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REPORT OF PERFORMANCE OF D'ORE DRY CONCENTRATOR ON CERTAIN TUNGSTEN ORE

Abstract of this Report.

A concentration of tungsten ore was made in a test run on January 24, 1950, by means of a dry concentrator table, whereby, out of 500 pounds of ore (the sample used) 32 pounds of scheelite concentrates were obtained, running 7.02 per cent WO_3; and the recovery of this scheelite from the ore was sufficiently high so that the WO_3 remaining in the tailings was only .09 per cent (9/100 of one per cent).[1] After the extraction of 32 pounds of concentrates, the remaining 468 pounds of tailings were, of course, ready for discard on the dump -- they were now so lean as to have no commercial value. The 32 pounds of concentrates (called primary concentrates) were ready for further concentrating and finishing on conventional wet tables, so as to bring this final product up to a required 60 per cent WO_3 for shipment. The saving in water (where the mine and mill are in the desert region) and the saving in wet table installation and milling space, through not having to handle the 468 pounds over the wet tables can be appreciated.

Later in this report, the 500 pounds will be converted into terms of tons throughout and percentage of concentrates per ton and the respective values in dollars, etc.etc. See page 15.

1. See assays, page 13 following.

Five runs — or passes — through the dry concentrator in question were required to accomplish the above result. It is as though the ore were passed over five of these machines, placed one beyond the other in series, with each machine taking out its portion of concentrates. The time required for the passage of 500 pounds of ore over one table (under conditions of continuous operation) is stated by Robert Dore, the designer, to average approximately 1 minute 5 seconds.[2]

It is a matter of concern whether it requires either two or three or five machines in series, on account of the investment.[3] But the item of main importance lies in the fact that such concentration can be obtained at all by dry methods. When the raw ore can be brought to the point where 93½ per cent (the 468 pounds mentioned) can be discarded as waste, and only the 32 pounds or 6½ per cent containing the values need be run through the finishing mill, it is obvious that all of the milling procedure is considerably simplified and a great saving of investment may be effected.

Purpose of this Report.

This report will outline the results of running two different batches, each consisting of 500 pounds of tungsten (wolfram) ore, through the D'Ore dry concentrator in two series of tests, January 4th and January 24th, 1950.

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2. The writer has not had opportunity to judge or calculate the rate other than in batch operations. See discussion of capacity and rate in Appendix A.

3. The cost of a D'Ore Pneu-Float concentrating machine is quoted at about $1,600. A description of the machine is given in Appendix A, at the close of this report.

The names of persons who were present and witnessed the test runs will be given later, as the respective tests are described.

Part I will describe the test run on January 4, and Part II the test run on January 24, 1950. Reference will also be made to a previous run made September 14, 1948.

The D'Ore dry concentrator is a machine designed to remove and save the valuable scheelite from ground ore, to the extent that the tailings remaining after the run have no further commercial value left in them. The machine is run without water, being intended particularly for use in desert regions where water in quantity is not available.[4] The separation of the scheelite in the machine is of course not perfect, nor is it intended to be. For example, of the 52 lbs. of primary concentrates, (out of 500 lbs. charge) 2[illegible] lbs. are scheelite and nearly 30 lbs. are gangue material. The final separation of the scheelite from the gangue is left to the Wilfley, Overstrom, or other wet tables. Those 52 pounds of primary concentrates comprise a mix running from coarse to very fine and may need regrinding for best results in the final wet tabling. See paragraphs immediately following.

Final Finishing Procedure.

While this report does not have specific data or assay records to present with regard to final finishing, it can be said that during the course of research work in connection with the D'Ore concentrator the final finishing and concentrating has been made without difficulty on a wet shaking table[5] and a product assaying above 60% WO_3 was obtained.

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4. The dry concentrator can be used for ores other than tungsten, when arrangements are made for proper grinding and drying.

