,960,000	-	-	105,196	224,196	343,196	438,634	557,634
			36,813,000	585,956	834,486	1,187,212	1,555,742	1,923,272	2,218,031	2,585,561

T A B L E 11.

WALKER MINE

LIFE AND PRESENT CASH VALUE OF PRESENT ORE RESERVE,

ASIDE FROM INDEBTEDNESS

ASSUMING NEW MILL WILL TREAT 150,000 TONS PER YEAR.

Price of copper.	Tons that can be mined.	Years Life	Average Annual Profit	PRESENT CASH VALUE	
				At 6%	At 8%.
18	535,000	3.5	738,732	2,301,202	2,216,949
17	535,000	3.5	633,723	1,974,088	1,901,812
16	535,000	3.5	549,506	1,711,750	1,649,078
15	305,000	2.0	777,871	1,445,693	1,411,793
14	305,000	2.0	593,606	1,103,234	1,077,364
13	305,000	2.0	417,243	775,456	757,272
12	165,000	1.1	532,687	545,103	539,156

Table 11 gives the present cash value of the ore reserve as developed at present, at different prices of copper, with the new equipment, and Table 12 shows the additional value gained by the installation of this equipment.

T A B L E 12  
PRESENT CASH VALUE OF SAVING BY NEW MILL.

Price of copper.	At 6% interest	At 8% interest
18¢	\$667,203	\$688,926
17	632,916	647,624
16	607,774	616,703
15	548,438	551,206
14	424,047	425,933
13	314,345	315,005
12	292,026	292,427

Since the proposed new equipment will cost about \$400,000, it will achieve a net saving on the present ore reserve if the average price of copper remains above 14¢ per pound. The amount saved above the cost of the new mill, etc., will be:

18	-	About \$275,000
17	-	About 240,000
16	-	About 210,000
15	-	About 150,000

This will be true only if the new mill makes it possible to bring the total operating costs down to \$5.00 per ton. To reach this figure will require the elimination of many expensive features of the past mining methods, notably:

Crooked drifts,

Excessive side swiping,

Irregularly placed chutes due to  
crooked drifts,

Cribbed manways,

Sorting at chutes,

Blasting boulders in chutes,

Tramming on intermediate levels.

To correct these points may delay output at present, but such delay will prove highly profitable if it results in increased efficiency in the future.

TO SUM UP:

The Walker Mining Company has an indebtedness of \$1,674,506; against this it owns an orebody, with a plant for its extraction. If the management believes that for the next four years the price of copper will remain above 14¢ per pound, there is justification for expending about \$400,000 more in improving the plant. If this is done, the indebtedness will be about \$2,075,000, and the orebody will be worth, according to the price of copper:

At 18¢	-	\$2,200,000 to 2,300,000*
At 17¢	-	1,900,000 to 2,000,000
At 16¢	-	1,650,000 to 1,700,000
At 15¢	-	1,400,000 to 1,450,000
At 14¢	-	1,075,000 to 1,100,000
At 13¢	-	750,000 to 775,000
At 12¢	-	540,000 to 545,000

\* Depending upon whether the assumed rate of interest to be paid on the investment is 6% or 8%.

With the new equipment, therefore, the present developed orebody will show an ultimate slight profit if copper remains above 17¢. This assumes that all the ore left in the mine will be treated by the new mill. Without the new equipment the orebody will not pay off the present indebtedness even at an average price of 18¢ for copper. (See Table 8).

The pressing needs at the mine are:

- 1st - Installation of new mill,
- 2d - Improvement in underground methods,
- 3d - Prosecution of extensive development and exploration work.

Very truly yours,

*Faul Billingsley*

PB/CH.

INTER DEPARTMENTAL CORRESPONDENCE

FROM:

SALT LAKE OFFICE  
OF  
INTERNATIONAL SMELTING CO.  
PURCHASING DEPARTMENT  
ANACONDA COPPER MINING CO.  
PURCHASING DEPARTMENT  
TOOELE VALLEY RAILWAY CO.  
WALKER MINING CO.

OFFICE OF  
J. B. WHITEHILL

SALT LAKE CITY, UTAH,

July 30, 1923.

Mrs V. A. Hart, Mgr.,  
Spring Garden, Calif.

Dear Sir:

Referring to your letter of July 26th, regarding settlement sheet of July 23rd, covering Mine Lot No. 70, concentrates. Enclosed please find the statement requested by you, showing correction in freight charges on account of the load being under minimum.

Yours very truly,

*J. B. Whitehill*

DAW.T.

Encl.

September 14, 1923

Mr. J. O. Elton, Manager  
International Smelting Company,  
O F F I C E S

Dear Sir:

I have studied carefully the recommendations for the Walker mine submitted by Mr. Gidel . I return them to you with the following comments:

No. 1. This covers the program for the development of the north shear zone on the 600' level. At the time of my visit in April I made the following recommendation for this area,

"The drift should be run straight, with a course about N. 20<sup>o</sup> W - - - - Crosscuts should be run to foot and hanging wall at 100 ft. intervals."

This development scheme took into account the certainty that the vein itself would show minor bends and displacements, and was intended to avoid the confusion sure to follow if the drift was allowed to wind around in search of the ore. The straight drift would take us through the desired area, and the crosscuts would find any ore of consequence. More important still, this scheme would have left the workings in good shape for any further development desired.

When Mr. Gidel reached the Walker mine in July he found

2- September 14, 1923

that the above program was not being followed, the drift having diverged from the allotted course in an effort to work over to a richer part of the vein. In fact it became ultimately a crosscut. Mr. Gidel therefore advised Mr. Hart verbally to start a fresh drift upon the best ore showing in this semi-crosscut, which has been done, the new drift now being probably 50 feet long. Recommendation No. 1 is essentially to the effect that this drift be continued on its present course, with crosscuts at 100 ft. intervals.

If our effort had been to continually keep the drift in the best part of the vein, Mr. Gidel's instructions would have been the best possible. The advantages of this aim, however, have been proved to be neutralized by the disadvantages of the resulting crooked drifts, which do not give a proper idea of widths and grade, and furthermore are seldom properly placed for the installation of chutes.

To follow out Recommendation No. 1 is to lose the advantages of regular openings and a consistent development plan, although the desirability of these features has been recognized in previous discussions. On the other hand, to go back to the point where the drift diverges from the original course means the duplication of about 100 ft. of work. It is a choice of evils, and on the whole I suppose we might as well forget the spilt milk and start again as recommenced by Gidel. It is important however, to make sure that in the future similar detours are avoided. The occasional presence of small slips

3- September 14, 1923

should not be the excuse for abrupt changes in the course of the drift.

No. 2. Unnecessary at present. This ore will be taken out in the natural course of extracting the shaft pillar east of No. 2 Raise.

No. 3. This is the same as one of my recommendations in April, and I endorse it fully.

No. 4. This embodies the idea contained in my April recommendation that the 700' level be extended beyond the fault in search for a faulted segment of the vein. It should be amended to exclude the subsequent drifting, which is a separate problem to be considered by itself. Therefore let it read as follows:

"Extend main drift on 7th level northwest on hanging wall side of fault, keeping fault on left hand side of drift for a distance of about 150 ft. unless the vein is encountered sooner."

No. 5 This is a good recommendation, and will develop a good looking parallel vein. It need not be taken up, however, till the general situation makes it desirable.

No. 6. Endorsed. The foot note suggesting a vertical shaft does not take into account the fact that we do not know as yet whether a shaft will ever be needed. The first thing to do is follow the best ore down.

Very truly yours,  
Paul Billingsley

| Level 600  
| Mine Walker  
| No. 1.  
|XXXXXXXXXXXXXXXXXX

RECOMMENDATIONS FOR DEVELOPMENT WORK

A.C.M. CO. GEOLOGICAL DEPARTMENT

DESCRIPTION

Drift N 20 W. from face Oct. 12 in northernmost crosscut, and drive crosscuts to footwall and hanging wall of vein at intervals of 100 feet.

OBJECT

To develop mineralized zone beneath that explored on the 300 level north. Few spotty assays above 3% copper were obtained above on the Third level. Since the main ore body shows so much improvement below the Third level it is possible that the north mineralized zone will contain ore on the lower levels.

Date of recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley

Subject to my letter 9/14/23 to J. O. Elton

} Level 600  
| Mine Walker  
|  
| No. 2  
| |||||

RECOMMENDATIONS FOR DEVELOPMENT WORK  
A.C.M. CO. GEOLOGICAL DEPARTMENT

DESCRIPTION

Drift northwest on ore showing on north side of Raise  
No. 2 on 600 level.

OBJECT

To develop ore to cut-off on northwest fault. A length  
of probably 70 to 100 feet of ore may be found here and will deter-  
mine whether or not short crosscuts should later be driven southwest  
from points in lateral north of cut-off.

Date of recommendation 9/12/23

Recommended by M. H. Gidel





RECOMMENDATIONS FOR DEVELOPMENT WORK  
A.C.M. GEOLOGICAL DEPARTMENT

) Level 700 Adit  
)  
) Mine Walker  
)  
) No. 5  
)  
))))))))) ))))

Description

Drift northwest on vein showing in main crosscut at a point 65 feet north of station No. 3000. The vein is 580 feet south of main drift northwest.

OBJECT

General development of a vein which might contain an ore shoot. A 60 foot exposure in the main crosscut assays 1.8% copper.

Approximate amount of work 300 feet or more

Date of recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley

RECOMMENDATIONS FOR DEVELOPMENT WORK  
 A.C.M. CO. GEOLOGICAL DEPARTMENT

| Level 700 Adit  
 |  
 | Mine Walker  
 |  
 | No. 6  
 |  
 |XXXXXXXXXXXX|

Description

At a point midway between Raise No. 2 and Raise No. 3 sink a winze on vein to a depth of at least 200 feet. Drive appropriate drifts and crosscuts to adequately develop the ore shoot below the adit level.

Object

To develop the downward extension of the ore shoot at a point where the best ore shows on the tunnel level. Note: **if** considerable development be planned below the tunnel level, Mr. Hart's plan of sinking a vertical shaft from a point on the foot wall side of the vein between the granodiorite dikes would be more desirable. The shaft would thus be located away from old stopes and in an area relatively dry. The bulk of water contained in the ore shoot north of the dike might be excessive and costly to handle with sinking pumps in the winze as proposed. Regular level development from a vertical shaft could then be done at any desired depth.

Date of Recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley

# ANACONDA COPPER MINING COMPANY

RENO H. SALES, CHIEF GEOLOGIST  
F. A. LINFORTH, ASSISTANT CHIEF GEOLOGIST



BUTTE, MONTANA

Sept. 20, 1923

## GEOLOGICAL DEPARTMENT

Mr. Paul Billingsley,  
Portage, Wash.

Dear Sir:

I am sorry you did not wire me that you would be in Butte on the 17th. as I could have made it in time to see you.

I have your letters written in Butte on Sept. 17th. and I may say with reference to the Walker Mine that now as in the past Mr. Thayer and Mr. Wraith are much more disturbed about small changes in Walker development work than necessary. At the same time it is about time they were telling Hart to carry out development work the way he is told or let somebody else do it. I think it is absolutely useless for members of the Geological Department to be chasing to the Walker Mine on matters which are of no great moment and for which they are not responsible and for which they cannot be held responsible unless the management at the mine carries out the work as laid out by the Geological Department.

The story has been the same ever since development began at the Walker Mine and I don't see how things will be any better unless Hart is made to follow instructions. The point is that our trips there do not result in any improvement,

*Walker*

consequently I get rather provoked at the frequent request that you or Gidel or somebody else go there and as far as I can see the developments at the mine are carried on just about as Hart wants them.

It would be difficult for me to say how many times Hart has received instructions to furnish the Butte office with copies of his blue print maps, notwithstanding this, I have not seen an advance working map of the Walker Mine for a year or more except one brought home by Gidel.

I expect to go to Salt Lake when Thayer is there and possibly go on to the Walker Mine, although this is hardly necessary unless Thayer suggests it. I do want to meet with Mr. Thayer and Mr. Elton on the subject and will plan to be in Salt Lake before they go or upon their return from the Walker.

As far as the duplication of the geological work at Walker is concerned, I think I should have something to say about that from this end and it is my belief that if the work is properly done by Gidel, and I think you will agree with me that Gidel's work is entirely satisfactory, I am going to object to using the time of other geologists to duplicate geological work at the Walker. This is one matter I want to have an understanding about with Elton. If Hart would communicate with us regarding geological problems, development work and etc. instead of ignoring us entirely, the Walker development could be carried on without any worry on the part of Elton. Hart insists upon being his own geologist and apparently doesn't want to take

any advice or instructions from this office. I insist that if we are to be held responsible, Mr. Hart is going to do things the way we want him to, <sup>and</sup> he is going to keep us informed of developments so that we can watch what is going on from our department rather than waiting for these difficulties to come up through Elton. It should not be necessary for Elton to be bothered with matters of this sort and he can be relieved of it if he will make certain that Hart obeys instructions as to prospecting and development given by this department.

Regarding the outlying properties in the vicinity of the Walker it doesn't need Hart's influence to make a competent engineer report unfavorably on same. There seems to be a thought lurking in the mind of somebody that there is a good mine waiting development in that vicinity but I think you will agree with me from Gidel's examinations that there is nothing there worth thinking about, and so far nothing has been found in any of the prospects that justifies even a moderate amount of development work. It would be absolutely a waste of time for you to cover the same ground examined by Gidel. I have seen some of the properties and I feel sure that as far as Hart is concerned he was never inclined to be pessimistic regarding anything that had even a fair showing. In the past two or three years he has been pretty well tied up with the Walker and has not had much opportunity to study outside prospects, but I am sure he has the local

situation pretty well sized up and we can be safe in assuming that prospects in the Walker vicinity have but little promise of becoming profitable mines.

If we have any money to spend on new prospects there is still room for such expenditures on the north end of the Walker Mining Company's property. If the Walker shear zone is worth prospecting anywhere outside of the Walker Mine, it should be worth prospecting on the most northerly claims of that company and I would personally much prefer spending money there than upon any of the things Gidel or any of the rest of us have seen on independent properties in that district.

As far as the ore calculations are concerned as between your estimates and Arieta's, I am willing to stand on your tonnages. There is no way of making accurate comparisons beyond what you have already said to Elton relative to the probable amount of waste broken in the stope walls through actual mining operations. Hart's effort appears to have been mainly to get his tonnage figure up, ignoring the <sup>g</sup>ffect on the assay of the ore. He feels satisfied to be able to get his tons up to his earlier estimates. The fact of the matter is as you have already stated, there is about so much copper in the Walker ore body and it doesn't make much difference whether you put it in 600,000 tons or 1,000,000 tons except in the matter of costs. Hart prefers more tons.

Very truly yours,



RHS EL

October 12, 1923

Mr. V.A. Hart, Manager  
Walker Mining Company  
Spring Garden, Calif.

Dear Sir:

In accordance with the decision reached at yesterday's conference, I wish to make the following recommendations for development at the Walker Mine. It is understood that the work is to be prosecuted at the rate of approximately 300 feet per month.

1. Drift South on main vein from point of its intersection by 700 tunnel to granite contact. Subsequently explore fully in this area by cross-cuts and raises.

2. Continue exploration of shear zone at North end of 600 level by means of straight drift with cross-cuts in both directions at intervals of 100 feet. Drift should be continued N 20° W from present face until and if the geological department authorizes a change in course.

3. Open sill to limits of ore in all directions from Cross-cut No. 2 East of North drift on 6th level. (Mr. Thayer's suggestion).

4. Extend 7th level beyond present North face with a course of N 55° W, which places it parallel to the shaft fault and about 10 ft. in the hanging wall. Continue for about 200 ft. or until the first North fault is cut, unless ore is encountered sooner. If course of N 55° W does not keep away from shaft fault, notify geological department.

2- October 12, 1924

5. Cross-cut 150 ft. into hanging wall on 7th level for purpose of establishing diamond drill station to test vein below this level. This cross-cut may be located with reference to convenience on 7th level, but should be preferably between No. 1 and No. 3 raises. Mr. Arrietta's suggestion as to placing cross-cut a few feet above level for convenience in loading big cars has no objections from the geological standpoint.

6. Drift South on 5th level, first turning Eastwardly to hanging wall of vein, then following this South to and beyond large granite dike at about 340 ft.

You may consider this letter as your authorization to start the above work.

Yours very truly,

Paul Billingsley

Geological Department  
International Smelting Co.

PB.L

September 14, 1923

Mr. J. O. Elton, Manager  
International Smelting Company,  
O F F I C E S

Dear Sir:

I have studied carefully the recommendations for the Walker mine submitted by Mr. Gidel . I return them to you with the following comments:

No. 1. This covers the program for the development of the north shear zone on the 600' level. At the time of my visit in April I made the following recommendation for this area,

"The drift should be run straight, with a course about N. 20<sup>o</sup> W - - - - Crosscuts should be run to foot and hanging wall at 100 ft. intervals."

This development scheme took into account the certainty that the vein itself would show minor bends and displacements, and was intended to avoid the confusion sure to follow if the drift was allowed to wind around in search of the ore. The straight drift would take us through the desired area, and the crosscuts would find any ore of consequence. More important still, this scheme would have left the workings in good shape for any further development desired.

When Mr. Gidel reached the Walker mine in July he found

2- September 14, 1923

that the above program was not being followed, the drift having diverged from the allotted course in an effort to work over to a richer part of the vein. In fact it became ultimately a crosscut. Mr. Gidel therefore advised Mr. Hart verbally to start a fresh drift upon the best ore showing in this semi-crosscut, which has been done, the new drift now being probably 50 feet long. Recommendation No. 1 is essentially to the effect that this drift be continued on its present course, with crosscuts at 100 ft. intervals.

If our effort had been to continually keep the drift in the best part of the vein, Mr. Gidel's instructions would have been the best possible. The advantages of this aim, however, have been proved to be neutralized by the disadvantages of the resulting crooked drifts, which do not give a proper idea of widths and grade, and furthermore are seldom properly placed for the installation of chutes.

To follow out Recommendation No. 1 is to lose the advantages of regular openings and a consistent development plan, although the desirability of these features has been recognized in previous discussions. On the other hand, to go back to the point where the drift diverges from the original course means the duplication of about 100 ft. of work. It is a choice of evils, and on the whole I suppose we might as well forget the spilt milk and start again as recommenced by Gidel. It is important however, to make sure that in the future similar detours are avoided. The occasional presence of small slips

3- September 14, 1923

should not be the excuse for abrupt changes in the course of the drift.

No. 2. Unnecessary at present. This ore will be taken out in the natural course of extracting the shaft pillar east of No. 2 Raise.

No. 3. This is the same as one of my recommendations in April, and I endorse it fully.

No. 4. This embodies the idea contained in my April recommendation that the 700' level be extended beyond the fault in search for a faulted segment of the vein. It should be amended to exclude the subsequent drifting, which is a separate problem to be considered by itself. Therefore let it read as follows:

"Extend main drift on 7th level northwest on hanging wall side of fault, keeping fault on left hand side of drift for a distance of about 150 ft. unless the vein is encountered sooner."

No. 5 This is a good recommendation, and will develop a good looking parallel vein. It need not be taken up, however, till the general situation makes it desirable.

No. 6. Endorsed. The foot note suggesting a vertical shaft does not take into account the fact that we do not know as yet whether a shaft will ever be needed. The first thing to do is follow the best ore down.