5. A Dunham table was used, made by Gordon S. Dunham Sales & Manufacturing Co. of South Pasadena, California.

Mr. N. J. Amen[6] of the Minerals Research Company of Glendale, in a recent conversation with the writer regarding the D'Ore concentrates, authorized the following statement:-

> "Certainly the most important part of concentrating ore -- particularly in the arid western sections -- is to obtain a good primary concentrate. From that point on I can say that the concentrates can be beneficiated readily. No matter how complex, or in what form, we can condition the concentrates. The principal difficulty that operators have, as a rule is due to not being able to secure a workable primary concentrate. As a consequence they have too much material on their wet tables, from which they are trying to obtain the values."

In actual practice it is planned to first size the primary concentrates from the D'Ore concentrator (by means of a hydraulic classifier) into 6 sizes, and the 6 sizes will then be run on 6 separate wet tables, each built and adjusted for the particular size. Middlings from, say 3 of the wet tables (perhaps 30%) will be reground (so as to break free any scheelite grains from attendant quartz or limestone) and this product will again be sized to about 22 mesh and sent over the proper table.

The resultant concentrates from the 6 tables will constitute the final product, although this product will be put through a magnetic separator to remove any iron, garnet and epidote, oxidized minerals and sulphides.[7] The scheelite ultimately remaining, freed from all impurities, will then be ready for packaging and shipment.

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6. Mr. N. J. (Nick) Amen is highly regarded as an authority on the beneficiation of ores. His company specializes in problems of ore dressing, and maintains a plant to condition concentrates. The company also builds magnetic separators. Mr. Amen has been a consultant and also a collaborator with Prof. Dore and Walter Deppen in the development of the D'Ore mill and concentrators.

7. The analysis of the Shadow Mtn. ore used in the present tests shows practically no iron or other metals. However, some garnet is present and possibly a slight amount of epidote.

Character of the Ore Used.

All the ore was obtained from the properties of Just Associates, in the Shadow Mtn. mining district, San Bernardino County, California. Two batches of the ore, more than 600 pounds each, were ground in a D'Ore pilot mill[8] in Glendale, and the ore was then brought to the yard of Cottrell Engineering Co. in Los Angeles, where the concentrator is located.

The material was rather low grade ore, consisting of scheelite in limestone, and scheelite with schist and with quartz. The first batch of 500 pounds assayed .75 per cent WO_3; the second batch assayed .51 per cent WO_3.[9] The ore was ground in two separate batches, therefore the two batches do not assay the same amount of WO_3 content. Of the 700 or 800 pounds in the first batch, 550 pounds were taken for the first test run, January 4th, as will be described in the following paragraphs.

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8. See record of screen analysis of ground ore by Smith-Emery Co., page 6 following.

9. See assays, pages 6 and 13 following.

PART I

TEST RUN OF JANUARY 4, 1950

When preparing the ore for a test run this ore was ground in a small D'Ore pilot mill, and for this purpose the mill was set to keep as much of the product above (larger than) 40 mesh as possible. Five hundred and fifty pounds of the material were used for the run on January 4th. The screen analysis was as follows:--

(Sample No. 1 - Heads - Dore 1-4-50 Clute)

+4	mesh			none	
-4	"	+8	mesh	none	
-8	"	+20	"	40.1%)	
-20	"	+40	"	40.4%)	-- 80.5%
-40	"	+60	"	9.1%)	
-60	"	+80	"	4.3%)	
-80	"	+100	"	1.4%)	-- 19.5%
-100	"	+200	"	3.5%)	
-200				1.2%)	

See Smith-Emery Company Laboratory Report No. 317743-45 dated January 11, 1950, at the close of this report.

The five hundred and fifty pounds of ore were put into the feed hopper of the D'Ore dry concentrator. The machine was started, and as the ore was fed from the bin or hopper on to the deck a running sample comprising a total of 50 pounds was taken off by the writer. Thus 500 pounds went over the deck. The 50-pound sample was labled "Sample No. 1 -- Heads -- Dore -- 1-4-50 -- Clute." This sample was the one given the screen analysis as reported above, and it was also assayed for WO_3 content by Smith-Emery Co. The assay showed .75 per cent (3/4 of 1 per cent) WO_3. See Smith-Emery Company Laboratory Report No. 317743-45, at the close of this report.