Very truly yours,  
Paul Billingsley





RECOMMENDATIONS FOR DEVELOPMENT WORK  
A.C.M. GEOLOGICAL DEPARTMENT

} Level 700 Adit  
} Mine Walker  
}  
} No. 3  
}  
} |||

DESCRIPTION

From main 700 crosscut extend drift southeast through fault zone; recover vein probably thrown to right, and drift on same to granite contact. Crosscuts to foot and hanging wall of vein may be necessary at 100 foot intervals.

OBJECT

To develop the Walker Vein in new territory. Seven feet of 2.1% copper ore was found in a diamond drill hole 200 feet from the main adit crosscut. The vein at this point shows increasingly copper content and the proposed work may develop a new ore shoot.

Approximate amount of work 600' of drifting to granite contact.

Date of Recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley



RECOMMENDATIONS FOR DEVELOPMENT WORK  
A.C.M. GEOLOGICAL DEPARTMENT

) Level 700 Adit  
)  
) Mine Walker  
)  
) No. 5  
)  
))))))))) ))))

Description

Drift northwest on vein showing in main crosscut at a point 65 feet north of station No. 3000. The vein is 580 feet south of main drift northwest.

OBJECT

General development of a vein which might contain an ore shoot. A 60 foot exposure in the main crosscut assays 1.8% copper.

Approximate amount of work 300 feet or more

Date of recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley

RECOMMENDATIONS FOR DEVELOPMENT WORK  
 A.C.M. CO. GEOLOGICAL DEPARTMENT

| Level 700 Adit  
 |  
 | Mine Walker  
 |  
 | No. 6  
 |  
 | ||||| ||||| ||

Description

At a point midway between Raise No. 2 and Raise No. 3 sink a winze on vein to a depth of at least 200 feet. Drive appropriate drifts and crosscuts to adequately develop the ore shoot below the adit level.

Object

To develop the downward extension of the ore shoot at a point where the best ore shows on the tunnel level. Note: **if** considerable development be planned below the tunnel level, Mr. Hart's plan of sinking a vertical shaft from a point on the foot wall side of the vein between the granodiorite dikes would be more desirable. The shaft would thus be located away from old stopes and in an area relatively dry. The bulk of water contained in the ore shoot north of the dike might be excessive and costly to handle with sinking pumps in the winze as proposed. Regular level development from a vertical shaft could then be done at any desired depth.

Date of Recommendation 9/12/23

Recommended by M. H. Gidel

Approved by Paul Billingsley

December 12, 192~~4~~ <sup>3</sup> <sub>2</sub> <sub>1</sub>

Mr. J. O. Elton, Manager  
International Smelting Company  
O F F I C E S

Dear Sir:

Following are the recommendations for development at the Walker Mine brought up to date.

700 Level - South End.

After drift south from main tunnel has been extended far enough for switch, proceed with small drift for twenty-five feet; then x-cut south  $60^{\circ}$  west for a distance of thirty-five feet or to the vein if encountered in a shorter distance.

Sub-level Above 700

From shaft drift north on vein until cut by fault. Extend through fault, then parallel to fault on hanging wall side until vein is cut. Then drift north on vein.

700 Tunnel

Drift north on vein which shows in main tunnel 570 feet southwest of main drift.

600 Level - North End.

Side swipe to limits of ore showing in No. 2 north cross-cut. Start raise in best ore, continue raise until ore is cut by fault on foot wall, then notify geological department for further instructions.

2- December 12, 1924

600 Level- North End.

Continue drift on same course until well through fault, then turn due north. At a point 100 ft. beyond fault crosscut due east to hanging wall of vein unless fault is first encountered.

500 Level

Drift south on 5th level, first turning eastwardly to hanging wall of vein, then following this south to and beyond large granite dike at about 340'

Very truly yours,

Paul Billingsley

PB?CH

## OFFICERS

J. R. WALKER  
PRESIDENT  
J. O. ELTON  
VICE-PRESIDENT  
J. B. WHITEHILL  
SEC'Y-TREAS.

## WALKER MINING COMPANY

621 KEARNS BUILDING

## DIRECTORS

J. R. WALKER  
C. A. WALKER  
J. O. ELTON  
J. B. WHITEHILL  
B. R. HOWELL

SALT LAKE CITY, UTAH, January 18, 1924.

Mr. V. A. Hart, Manager,  
Walker Mining Company,  
Spring Garden, California.

Dear Hart:-

Replying to your letter of January 15th will say that I discussed the geological recommendations with Mr. Sales, who is here today. It is his opinion that we should adhere strictly to Billingsley's recommendations, as contained in his letter of December 12th.

I wish to thank you for the suggestions contained in your letter. The raise that you suggest in the south end of the tunnel level can be run at any time. Mr. Sales is of the opinion that we should push the work on the south end as fast as possible until we reach the back granite stock to the south. As you know, this recommendation has been before us for the past three years, but up until the present time we have not been able to get to it.

The driving of the sublevel north beyond the manway raise was also discussed with Mr. Sales, but he did not express himself as being very enthusiastic in regard to this recommendation. He thought it was best to carry it ahead as outlined by Mr. Billingsley.

I received your telegram in regard to changing the direction of the 600 drift north, and asked Mr. Billingsley to wire you authorizing the change of direction as suggested in your telegram.

I am glad to note that the bin foundation has been caught up and is now in good shape.

Please push the development work as fast as possible on the three recommendations to which you are to give preference.

Very truly yours,

JOE:H  
CC:PB



J. O. Elton,

Vice-President.

WALKER MINE  
SITUATION AND RECOMMENDATIONS  
FOR DEVELOPMENT WORK

March 5, 1924.

RESULTS OF RECENT DEVELOPMENT

Development work during the past few months has been restricted to three places - the north end of the 600 level, the sub-level just north of the main shaft, and the south end of the 700 level.

In the 600 north drift the vein has been followed for about 700 feet from the point where it was first struck. The face is now almost exactly as far north as the 300 north drift. The vein has remained strong and wide, but the grade has been almost entirely below 2%. One high grade bunch was encountered in No. 2 crosscut (613), but sideswiping has proved this to be only about 25 feet long by 20 feet wide. In the vicinity of crosscuts No. 4 (618) and No. 5 (620) the grade has averaged a little over 2%. This area is almost directly below (on the dip of the vein) the best portion of the vein on the 300 level, and a raise should ultimately be driven up in this region. For nearly 300 feet beyond 620 crosscut the grade remained below 2%. Beyond this point however an improvement can be noted. A rather strong north-south slip angles across the vein, and has permitted the descent of oxidation and some enrichment. In the 50 ft. length of vein developed beyond this slip to date, considerable sooty chalcocite can be seen, and the grade is somewhat better. It is to be

2- March 5, 1924

feared, however, that the improvement will be only local, in the vicinity of the oxidized slip.

The sub-level work was planned to develop a block of ground lying immediately north of the main Shaft Fault. There is a geometrical possibility that a wedge of the main orebody will be found on the lower levels in this block. The crosscut on the sub-level penetrated the fault, and disclosed from two to three feet of good ore lying on the hanging wall, in just the position proper for the tip of the anticipated wedge of vein. Unfortunately, a short distance farther on the crosscut encountered a series of cross faults, which may cut off the wedge of vein and drop it below the level. A very little additional work will prove this one way or the other.

In the 700 south drift the vein was successfully followed through an area of faulted ground, and has now been followed beyond in an unbroken segment for 60 feet. The face of the drift is now slightly south of the drill hole. The appearance of the vein is good, the width about 8 feet, and the mineralization of promising character. While the muck pile assays have averaged less than 2% the vein proper will probably run 3%. The drift has been driven partly in the footwall and the muck piles have included much waste. I believe that this southern vein will carry commercial ore a very short distance above the 700 level, and it is quite likely that the level itself will improve in grade as it extends southward.

3- March 5, 1924

### RECOMMENDATIONS

It seems desirable to increase somewhat the per month footage of development. The present program requires about 350 feet. This can be raised to 500 ft or more without raising the current costs above the desired figure of \$3.00 per ton. The additional work can be done in part in places which will advance the date when new stopes will be available, and in part in places which will yield milling ore at once, and hence raise the daily tonnage available for the mill. These are all ends the attainment of which is advantageous. Accordingly the following recommendations are made:

(All others are hereby annulled)

1. 400 Level. Extend Hanging Wall drift (401) south on vein as long as vein remains definite and contains pay ore. Notify geological department if conditions change. Rock broken goes into stopes.
2. 500 Level South end of 504 drift. Open up vein by side-swiping east side of drift, then drift southerly on vein to and beyond large granite dike. Further directions will be given if necessary for the recovery of the vein beyond the dike. Rock broken goes into stopes.
3. 600 Level Continue 616 drift north on present course, with crosscuts to foot and hanging wall every 100 ft. Rock broken goes to mill.

4- March 5, 1924

4. Sub-level. Continue north crosscut N  $55^{\circ}$  W to point 60 ft. from Sta. 89. Then crosscut S  $35^{\circ}$  W until through Shaft Fault. Waste.

5. 700 level - North End Extend 712 drift north with a course N  $30^{\circ}$  W for 470 ft. Waste.

6. 700 Level - South /End Continue 703 drift south on the vein. Crosscut to foot and hanging wall every 100 ft. Later on recommendations for a raise or raises in this area will be made.

Respectfully submitted,

Paul Billingsley

Salt Lake City

March 7, 1924

5

INTERNATIONAL SMELTING CO.,  
GEOLOGICAL DEPARTMENT

*Ataconda Copper Mining Company*

GEOLOGICAL DEPARTMENT

WALKER MINE

SITUATION AND RECOMMENDATIONS

FOR DEVELOPMENT WORK

March 5, 1924.

By

Paul Billingsley.

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WALKER MINE  
SITUATION AND RECOMMENDATIONS  
FOR DEVELOPMENT WORK

March 5, 1924.

---oOo---

INTRODUCTION:

The general situation at the Walker Mine is more encouraging than at any previous time. Costs on the present orebody have been brought to below \$3.00 per ton for mining and milling, and development work is proceeding at a rate that promises to disclose new orebodies before the present one is exhausted.

However, it must be borne in mind that the present low costs represent only the final stages in the extraction of the ore. If the entire process be regarded as divided into development, preparation for stoping, breaking, producing ore, tramping to mill, and milling, it can be seen that the present costs represent in general only the "breaking", and subsequent operations.

If the mine operation is to be well balanced, the proper amount of development and preparation on new ore should be carried on simultaneously with the stoping of the present orebody. This is made additionally advisable by the fact that the present orebody will have none too long a life. Finlay estimates that about one year more will complete the stoping below the 300 level on the present orebody, and that from present indications about three months more will exhaust the ore above the 300. I fully concur

-2-

in these estimates. It is accordingly very important to find, develop, and prepare new orebodies for stoping at the earliest possible moment. And since all the evidence to date indicates that such new orebodies will be low grade, it is particularly advisable to get them into production while there still remains some of the high grade ore in the north end of the main orebody which can be used to raise the average mill feed to the most efficient figure - about 3.3%.

#### RESULTS OF RECENT DEVELOPMENT:

Development work during the past few months has been restricted to three places - the north end of the 600 level, the sub-level just north of the main shaft, and the south end of the 700 level.

In the 600 north drift the vein has been followed for about 700 feet from the point where it was first struck. The face is now almost exactly as far north as the 300 north drift. The vein has remained strong and wide, but the grade has been almost entirely below 2%. One high grade bunch was encountered in No. 2 crosscut (613), but sideswiping has proved this to be only about 25 feet long by 20 feet wide. In the vicinity of crosscuts No. 4 (618) and No. 5 (620) the grade has averaged a little over 2%. This area is almost directly below (on the dip of the vein) the best portion of the vein on the 300 level, and a raise should ultimately be driven up in this region. For nearly 300 feet beyond 620 crosscut the grade remained below 2%. Beyond this

-3-

point however an improvement can be noted. A rather strong north-south slip angles across the vein, and has permitted the descent of oxidation and some enrichment. In the 50 ft. length of vein developed beyond this slip to date, considerable sooty chalcocite can be seen, and the grade is somewhat better. It is to be feared, however, that the improvement will be only local, in the vicinity of the oxidized slip.

The sub-level work was planned to develop a block of ground lying immediately north of the main Shaft Fault. There is a geometrical possibility that a wedge of the main orebody will be found on the lower levels in this block. The crosscut on the sub-level penetrated the fault, and disclosed from two to three feet of good ore lying on the hanging wall, in just the position proper for the tip of the anticipated wedge of vein. Unfortunately, a short distance farther on the crosscut encountered a series of cross faults, which may cut off the wedge of vein and drop it below the level. A very little additional work will prove this one way or the other.

In the 700 south drift the vein was successfully followed through an area of faulted ground, and has now been followed beyond in an unbroken segment for 60 feet. The face of the drift is now slightly south of the drill hole. The appearance of the vein is good, the width about 18 feet, and the mineralization of promising character. While the muck pile assays have averaged less than 2% the vein proper will probably run 3%. The drift has been driven partly in the footwall and the muck piles have includ-

-4-

ed much waste. I believe that this southern vein will carry commercial ore a very short distance above the 700 level, and it is quite likely that the level itself will improve in grade as it extends southward.

RECOMMENDATIONS:

It seems desirable to increase somewhat the per month footage of development. The present program requires about 350 feet. This can be raised to 500 ft. or more without raising the current costs above the desired figure of \$3.00 per ton. The additional work can be done in part in places which will advance the date when new stopes will be available, and in part in places which will yield milling ore at once, and hence raise the daily tonnage available for the mill. These are all ends the attainment of which is advantageous. Accordingly the following recommendations are made:

(All others are hereby annulled)

1. 400 Level. Extend Hanging Wall drift (401) south on vein as long as vein remains definite and contains pay ore. Notify geological department if conditions change. Rock broken goes into stopes.
2. 500 Level. South end of 504 drift. Open up vein by side-swiping east side of drift, then drift southerly on vein to and beyond large granite dike. Further directions will be given if necessary for the recovery of the vein beyond the dike. Rock broken goes into stopes.

-5-

3. 600 Level. Continue 616 drift north on present course, with crosscuts to foot and hanging wall every 100 ft. Rock broken goes to mill.
4. Sub-Level. Continue north crosscut N  $55^{\circ}$  W to point 60 ft. from Sta. 89. Then crosscut S  $35^{\circ}$  W until through Shaft Fault. Waste.
5. 700 Level - North End. Extend 712 drift north with a course N  $30^{\circ}$  W for 470 ft. Waste.
6. 700 Level - South End. Continue 703 drift south on the vein. Crosscut to foot and hanging wall every 100 ft. Later on, recommendations for a raise or raises in this area will be made.

Respectfully submitted,

*Paul Billingsley*

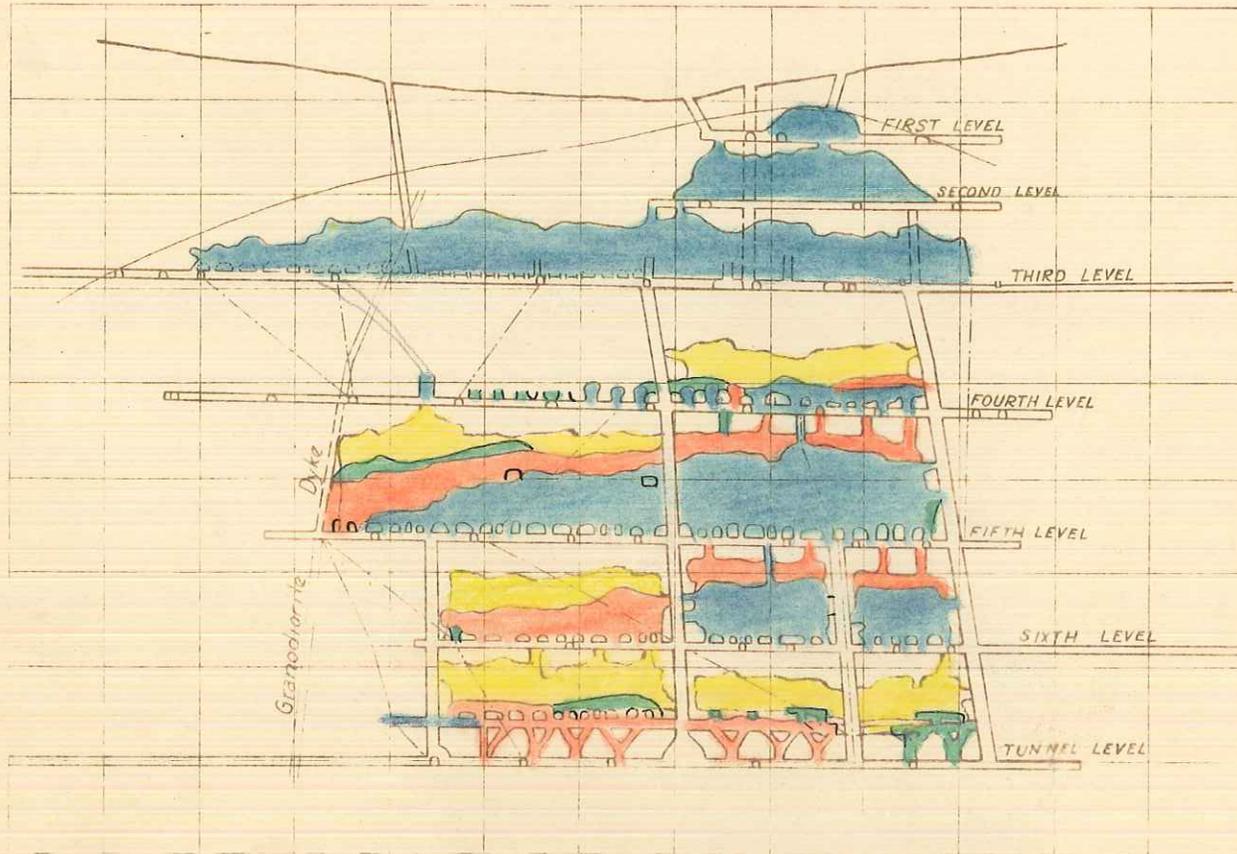
Salt Lake City.

March 7, 1924.

# WALKER MINE

## LONGITUDINAL PROJECTION OF OREBODY IN PLANE OF VEIN

SCALE: 1 INCH = 200 FEET



### LEGEND

- Stopped prior to April 15, 1923.
- Stopped April 15, 1923 to October 8, 1923.
- Stopped October 8, 1923 to Nov. 1, 1923.
- Stopped Nov. 1, 1923 to March 1, 1924.

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April 1, 1924

Mr. Wm. Wraith, Vice-President  
Walker Mining Company  
Room 1825, 25 Broadway,  
New York, N. Y.

Subject: WALKER MINE

Dear Sir:

Regarding the recommendations made on the 700 level  
Walker Mine, north end:

The points raised by you in your letter of March 14th to  
Mr. Elton are entirely reasonable and proper. The development  
of the north end is less important and less attractive than that  
of the south end and should not be permitted to retard the latter  
in any way. It is my belief that we have provided for the prose-  
cution of the south end work as rapidly as mining conditions and  
equipment permit. If not we will raise the rate of work to this  
point.