After the ore had passed through the machine once, the first concentrate (about 2 pounds) was taken off from the tray or receiver beneath the

table, then the ore (498 pounds) was again put into the hopper and run over the table the second time. Again the concentrate was removed from the tray and this was added to the 2 pounds and together the concentrates added up to 3.014 pounds, or 1,367 grams in weight. This primary concentrate was called "Sample No. 2, Concentrates -- Dore -- 1-4-50 -- Clute." The tailings (weighing, at least theoretically, 497 pounds) were sampled by the writer (Clute) and this sample was called "Sample No.3 -- Tails -- Dore -- 1-4-50 -- Clute."

Samples No. 2 (concentrates) and No. 3 (tails) were taken with Sample No. 1 (heads) to Smith-Emery Company for analysis. See Smith-Emery Company Laboratory Report No. 317443-45, at the close of this report.

Result of Run; Insufficient Recovery.

The 3.014 pounds (1,367 grams) of concentrates assayed 15.32% WO_3. However, the tailings assayed .66% WO_3. It will be recalled from above that the heads, or original ore, assayed .75% WO_3. Therefore the content of .66% WO_3 in the tailings did not represent, by any means, a satisfactory extractions. The tailings still retained too high a value of WO_3. It had been expected that the ore would be cleaned down to a point where the tailings showed something like .06% (6/100 of 1 per cent), rather than .6% (6/10 of 1 per cent). Also, the 3.01 pounds of concentrate represented only a samll amount by weight.

Clearly, there was insufficient extraction of scheelite from the ore, as indicated by the assays. There had been very little concentration effected. The question arose: What had occurred, to prevent more of the scheelite from coming out of the ore? The results of this test required further work. The machine was cleaned out (some rusting of the steel balls

was found) and some additional testing was done in preparation for another trial run, as will be described in Part II hereof.

In connection with the above first run (of Jan. 4, 1950) several important things were learned, as follows:--

A microscopic examination of the scheelite in the concentrate (under ultraviolet light) showed the grains were mostly of the large size. Also the screen analysis made by Smith-Emery Co. indicated that 91% of all material in the concentrates was larger than 40-mesh, as follows:--

"Sample No. 2 Concentrates -- Dore 1-4-50 -- Sluice,"

Screen Analysis:--

+ 4 mesh			none	
- 4 "	+ 8 mesh		none	
- 8 "	+20 "		64.8%	-- 91.0%
- 20 "	+40 "		26.2%	
- 40 "	+60 "		5.7%	
- 60 "	+80 "		1.7%	
-80 "	+100 "		1.1%	-- 9.0%
-100 "	+200 "		1.5%	
-200 "			1.0%	

When the above screen analysis is compared with the analysis of the raw feed or heads, page 6, the following comparison appears:-

Size	In Feed, Or Heads	In these Concentrates
-8 mesh, + 20 mesh	40.1%	64.8%
-20 " , + 40 "	40.4% -- 80.5%	26.2% -- 91.0%
-40 " , +200 "	-- 19.5%	-- 9.0%
	100.0%	100.0%

This shows that in the process of concentrating, the largest sizes (8 to 20 mesh) were being gathered into the concentrates, while the fines (below 40) were not being gathered. In fact, they were being lost. In more correct concentration, both coarse and fine particles should be

gathered into the concentrates in approximately the same proportions as they occur in the original grind. Both coarse and fine carry value -- that is, the fine particles of scheelite are of exactly the same value per pound as the coarse. The microscopic examination showed that, in the main, most of the scheelite grains were broken away from the quartz or gangue material, although not entirely.

It was clear that the adjustments for best concentration had not been made for this run. (As a matter of fact, no prior pilot run had been made, hence there were no adjustments.) It was determined, to do further adjustment work and make another run on a batch of the ore. The results will be described later, in Part II.

The assay of the concentrates from the first run -- January 4th -- was as follows:--

"Sample No. 2, Concentrates -- Dore -- 1-4-50 -- Slute," (See Smith-Emery Report No. 317743-45, January 11, 1950).

Weight of sample	1,367.00 grams.
Tungsten Trioxide (WO_3)	15.32%
Copper (Cu)	0.03%
Molybdenum (Mo)	0.01%
Phosphorus (P)	0.003%
Sulphur (S)	Trace

The minerals copper, molybdenum, phosphorus and sulphur comprise the elements which, if present in too great quantity, are impurities causing penalty in the price payable for tungsten concentrates. The foregoing assay by Smith-Emery Company shows the percentages of impurities to be so slight as to create no penalties.