As to the north end, I was led to recommend additional  
work below the 600 for the following reasons:

1. The "Sub-level " development north of the shaft  
showed the very top of a block of ore which should be larger on  
the 700. The new 700 work will place us within easy cross-  
cutting distance of this.
2. The sideswiping in 613 crosscut, while not as  
successful as was hoped, still shows the presence of a considerable  
body of three percent ore. Going up, this will probably be cut  
off within 60 feet or so, but going down should reach the 700  
level without serious interruption. This relatively rich bunch  
may be the nucleus of a considerable body of ore that will exceed

2- April 1, 1924

in grade the break-even limit of mining, which with present costs is below two percent. The proposed work on the 700 has been laid out with a view of reaching the downward projection of this 613 bunch. My recommendation stopped at this point, leaving for a later date the matter of extending the drift farther northward. If it is so extended until below the 627 crosscut it will reach a total length of about 900 feet as indicated by Elton.

3. The north zone has now been developed on the 300 and the 600. While in general below profitable grade, as you point out, there are places on both levels where the break-even limit is exceeded, particularly as recent costs indicate that this limit may in the future be lower than we have in the past been able to concede. Between the 300 and 600 is over 300 feet, on the dip of the vein, which is far too great a distance to leave unexplored. A certain number of raises must be driven from the 600 to the 300 to develop this ground. At present the driving of such raises would be very difficult and expensive because of ventilating difficulties due to the fact that the 600 north drift is a dead end. If however the 700 is extended out below and a raise put up to the 600 at some point where the grade of the ore justifies it, a circulation of air will be established that will greatly simplify the driving of raises from the 600 to the 300.

It is impossible to predict just what width and grade we expect to find in the 700 north country. We have, however, two showings above the 700 - in the "sub-level" and in 613 cross-cut, that we feel deserve development on that level, and the recommendation #5 was made to accomplish this, together with the

3- April 1, 1924

other ends above outlined.

I agree absolutely with you in the points you emphasize in the concluding paragraphs. We must push the south end, and we must get new shrinkage stopes ready for mining as soon as possible. The north end work is not an alternative to this program. It is merely an addition to it that may give us some more ore.

Very truly yours,

(Signed) Paul Billingsley

39  
/

Oct. 25, 1924

Mr. Wm. Wraith,  
25 Broadway,  
New York City, N. Y.

Dear Sir:

I returned from Salt Lake this morning where I went over the Walker developments with Elton and Lyon.

I found that some of the developments in the Walker Mine are not being carried out in accordance with the recommendations made by the Geological Department. I merely wish to go on record here that this department cannot be responsible for the manner in which some of the prospecting work has been done.

From memory I can cite two examples I noted on the maps yesterday. The first one, at the south end of the 700 level. The vein became small and it was recommended by the Geological Department that crosscuts be run to the right and left of the face to see whether or not there was any more of the vein outside of the drift. The local management there did not carry out this work as recommended but ran a raise at the face of the drift 30 feet high, then ran the crosscuts from the top of the raise claiming that it would be cheaper than running on the sill. I do not think it needs any argument to convince you that such a procedure was not in accordance with good mining. It added the

cost of the raise and besides had any ore been encountered in these raise crosscuts it would have been necessary to crosscut on the sill to such vein in order to continue its development.

The second example, which work however was not recommended by the Geological Department was the driving of an intermediate over the 700 south drift at an elevation of 30 feet above the 700. This has no value either from a prospecting or mining point of view as far as I am able to determine. Furthermore the development work carried out to develop the vein on this intermediate was not in accordance with good mining in my judgment.

In our endeavor to assist the local management there in laying out his 700 level developments to the north to get into the vein and follow it with a minimum number of twists and turns, Mr. Lyon was told that the Geological Department had nothing to do with developments of that kind as the Geological Department was only concerned in prospecting work.

We wish to give the Walker management as much assistance as possible, we have always done so and hope to continue to the best of our ability. We do not wish however to be held responsible for such work as has been done above the south end of the 700 level on the so-called 30 foot intermediate.

On the 600 foot level at the extreme north end, the prospecting drift or crosscut recently passed through four or five feet of good grade ore. Notwithstanding the expressed desire of the management to follow ore rather than waste this drift was

extended through the ore band for a few feet and was than extended northerly alongside of and parallel to the ore. I understand the drift will be turned further to the left to again get in the vein. I am quite unable to understand why the drift shouldn't have been turned on the ore rather than in the country rock within a few feet of it.

The reason I am writing you is because I am not at all in accord with the manner in which these prospecting operations are being carried out. As far as our end of it is concerned I do not feel that it is good mining and I hope that our department will not be held responsible for it.

Very truly yours,

(Signed) Reno H. Sales

RHS EL  
Cc to T.T.Lyon.

ROOM 1825  
25 BROADWAY  
NEW YORK

November 12, 1924.

Mr. Tom Lyon,  
Geological Department  
Kearns Building,  
Salt Lake City, Utah.

Dear Tom:

I wish to acknowledge receipt of your letter of November 7th on the subject of development work at the Walker Mine.

I note the points that you bring out in reference to the charges to breaking ground and development. This is purely an accounting question and for which Mr. Hunter is responsible. If there are misunderstandings relative to the sub-division of accounts as outlined by our standard system of accounting, Mr. Hunter will be the one to straighten the matter out.

Relative to the earnings of contractors - I am sure that this can be left to Mr. Greninger, as undoubtedly he has adopted the rates that were in effect on his arrival, and it is quite apparent that the men are doing more work. I would suggest that these earnings are not out of the way as compared with Butte, but as it is a local operating matter and a matter in which local conditions must govern, Mr. Greninger is the one to decide what policy he shall pursue.

Thanking you for calling my attention to this, I remain,

Yours very truly,



Wm Wraith  
Vice President.

WmWraith/J  
cc -Mr. Greninger  
Elton

November 24, 1924

Mr. Wm. Wraith  
25 Broadway  
New York, N. Y.

My dear Will:

I have your letter today relative to the Walker.

My criticism of the sub-level 30 feet above 703 main drift south did not apply to the method of mining, but to the manner in which the work was carried out. I understand, of course, that the method of mining at the Walker requires such a sub-level, but it is surely essential to the proper carrying out of this method that the sub-level follows the ore, or the vein at least. There is no ore in 703 drift between 740 raise and 727 crosscut but 643 sub-level drift above this section does not even follow the vein, but wanders around in the footwall. Had it actually followed the vein it would have been useless anyhow it seems to me, because 703 drift shows there's no ore there to mine. 648 crosscut at the south end of 643 is similarly a useless piece of work. The two amount to 170 feet.

In Billingsley's judgment the first thing necessary in this south country, -I agree with him- was to put up raises to determine whether or not the ore disclosed in 703 south drift

2- Mr. Wm. Wraith

November 24, 1924

extended upward. If it does not, a sub-drift would not be needed. A further reason for getting these raises up was to definitely locate the ore at the 500 level elevation so as to guide the exploratory drift, #564, in its southward extension. The raises have not been made, and the 500 level south drift has wandered around and finally stopped, awaiting the completion of 750 raise. My point here is, that 750 raise should have been run as rapidly as possible and that the sub-level should have waited until the ore was proved, and its location at the 500 determined.

I see no reason for establishing a sub-level at the south end of 703 drift. There is no ore at 742 raise or within 100 feet of it, consequently mining will never extend to within 100 feet of this raise, and 742 raise can not properly be regarded as a part of the mining system. While I agree with you that in many instances crosscuts for prospecting purposes may best be run from intermediate or sub-levels it is of doubtful advisability to me where main workings are being extended out into new territory.

On the north end of the 600 level the Walker mine progress blueprint map, dated November 1, 1924, shows that 667 drift continued 60 feet in country rock waste before getting back into the vein, although there couldn't have been more than 3 feet of rock between the drift and the vein through all this distance. I know what the Walker vein looks like and I see no excuse for not following the ore when you have it. Even his last map does not show that he is now turning on the ore but instead he is crosscutting it again. On the 500 level south Lyon directed the management to continue drift 574 southerly on its course until it got through the irregular granite

November 24, 1924

dikes in that vicinity. When the 574 was continued a granite dike was encountered, but instead of continuing straight ahead through the dike as directed, the management turned and crosscutted 35 feet to the right, a useless piece of crosscut as there could be no reason for expecting to pick up the vein or a vein in that crosscut. On Mr. Lyon's last trip to the Walker this south work was stopped until such time when the 700 raise reaches the 500 level.

I know the Geological Department will not be held responsible for mining operations at the Walker. I do not want you to feel that I am criticising the mining end. I may differ from you in opinion as to the proper method of prospecting certain areas, but in the final say so as to how it will be done I certainly am always glad and willing to leave it to the mine management. But the Geological Department has in the past been held responsible, to some degree at least, for prospecting and development work, and whenever I see drifts run in waste when they should be in ore, or at least should be in the vein; and crosscuts run that are useless, I am going to kick, anyhow as long as this department has anything to do with it.

You may be sure that no one appreciates more than I the value of harmony and cooperation in an organization. Whatever criticisms I may have to offer are made with the main object in view, namely, helping the Walker mine to find all the ore there is in their ground and to mine it as cheaply as possible.

Very truly yours,

RHS/P  
cc: Mr. Lyon

(Signed) Reno H. Sales

# International Smelting Company

J. O. ELTON  
MANAGER



SALT LAKE CITY, UTAH, December 18, 1924.

Mr. R. E. Dwyer, General Auditor,  
Anaconda Copper Mining Company,  
25 Broadway,  
New York.

Dear Sir:-

I have today discussed with Mr. Sales the matter of supplying information with reference to Utah Delaware Mining Company, as requested in your letter of October 22, 1924. Also information with reference to Walker Mining Company, as shown in your letter of December 2nd, 1924.

In connection with the information covering Utah Delaware Mining Company, will say that we will have this ready within a few days and it will be mailed to you so that it will arrive in New York by the end of the month.

With reference to information covering Walker Mining Company, would say that after going through the records here and discussing this matter, we have come to the conclusion that the proper date to be used as date of discovery will be June 30, 1921, at which date the raise connecting the tunnel with the old shaft was completed.

I am today requesting Mr. Greninger to prepare the necessary maps, and will proceed to complete other information required in Form D. This we hope to have ready to be mailed to you to arrive in New York not later than January 15th, 1925.

Very truly yours,

ADH:H  
CC:RHS✓

A. D. Hunter,  
Cashier.

Dec. 21, 1924

Mr. R. E. Dwyer,  
Anaconda Copper Mining Co.,  
Room 1801, 25 Broadway,  
New York City, N. Y.

Dear Sir:

Mr. A. D. Hunter did not go to the hospital as suggested in my letter to you of the 15th. inst. He is not in good physical condition however.

We spent some time on the Walker matters in an endeavor to answer the questions set forth in your letter to Mr. Hunter of December 2nd. Mr. Hunter has written you of our selection of June 30th, 1921 as the date of discovery, and we make this date coincident with the date chosen as the time when the Walker Mine changed from a development proposition to an operating mine.

The development program at the Walker, which was agreed upon at the time, or immediately after my report to Mr. C. F. Kelley dated July 17, 1918, contemplated a crosscut tunnel to the vein, a drift upon the vein under the upper mine workings, with shaft and raise connections from the tunnel level to the 400 level which was the deepest level of the then existing workings on the vein.

Anaconda Copper Mining Co. v. United States, 250 U.S. 123, 19 S.Ct. 1039, 67 L.Ed. 201 (1919). This is a public domain document. The copyright in this document is held by the U.S. Government.

This plan had for its objectives the development of the vein to determine its value at the tunnel level, and to open up the ore body for economical mining.

Now as to how this development work is concerned with the discovery date. The amount of ore actually developed or in sight on July 17, 1918; the date of my report, was not sufficient to guarantee the return of the money necessary for development and equipment of the property, in other words it was insufficient to insure the Walker Mining Company that it had a profitable venture and until it had been proved that there was enough ore in the ground, of profitable grade, to at least return the investment incident to development and equipment of the property, the Walker Vein was not a discovery of ore as I view it.

It so happened that the tunnel level showed a marked falling off in grade of ore as compared with the 400, and it was not until Raise No. 1 and main shaft connections were made with the 400 level that the extent of the higher grade portion of the ore body was fully known.

The No. 1 Raise was completed to the 400 level or or about October 1, 1920. The Shaft connection from tunnel to the 400 was completed on or about June 30, 1921.

This date June 30, 1921 unquestionably marks the end of a development program. Prior to this date the mine was in a prospecting and development stage. The completed development program had proved the ore body and afforded means for its

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profitable extraction. Subsequent to June 30, 1921, the objective was the exploitation of the proved ore body, and further prospecting and development work followed the usual course incident to metal mining operations.

The crosscut tunnel intersected the Walker Vein sometime around Jan. 1, 1920. The drift northerly on the vein encountered what might be regarded as the south end of the ore shoot in May, 1920, and passed out of the north end of the ore body about October 1, 1920. No. 1 Raise was started near the south end of the ore near where it was encountered in May and was extended upward and holed to the 400 level at about the same time that the tunnel drift reached the north end of the ore, i. e. Oct. 1, 1920.

It might be urged and with good reason, that Oct. 1, 1920 marked a date when the ore was sufficiently proved to constitute a discovery. The No. 1 Raise started in low grade ore but passed into better grade at a short distance above the tunnel level and showed good ore from that point to the 400. But, the tunnel drift to the north disclosed a much lower grade than was opened on the 400 level north of the No. 1 Raise, and it was not until the shaft connection was made with the 400, that this downward extent of the better grade ore became known.

It may be questionable as to whether Oct. 1, 1920 or the later date June 30, 1921 should be regarded as the discovery date. The latter date seems to me to be the proper one. I certainly would not put it earlier than Oct. 1, 1920.

#4

There is, however, in connection with the discovery date of the Walker Mine, as discussed above, a feature I wish to call your attention to. This may possibly have weight in arriving at the date of discovery.

The ore disclosures of the Walker Mine on the 300 and 400 levels were excellent. The tunnel level on this ore body was a disappointment. The character of the vein and ore on the 400 level was such as to lead one to expect a much better grade of ore at the tunnel level than was actually found. Therefore in estimating the ore body for tax purposes it would have been reasonable to project the 400 ore to a depth considerably below the tunnel level at any time prior to the tunnel development. The tonnage expectancy figured from the 400 level showing would undoubtedly have been higher and the average metal content taken at a higher figure, than were possible subsequent to the completion of the tunnel drift.

My own feeling is that on or about May 1, 1920, when the tunnel drift began to show a better ore, I, myself, or any engineer would have given the maximum tonnage for the Walker.

Ore of the size and grade as disclosed on the tunnel level is profitable above the level but probably worthless below the tunnel. In consequence any calculation of ore tonnage for the Walker Mine on October 1, 1920 or any subsequent date prior to the discovery of the south ore body, must be limited to the developed ore body above the tunnel level, unless one may with reason assume that the main shoot will improve in grade

#5

at greater depths, or that at some future time under favorable price conditions the grade of ore as indicated below the tunnel level will become profitable.

If there is any advantage to us in making the Walker tonnage large, provided you agree that the below tunnel level ore of the Main shoot is of little value, it may be advisable when all angles of the thing are considered, to make the discovery date on or about May 1, 1920.

Your letter to me indicated a desire to make the discovery date as late as possible. What I have outlined above discloses my own opinion to be that on October 1, 1920 or on June 30, 1921 the Walker Mine had a much larger actually developed ore value with but little indicated additional possibilities, than on the prior date of May 1st, 1920, but that on the date, May 1, 1920, while the mine had probably less than one-third of the blocked out or developed ore value, it had an ore expectancy far greater than on October 1, 1920 or a later date, and which was doubtless much greater than will ever be realized from that particular ore shoot.

I have gone into this matter in some detail in order that you may understand the basis of our selection of June 30, 1921 as the date of discovery, and I deemed it advisable to explain to you some features which will have a considerable influence in ore estimates made at different dates.

Very truly yours,

(Signed Reno H. Sales

CC to A.D.Hunter.

C O P Y

SALT LAKE CITY, UTAH

April 29, 1925

Mr. Wm. Hreith  
Room 1825  
25 Broadway  
New York, N. Y.

Dear Sir:

Mr. Elton has handed me Mr. H. N. Tunnell's letter to you dated April 25th. In this letter Mr. Tunnell discusses the ore reserve question at the Walker mine, and apparently he is much in doubt as to whether or not the Walker mine will be able to produce three percent ore over a period of five years for the reason that the developments on the North ore body are insufficient to assure a large tonnage of two percent ore.

I agree with Mr. Tunnell that this North ore body is not much more than indicated by the present status of development and that a great deal of work will be necessary to prove whether or not a large tonnage of two percent ore exists. I have commented upon this feature of Walker developments many times in the past. I think I have always argued that there was a good chance that a complete development of the ore body might bring its grade as low as 1.8 percent copper, or possible by reducing the tonnage, the grade might be 2 percent or possible slightly higher than that.

2- Mr. Wm. Wraith

April 29, 1925

When I was in New York in February I left with you a longitudinal section of the Walker mine on which was shown the approximate outline of the North ore shoot. You will note from Mr. Tunnell's letter that he is starting in his development of this ore body between Raises 752 and 761. You will note from our longitudinal map that number 752 raise lies to the south of the ore body as we have determined it. The only comment I have to make here is that Tunnel should develop this ore body northerly from 761 Raise rather than to the south because 615 crosscut of the 600 level shows the vein to be poor between Raises 752 and 761.

Mr. Tunnell also submits a plan of proposed exploration work of the north end of the Walker vein by diamond drilling from the surface.

Mr. Arietta suggests that this diamond drilling is needed to locate the ore body in order that the 600 level work can be extended more intelligently in search for ore. The cost of the drilling is estimated at \$5,000.

I see no justification whatever for doing this diamond drill work for the following reasons:

1st. The 600 level is already as far North as the proposed location of the most southerly drill hole,

2nd. There is no certainty that ore underlies this outcrop.

3rd. Whether or not the diamond drilling is done from the surface it is absolutely certain the 600 level work will have to be done, that is crosscuts will have to be extended easterly and westerly at or near the present face of the 600 level north. These crosscuts, with a certain amount of drifting, will show whether or not there is any ore in the ground. In my judgment the cost of the diamond drilling is a needless expense.

3- Mr. Wm. Wraith

April 29, 1925

Mr. Arietta suggests 1200 feet of drill hole at a cost of \$5,000. When it is remembered that the Walker company does not own its own diamond drill equipment, I feel more or less certain that the work cannot be done for \$5,000, which is at the rate of slightly more than \$4.00 per foot.

I think it much wiser for the Walker mine to expend the estimated cost of the diamond drill program on underground work. Apparently the main Walker vein has played out in the north end of the present 600 level workings. Whether it will appear again is problematical. Rather than poking around over the surface with a diamond drill to find something which may not exist, I would rather extend the 600 level several hundred feet to the north to be followed by crosscutting easterly and westerly or in whichever direction it is deemed most advisable.

Very truly yours,

RHS/P

CC: JOE

(Signed) Reno H. Sales

SALT LAKE CITY, UTAH

May 1, 1925

Mr. Wm. Wraith  
Room 1825  
25 Broadway  
New York, N. Y.

Dear Sir:

Replying to your letter of April 25th.

I am enclosing herewith a map of the North end of the Walker mine showing the relation of the present mine workings to the large outcrop showing on the North end of the property.

Using the average dip of the Walker vein, the position of the vein at the 600 level as projected from the outcrop, falls practically in line with the 600 north drift.

If this projection is reasonably accurate I see no reason, as suggested in my letter to you of April 29th, of doing diamond drilling for the purpose of better locating the Walker vein underground. The 600 foot level should be pushed ahead<sup>followed</sup> by crosscutting to pick up the vein.

Very truly yours,

RHS/P  
Encl.