A spectographic examination, made on the same sample of concentrates, is given also on the Smith-Emery Laboratory certificate herewith, No. 317743-45, January 11, 1950. This confirms the absence of any other serious impurities.

The January 4, 1950 test run of the D'Ore concentrator -- the run described above, was witnessed by a number of persons interested in the outcome. The following were present at the test in the yard of the Cottrell Engineering Co., 320 So. Avenue 17, Los Angeles, the afternoon of January 4th:

A. H. Sweet	W. J. Bevier
G. L. Chrisope	Harry Lee Martin
Don A. Sweet	C. C. Piedler
W. H. Gabe	Wm. P. Cottrell
J. J. Jessup	E. Richard Just
W. A. Trout	Walker S. Clute
E. Ord Slater	Walter Doppen
Edw. L. Stanoliff	Robt. F. Dore

The writer (Clute) personally took the samples, mixed and quartered same, and submitted the portions for assay to Smith-Emery Company the following day. The assay reports were furnished us by Smith-Emery Company under date of January 11, 1950, and have been quoted above.

PART II

TEST RUN JANUARY 24, 1950

Whereas the study of the assays from the run of January 4th showed that there had been less extraction of scheelite crystals from the ground ore than was anticipated, another run was decided upon. The concentrator machine was cleaned -- the shot-bed was cleared of all sand, rust, and silt that had gathered.

The screen analysis and microscopic examination of the concentrates from the run of January 4th showed that the scheelite grains (and gangue material also) were mostly of the large size, 8 to 20 mesh, as described on page 8. To effect proper concentration it would be necessary

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to accomplish two things: first, gather particularly the fines into the concentrates; and second, get or a great deal additional scheelite, both coarse and fines, into the concentrates, so as to leave no values of consequence in the tailings. The .66% remaining in the tailings of the first run were far too high.

Consequently, it was determined to run the second batch of ore with these changes: (1) Reduce the air pressure and volume, otherwise called the air suspensory medium, which was evidently lifting the smaller and lighter particles (both scheelite and gangue) and preventing them from dropping through to the concentrates (2) Pass the ore over the concentrating table not only twice, but three or four times or more, taking off the concentrates each time and running the remainder. This would be equivalent to passing the ore over a series of four or five tables, placed one following the other. The object of this would be, of course, to provide considerably more time on the tables for the ore.

Run of January 24, 1950; Method of Run.

A batch of ore, 550 pounds, was placed in the hopper of the 3'Ore concentrating machine. As the ore was fed to the table during the run, a representative sample consisting of 50 pounds was taken off, so that 500 pounds of ore went through the machine.

After the first pass of the ore through the machine, the concentrates were taken from the receiver or tray where they gathered beneath the table. These were kept separate and marked "1st pass concentrates". They were held for assay. There were 7½ pounds of these 1st pass concentrates, as will be discussed later.

Then the remainder (say 492½ pounds) was again run through the

machine. This time the concentrates amounted to 4 pounds. They were marked "2nd pass concentrates" and held for assay.

The remaining ore (say 488½ pounds) was run through the machine. The concentrates amounted to 5½ pounds; they were marked "3rd pass concentrates" and held for assay.

The ore was similarly run the fourth and fifth times. The 4th pass and 5th pass concentrates were similarly held for assay, and the assay results will be stated below.

These assays were made by Ed. Eisenhauer, Jr. of Los Angeles under date of January 26, 1950.[10] A copy of the Eisenhauer assay is included at the close of this report. The sampling in this case was done by Mr. Robt. Dore and Mr. Walter Doppen.

Those who were present at the yard of Cottrell Engineering Co. and witnessed the run of January 24th, were:

H. R. Stimson	H. Victor Begard
Valentine J. Beganek	Wm. Cottrell
Ralph Caverstock	G. Louis Martin
Lloyd I. Seay	Robert Dore
Walter Doppen	

Results of Run of January 24th.