( Signed) Reno H. Sales.

ROOM 1825  
25 BROADWAY  
NEW YORK

May 5, 1925.

Mr. Reno H. Sales,  
Anaconda Copper Mining Company  
Anaconda, Montana.

Dear Reno:

I wish to acknowledge receipt of yours of April 29th, which is composed of remarks on Mr. H. R. Tunnell's letter to me dated April 23rd.

I agree with you in reference to the diamond drill work and I would suggest in reference to the suggestions that you make as to the work to be done in the north orebody wherein you state that work should be done north on raise 761, that you transmit your instructions to Mr. Lyon so that he can in turn transmit them to Mr. Tunnell. I am sure that Mr. Tunnell will greatly appreciate your remarks on this subject.

I am writing him giving him the substance of your letter but I think that as a matter of procedure, that it also should go from you to Mr. Lyon and from him to Mr. Tunnell.

Yours very truly,



WmWraith/J

# ANACONDA COPPER MINING COMPANY

GEOLOGICAL DEPARTMENT



RENO H. SALES, CHIEF GEOLOGIST  
F. A. LINFORTH, ASSISTANT CHIEF GEOLOGIST

BUTTE, MONTANA

May 12, 1925.

Mr. T. T. Lyon,  
823 Kearns Building,  
Salt Lake City, Utah.

Dear Tom:-

I have a letter from Mr. Wraith, a copy of which is herewith enclosed.

Will you please write Tunnell as suggested by Wraith, or, if you contemplate a trip to the Walker soon, consult with him about the development of the North Ore body in an endeavor to devise a plan for prospecting and developing this ore body.

If possible write me a letter while you are at the Walker, giving briefly the decision arrived at by Tunnel and yourself. I want Tunnell to see your letter so that he may fully understand and agree with the recommendations made. A joint letter might not be a bad plan, if you can agree on details.

Very truly yours,

*Reno H. Sales*

RHS/D

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## INTERNATIONAL SMELTING COMPANY



PAUL BILLINGSLEY  
TOM LYON

GEOLOGICAL DEPARTMENT  
KEARNS BUILDING

SALT LAKE CITY, UTAH,  
May 2., 1925

Mr. R. H. Sales  
526 Hennessy Bldg.  
Butte, Montana

Dear Sir:

I returned from the Walker Mine yesterday. While there Mr. Tunnell and myself wrote Mr. Wraith a joint letter outlining the development work needed on the sub level to open up the north ore body for subsequent stoping which will be forwarded from the mine as soon as the accompanying maps are completed. There is a complete copy for you.

Mr. Elton tells me that the Yankee job will be held up for some time waiting for a cable.

Do you approve of the plan for Colorado work outlined in my recent letter?

Very truly yours,

*Tom Lyon*

Salt Lake City, Utah

July 6, 1925

Mr. H. A. Funnell, Manager  
Walker Mine  
Spring Garden, Calif.

Dear Sir:

In connection with this question of mineral discovery, will you please have some samples taken along the best looking of the small fissures and seams to be found in the granite in the Main Tunnel. These samples should be taken of the best looking material, no matter how small or thin. Have them assayed for gold and silver with care using clean reagents. Ask the assayer to first assay or test the fluxes used.

It might be well to try to get one of these samples for assay, if possible, from within the boundaries of each of the claims rejected by Friedhoff, namely, the Pacific #10, Pacific #12, Pacific #13, and Grizzly.

If only small amounts of gold or silver are shown by these assays, we should be able to maintain our claim for patent on these four locations and it might help on one or two others.

I think it very advisable also to slap a couple or three lode locations over that small schist area lying just

2- Mr. H. R. Funnell

July 6, 1985

below your house. Make the points of discovery on the out-cropping schist and lay the claims out right over the Dolly Placer so they will cover the new mill and everything in the way of surface building or plant of value not included in the original mill site claim. If the Dolly Gulch Placer is no good I am afraid some one might come along and throw a lode location on that schist and include the new mill. If they had a valid discovery we might have a time getting them off. I think you can find some kind of a crack or fissure in the schist for your discovery. Anyhow do whatever is necessary to locate and hold the claims.

On the bare possibility that such a location is proper and valid it is extremely important that this matter be kept very confidential and that the work be done as quietly and expeditiously as possible.

Very truly yours,

(Signed) Reno H. Sales

RHS/P

ANACONDA COPPER MINING COMPANY.

BUTTE, MONTANA.

SALT LAKE CITY, UTAH.

July, 6, 1925.

Mr. Wm. Wraith  
25 Broadway,  
New York, N. Y.

Dear Sir:

At the request of J.O. Elton I visited the Walker mine on June 29th and 30th in connection with the expected adverse report of Forest Ranger W.H. Friedhoff on some of the claims included in the application of the Walker Mining company for patent.

On July 1st I saw Mr. Friedhoff at Yerington and talked over the situation fully. Friedhoff had, however, already sent in his report and recommendations on the Walker claims to the District Forester's office at Quincy so that it was impossible to do anything more than to get first hand knowledge of Friedhoff's attitude regarding the Walker claims.

I found that Friedhoff had a good knowledge of the geological conditions surrounding the Walker mine. He impressed me as holding a friendly feeling toward mining companies, particularly those actively engaged in mine development. Friedhoff has had many years experience in forestry work and particularly in connection with location and patenting of mining claims within the National Forest boundaries covering Plumas County, California and surrounding territory.

I learned from Friedhoff that the patenting of the Walker claims, included in the present application for patent, had been the subject of much discussion between himself and MR. V. A. Hart, former

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manager of the Walker Mining Company, and that he Friedhoff had at all times held an adverse opinion as to certain ones of the group. The views he expressed to<sup>me</sup> may be better understood after I have explained the geology in the situation.

I am enclosing herewith a geological map for your guidance. It also shows the claims held by the Walker Mining Company. Included within the violet colored boundary are claims already patented. Surrounding these patented claims, and lying within the blue boundary, are the claims included in the present application for patent and which have<sup>been</sup> approved for patent by Mr. Friedhoff. Claims included in the present application for patent, but which have been reported upon adversely by Friedhoff are bounded in red. Certain additional claims, namely the Summit 1 to 7 respectively, are recent locations made by the Walker Mining Company.

The geology of the situation is well shown on the map. The Walker veins and ore body occur in the schist. The course or trend of these ore bodies, as shown by the Mine workings, is a northwest southeast direction, generally parallel to the strike of the rather indistinct bedding of the schist.

The schist is intruded by an irregular body of granite which appears also to be later in age than the ore bodies. The area of granite exposed at the surface is shown in green color. That its actual volume is much larger than this is shown by the main adit tunnel which discloses granite beneath the lava.

Both schist and granite have been covered in the southerly and easterly portions of the Walker group by a late flow of andesitic, colored brown on the map. There is no question but that these lava flows are relatively recent and that they appeared long after the Walker vein in the schist had been exposed by erosion

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and considerably oxidized.

We therefore have three geological formations occupying the area under consideration. Of these three the schist is known to be mineral bearing. The granite has not been shown to contain ore bodies. In the mine workings of the Walker mine a small dike, undoubtedly an off-shoot of the main granite mass, cuts through the Walker vein ore indicating the granite to be of later age than the Walker ore bodies. In the Main Adit, however, there are many fissures which cut granite, but which are mineralized only slightly if at all. In the larger area exposed to the south and west of the Walker Mill extending down into Grizzly Valley no veins have been discovered within the granite. The evidence as to mineralization in the granite, while general<sup>ly</sup>/negative in character is not conclusive.

The andesitic lava flows in the vicinity of the Walker mine form a part of an extensive flow covering a large area lying to the east and northeast of the Walker property. These rocks upon weathering change to a dark red brown color with a resulting soil of a similar color. These flows are relatively recent geologically and show absolutely no evidence of mineralization.

Referring now to a patentability of these claims, Friedhoff rejects the claims outlined in red upon the ground of lack of mineral discovery. By reference to the map it will be seen that the great majority of the lode claims rejected lie within the area occupied by lava. The Pacific No. 12, Pacific No. 13, Grizzly, and Grizzly No. 1, lie partly within lava and partly within granite. The Pacific No. 3, appears to be largely<sup>within</sup>/lava although it is probable that schist might<sup>be</sup>/disclosed near its north end line by a small

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amount of trenching.

The Dolly Gulch Placer covering the basin-like area upon which the mill and town have been built, contains a small area of schist near its western boundary. The remaining area is occupied by lava and granite, but the deep covering of wash prevents an accurate tracing of their respective boundaries.

I examined carefully a large part of the ground covered by these claims. I inspected the 25' tunnel on the Grizzly No. 9 claim, also the small shaft on Grizzly No. 10 and the small pit on Summit No. 1.

I was compelled to conclude from my own personal examination that there is no possibility of a mineral discovery within the lava itself. In the large block of claims covered by lava therefore the only mineral discovery possible is in the rocks underlying the lava flow. Where schist is present mineral indications sufficient for discovery undoubtedly can be found. But in the granite areas beneath the lava, the hunt for a sufficient mineral showing to support a valid lode location might prove costly or even entirely unsuccessful. The depth of the lava is too great, and the possibilities of mineral too slight, to justify sinking shafts on these locations for the purpose of making a mineral discovery.

In the case of The Dolly Gulch Placer location which Friedhoff also rejects, on the grounds of non-discovery of placer gold, the situation is rather peculiar. Within the Dolly Gulch Placer location there is included a Mill Site location made by the Walker Mining Company. Friedhoff's statement is that a mill site location requires from the locator under oath the statement that the ground is non-mineral in character. If this be true there is an apparent lack

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of consistency on the part of Walker Mining Company to ask for a mineral patent on the Dolly Gulch Placer and a patent on the Mill Site as non-mineral ground.