The Eisenhauer assays of the concentrates of this run are as follows:

10. The circumstances that the assays for the run of January 4th, were made by Smith-Emery Co., and those for January 24th were made by Ed. Eisenhauer, Jr., have no significance; principally a matter of convenience at the time. It is indeed good policy to submit samples for assaying to various reputable firms.

		Tungstic Oxide (WO_3)
Heads		.51%
Primary concentrate -	1st Pass	12.72%
" "	2nd Pass	9.60%
" "	3rd Pass	7.02%
" "	4th Pass	4.53%
4th Pass tailings		.14%
Primary concentrate	5th Pass	2.84%
5th Pass tailings		.09%

The significant part of the above assay is that the final tailings contained not more than .09% (1/100 of 1 per cent) WO_3. Also, the 4th pass tailings were quite low, .14 per cent, but the result of passing the ore again (5th time) is evident, inasmuch as the concentrates taken off in that pass assayed 2.84%.

As a matter of fact, when calculations are made (see below) on the <u>weight</u> of material used and the weights of concentrates recovered, together with the assays given above, the percentage by weight of WO_3 that could be remaining in the tailings would be only .078%, rather than the .09% found by assay.

The concentrates were weighed as they were taken from the tray or receiver of the machine after each pass. They totalled 32 pounds, as will be shown below.

<u>Analysis of Run in Terms of Ounces WO_3</u>

500 pounds of ore, assay value .51% = 40.8 Oz. WO_3

1st	pass	conc.,	7½	lbs.	assay	Val.	12.72% =	14.7552	Oz. WO_3
2nd	"	"	4	"	"	"	9.60% =	6.1440	" "
3rd	"	"	5½	"	"	"	7.02% =	6.1776	" "
4th	"	"	7-3/4	"	"	"	4.53% =	5.6172	" "
5th	"	"	7	"	"	"	2.84% =	3.4080	" "
Totals			32	lbs.	"	"	7.05% =	36.1000	" "

Total Oz. WO_3 in original heads	40.8 Oz. WO_3,	100.00%
" " " " concentrates	36.1 " " ,	88.48%
Possible " " left in tails	4.7 " " ,	11.52%

(a) Tailings consist of 468 pound, or 7,488 Oz. of material;

then $\frac{4.7 \text{ Oz.}}{7{,}488 \text{ Oz.}}$ = .063% by weight (Dore).

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(b) Concentrates consist of 32 pounds or 512 Oz. of material

then $\frac{36.1}{512}$ = .705 or 7.05% WO_3 content.

Actual recovery of WO_3 by weight, 88.48% of all WO_3 contained in origianl ore, indicating the actual WO_3 content of the tailings to be .063% (Robt. Dore).

Further analysis of the run and the assays gives us the following:-

I Concentrates	7½ lbs.	@ .1272	= .9222	lb.	WO_3	
	4 "	@ .0960	= .3840	"	"	
	5½ "	@ .0702	= .3861	"	"	
	7-3/4 "	@ .0453	= .4583	"	"	
	7½ "	@ .0284	= .2130	"	"	
	32 "	@ .0702	2.2564	"	"	= 36.1024 Oz.

II Heads, 500 lbs. @ .0051 = 2.550 lbs. WO_3

II Heads contained - - - - - -	2.5500	lbs.	WO_3
I Concentrates removed	2.2564	"	"
III By subtr. tails should contain	.2936	"	"

IV By assay,
Tails 468 lbs. @ .0009 = .4212 lb. "

V By computations,
Tails 468 lbs. @ .00063 = .2936 lb. "

VI Recovery of WO_3 in concentrates,

$$\frac{2.2564 \text{ lbs. } WO_3}{2.5500 \text{ " "}} = 88.486\%$$

VII Data:

Scheelite, $CaWO_4$; at. wt. CaO = 56.10 or 19.4%
WO_3 = 231.92 or 80.6%
$CaWO_4$ = 288.02 100.0%

There is 80.6% WO_3 in scheelite (precise, .8052218). Given pounds of WO_3, divide by .806 to obtain pounds of scheelite.