Some recent panning tests for gold in a pit sunk along the <sup>and</sup> creek below the mill/w<sup>h</sup> within the Dolly Gulch Placer claim, failed to show any gold colors. This work is being carried on in other pits in the hopes of meeting with favorable results.

The situation confronting the Walker Mining Company may be summarized as follows:

1.- Of the 40 lode claims included in the recent Patent Application seventeen (17) have been <sup>passed</sup> and recommended for Patent by Friedhoff. These seventeen claims, together with the ten claims already patented protect the Walker on strike for a distance of approximately 9000 feet, or 1500 feet south of the most southerly workings on the tunnel level, and 3500 feet beyond the most northerly drift on the 600 level.

2. The original Mill Site has been recommended by Friedhoff for patent, but the new Walker mill is not on this mill site claim.

3. Twenty-three lode claims have been rejected for patent by Friedhoff on the ground of non-discovery of mineral. Of these twenty-three claims, seventeen lie wholly within the lava area and there is no possibility, in my judgment, that a mineral discovery can be made by trenching or by shallow shafts. Of the remaining six claims, granite is disclosed on the surface or in the Main Adit, within five of them, and on the sixth claim, which is the Pacific No. 3, the surface area is largely lava but a small amount of surface trench-

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ing might disclose schist but not necessarily any mineral showing.

4. The Dolly Gulch Placer upon which the new mill and most of the town surface works have been built, is rejected by Friedhoff on similar grounds, that is, of non-mineral discovery.

It remains for the Walker Mining Company to decide upon a course of action in the face of these rejections. My personal views may be summarized as follows:

1. - Claims lying wholly within the lava without mineral showing on surface or in underground workings should be withdrawn from the Patent Application but should be held by assessment as in the past. These include the following:

Grizzly	No. 1
"	" 2
"	" 3
"	" 4
"	" 5
"	" 6
"	" 7
"	" 8
"	" 9
"	" 10
"	" 11
"	" 12
Panama	No. 3
"	" 4
"	" 5
Standard Extension	
Reliable	
Pacific	No. 3
"	" 11

2. - Recent locations made wholly within the lava should be abandoned. These include:

Summit	No. 1
"	" 2
"	" 3
"	" 4
"	" 5
"	" 6
"	" 7

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Timber is now being cut from these locations. No doubt the government will require the Walker Mining Company to pay for any and all timber cut from such abandoned locations.

3. In the case of the following claims, namely, the Grizzly, Pacific No. 10, Pacific No. 12 and Pacific No. 13 which cover the 1350 feet of the Main Adit nearest its portal, the Walker Mining Company should ask for patents, on the ground that the small fissures in the granite disclosed within these claims constitute a sufficient mineral showing, and that adequate assessment work for patent has been performed through the construction of the Main Adit which passes through portions of these claims. These claims stand exactly upon the same footing as the Pacific No. 9 claim which has received the approval of Friedhoff.

This same ground can be secured by abandoning the claims as lode locations and covering it by Tunnel Site locations following the line of the tunnel, and patents for same can be secured without mineral discovery. As tunnel site locations they carry mineral rights but not surface rights. This would mean additional expense to the Walker Company sufficient to pay the cost of making re-locations and the mineral surveys for patent.

4. Friedhoff suggests a way out of the difficulty with the Dolly Gulch Placer.

There is now in force what is known at the "exchange grant" ruling of the Interior Department. I do not know at this time whether this ruling is in effect through an Act of Congress or merely a Land Office ruling, but I presume it is the former.

Friedhoff suggests that the Walker Mining Company acquire from a fee owner somewhere in Plumas County, title to a tract of equal acreage of cut-over land, and exchange such acquired acreage with the Govern-

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ment for the ground covered by the Dolly Gulch Placer. He is positive that such a plan is feasible and practical and legal, and in fact, he knows of no other way by which the Walker Mining Company can acquire full title to this ground if it is decided to be non-mineral in character, since it is within the Forest Reserve. He says cut-over lands can be had for \$2.50 to \$5.00 per acre.

It is apparent that the Walker Mining Company requires, for housing and other purposes, slightly more land than is included within the Dolly Placer. The exact amount needed should be determined so that ample acreage of cut-over land will be secured for exchange.

One element of danger has occurred to me in this situation as it affects the new mill and all surface structures built on ground outside the original mill site location. If as Friedhoff claims, the Dolly Gulch Placer has no merit or standing as a placer location it certainly would not hold the ground as against a lode claimant who might enter upon the placer, and, finding sufficient mineral showing within the small schist area shown on the map, he could locate a lode claim in such a manner as to include the new mill, and other valuable buildings.

To forestall this possibility I have written Tunnell to make one or more lode locations, placing them on the ground in such a manner as to cover the mill and all buildings or other surface improvements not included in the original Mill Site location.

From Mr. Tunnell's letter of a former date you can figure what the Walker Mining Company will owe the Government for timber already cut from claims rejected by Friedhoff. It amounts to about \$7,000 in round figures.

I should add here that I am entirely unfamiliar with any past

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history of Walker Group of claims. I know nothing of the how, when or why of the location of these claims in the lava area. Friedhoff states that in the past the Walker Mining Company has set its Main Adit tunnel work against the whole group as constituting annual assessment work. He flatly states that this tunnel does not tend to develop the Grizzly claims and therefore is not acceptable as assessment work. My own opinion is that the Adit tunnel does tend to develop all of the group because it is actually the proper method to develop that whole area.

Very truly Yours,

Reno H. Sales.

COPY

July 20th, 1925

B. B. Thayer, Esq.,  
25 Broadway, New York.

Dear Sir:

I visited the Walker Mine on June 29th and 30th. There are a few suggestions relative to present developments, and also as to possible plans for the future.

Of the work now going on I advise that drift 600-A should be discontinued, as it is being extended into territory which showed no ore on the 600 level.

Also that work should be pushed as rapidly as possible north from 767 raise to develop the better grade ore shown in 687 drift. I think it is quite desirable that we make a strong effort to develop this better grade ore as rapidly as possible, because the main orebody grade is not running as high as anticipated.

As to future developments, there are four possibilities in the way of development which might find ore, and I will consider these briefly.

1. The extreme north end development on the 600 level is not showing favorable results. It cannot be said with certainty that the present drift is following the main vein disclosed at the surface. Before proceeding much farther north, unless the ore improves in the present drift, I think crosscuts should be run easterly and westerly to make sure that we are under the best outcrop shown.

B.B.T. # 2

2. There are one or more veins in the foot wall of the main Walker vein and parallel to it. This was disclosed in the old survey crosscut tunnel and also in the main adit tunnel and in one or more drill holes driven at a former time. These veins are low grade and I do not feel they present anything favorable as to ore prospects, and I think should be prospected only as a last resort.

There are no indications of veins either on the surface or underground, in the hanging wall of the Walker. Prospecting in that direction is therefore an entirely unknown territory. Possibly two diamond drill holes would determine the existence or nonexistence of hanging wall veins.

3. It is confidently expected that the Walker vein will be cut off by the large body of granite disclosed in the main adit, but it is quite impossible to estimate how far south this cut-off may be found in the present main level drift on the 700. The vein is almost entirely pinched out at the present south face, but there is a stronger footwall south of the vein which, although low grade, has not been sufficiently prospected. This south section presents a fair possibility but the prospects are not especially encouraging.

4. In my judgment the most desirable thing to do is to sink on the main vein to determine its possibilities in depth. For this purpose a shaft or winze should be sunk at least 200 feet at a point approximately 100 feet south of the old inclined shaft. The southerly part of the orebody, that is, lying to the south of the point where the main adit intersects the vein, should be explored on deeper levels. It is a matter of operating judgment as to

B.B.T. # 3

whether one winze or shaft would answer for the exploration of both the main orebody and the south orebody, or whether two winzes should be sunk for that purpose. Apparently there is a rather strong stretch of barren ground between these two ore shoots, and it might be cheaper and more satisfactory to sink two shafts or winzes.

I feel that it is quite urgent that in view of the ore showings in the mine at the present time one or more of these plans of development should be undertaken at an early date. In my own opinion the work of developing the 200 foot level below the main orebody should be the first work; as to the order in which these various pieces of work should be carried out subsequently, it is a matter to be determined from time to time.

Yours very truly,

REMO H. SALES.

B.

Copy Wm. Wraith- J.O. Elton

COPY

July 31, 1925

J. O. Elton, Esq.,  
Manager, International Smelting Co.  
Salt Lake City, Utah

My dear Sir:

I am sending you copy of letter which I requested Mr. Sales to write me relative to the Walker Mine.

I am sending it to you to be digested by yourself and Tom Lyon, but please do not take any action in the matter whatsoever, as I wish to await the return of Mr. Wraith and take the matter up with him, when he will take it up with the Western Department.

Very truly yours,

(Signed) B. B. Thayer

August 13, 1925.

Mr. H. R. Tunnell,  
Walker Mining Company,  
Spring Garden,  
Plumas County, Calif.

Dear Sir:-

Attached please find copy of a letter from Mr. Reno Sales, on the subject of development at the Walker Mine. You will note that Mr. Sales strongly presses upon the need of development work below the tunnel level at points that would be selected later and after a study of conditions.

I believe that such development work should be done. I think also that it should be done by shafts, drifts and cross cuts, rather than by diamond drilling, so I would suggest that this be given a study by yourself and Mr. Lyon, forwarding your recommendation at as early a date as possible. Before shaft sinking starts it will be necessary to catch up as much water as we possibly can above the tunnel level, sealing it off in such a way so that we will have as little water as possible to pump. This fissure does make a lot of water and we want to make it as dry as we possibly can in our shaft work. It would probably be advisable to sink the shaft in one of the walls to avoid water.

I would appreciate your advice on this subject and wish that you would talk it over with Mr. Lyon, giving me the benefit of your opinion.

Yours very truly,

(SGD.) WM. WRAITH

WmWraith/M  
Enclosure:

CC: Mr. Lyon. ✓