VIII Weight of scheelite in foregoing concentrates:

If WO_3 content weighs	2.2564 lbs.	80.6%
then CaO " "	.5458 "	19.4%
Scheelite in concentrates weighs	2.8022 lbs.	100.0%

Value of Products in Dollars

Heads; 1 ton,	2000 lbs.	@ .51%	WO_3	= 10.2 lbs.	WO_3
Less, 5th Pass tails	" "	@ .09%	"	= 1.8 "	WO_3
Gives Concentrates	" "	@ .42%	"	= 8.4 "	WO_3

Then $\frac{8.4 \text{ lbs.}}{10.2 \text{ lbs.}}$ = 82.35% of WO_3 (or scheelite) recovered from each ton of original ore. This leaves 1.80 pounds of WO_3 (or scheelite) left remaining in tails per 1 ton of ore.

Ratios: 1 lb. scheelite contains .806 lb. WO_3
and 1.24 lb. " " 1.00 lb. WO_3

$\frac{1}{4}$ ton = 500 lbs. = 8,000 ounces
1 ton = 2000 lbs. = 32,000 ounces
Price quoted for Scheelite, $28.25 per unit WO_3

Weights	Lbs. or Ozs. of Conc. in 500 lbs. of Ore: Lbs.	Ounces	This number of lbs. or ozs. of Conc. would be in 1 ton of ore: Lbs.	Ounces
1st Pass Conc.	7 x 16=	116	(7 x 4=29) 29 x 16 =	464
2nd " "	4	64	16	256
3rd " "	5½	88	22	352
4th " "	7-3/4	124	31	496
5th " "	7½	120	30	480
Wt. of Concentrates	32	= 512	128	= 2,048
Avg. % WO_3	7.02%	7.02%	7.02%	7.02%
Wt. of WO_3	2.256	= 360.0	8.99	= 1,437.0
Price for WO_3	$1.4125	$0.0883	$1.4125	$0.0883
	$3.186	$3.186	$12.70	$ 12.70
	Value in 500 lbs.		Value per Ton	

Taking the $12.81 value per ton recovered in the primary concentrates, we wish to ascertain what value remains in the tailings and is lost. Thus:-

Price quoted for Scheelite,	$28.25 per Unit WO_3
Assay value this ore (feed)	.51
Value of Ore	$14.41 per ton
Value found in Concentrates	12.81 " "
Values lost in tailings (a)	$ 1.60 " "

Check: 1872 lbs. tailings
x.09% Assay Val.
1.68 lbs. WO_3 content
@ $1.4125
$2.37 Lost in tailings and/or unaccounted for.

Note: If the tailings assay were .06% then the check of value lost in tailings would be:
1872 lbs. tailings
x .06% assay value
1.130 lbs. WO_3 content
@ $1.4125 per lb.
$1.60 Value lost in tailings, which would check with (a) above.

Price of Ore and Concentrates

The present quoted price for tungsten concentrates is $28.25 per unit of WO_3. The price or value per ton of material is the assay in percentage of WO_3, multiplied by the price quotation. The "unit" is 1/100 or 1 per cent of a ton, therefore 20 pounds of WO_3. There are 60 units in a ton of 60% concentrates; or 15 units in a ton of 15% concentrates.

Example I	60% WO_3 equals 60 units per ton x $28.25 Material is worth $1,695 per ton
Example II	Assay value is 7.02% WO_3 Then 7.02 x $28.25 = $198.32 value per ton
Example III	Assay value is .51% WO_3 Then .51 x $28.25 = $14.41 per ton
Example IV	Assay value 1% WO_3 Then 1 x $28.25 = $28.25 per ton
Example V	Assay value of 1 lb. WO_3 This would mean 1 lb. out of 2,000 lbs., or an assay value of .05% Then .05 x $28.25 = $1.4125 per ton. The 1 lb. has the same value:-$1.4125 per lb. Also, 1 ounce of WO_3 is 1/16 of a pound, and therefore is worth $.0883 per oz.

Summary of Results of January 1950 Runs.

The sum and substance of the test runs appears to be that if the ore is re-run a sufficient number of times — in this instance 5 times -- a satisfactory concentration and extraction of scheelite is obtained. Out of ore assaying $14.41 per ton, $12.81 was recovered in the concentrates and $1.60 (or the assay would say $2.37) remained in the tailings and/or was unaccounted for.

The re-run means that a series of tables should be provided, such as 5 tables to be run in series.

The present tests do not indicate the time required for the passage of ore over the table, or tables. This is due to the fact that the batch runs are poor indicators of the timing that goes with continuous runs.

Correlation with Prior Runs and Tests.

Previous experience in making a test run and assay was had on September 14, 1948. The results of that test and of the tests in January 1950 as similar enough to have one confirm the other as to the performance of the D'Ore concentrator.

In the earlier (Sept. 1948) run, the heads or feed assayed 1.05% WO_3, the tails 0.11% WO_3, and the concentrates 15.43% WO_3. These may be compared with the January 24, 1950 run, where the heads assayed .51% WO_3, the tails 0.09% WO_3, and the concentrates 7.05%. It will be noted that the ore used in September 1948 was twice as rich (1.05%) as the ore in January 1950 (.51%); and the concentrates extracted in September 1948 were twice as rich (15.43%) as the concentrates in January 1950 (7.05%).

The performance of the machine appears to be consistent. This concentrator was designed by Mr. Robert Dore assisted by Mr. Walter Deppen, particularly with the view to processing Shadow Mtn. tungsten ore. The scheelite deposits at Shadow Mtn. had been worked to some extent in 1938 but the operators found difficulty in milling the low grade ore and had given up the project. Mr. Dore and Mr. Deppen experimented with dry separation and extraction, and finally developed the present dry shaking table, with shot-bed mechanism and pneumatic or air suspensory. Dore's experience with scheelite and wolframite ores throughout the western area provided the know-how as to the mechanical action necessary to effect the

separation of heavier scheelite from the lighter gangue materials. The present machine or concentrator appears capable of taking out the scheelite, particularly in the case of low grade ore, and leaving no value of consequence in the tailings. In fact, during the development of this concentrator, the ore often used for the trial runs consisted of tailings from the prior milling operations at Shadow Mtn. -- the material which had been passed over standard size wet concentrating tables, consequently running low grade in scheelite, good recoveries were obtained from these tailings.

The foregoing is recited to indicate that the D'Ore concentrator has quite evidently passed the experimental stage and appears to be proving its ability and consistency of performance.

Test Run of September 14, 1948.

An outline of the test run of September 14, 1948, is as follows (reported by Robt. F. Dore):-

Present to observe the tests were:

John Herman of Smith-Emery Company.
Gage D. Dub, Consulting Mining Engineer
Walter Daugherty, Mining Operator, Beverl Hills.
Fred Carlson, Mining.
J. J. Jessup, Former Dit Engineer, Los Angeles.
Fay L. Wright, Geologist and Engineer.
E. Richard Just, General Partner, Just Associates, Owner of Shadow Mtn. property.
E. D. Arthur, Secretary Mining Division, Los Angeles Chamber of Commerce.
Wm. F. Dottrell, Owner, Dottrell Engineering Co.
Walter Doppen, Operator and Developer of Equipment used.
Robt. F. Dore, Operator and Developer of Equipment used.

Equipment: D'Ore Pneu-Float Concentrator.[11]

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11. For description of concentrator, dimensions and capacity, and material handled in this test run, see Appendix A of this report, (page 5) following.

Ore Used. 500 pounds Shadow Mtn. ore ground to minus 14 mesh in D'Ore mill.

Results. Ratio of concentration approximately 70 to 1, of material handled to concentrates, recovering 7[illegible] pounds of rough concentrates, disposing of 492[illegible] pounds of material to tailings, in which only a trace of scheelite showed under mineral light.

Assays. (1) Assays by A. V. Herr Laboratory, 5176 Hollywood Blvd., Los Angeles, Certificate No. 16519:-

Heads, 1.01% WO_3
Tails, 0.11% WO_3
Concentrates, 15.2[illegible]% WO_3

(2) Assays by Smith-Emery Company, 920 Santee Street, Los Angeles, Certificate No. 297668-9:-

Heads, 1.09% WO_3
Tails, (no sample)
Concentrates, 15.62% WO_3

(3) Average of the two assays:

Heads, 1.05% WO_3
Tails, 0.11% WO_3
Concentrates, 15.43% WO_3

The results, indicated by an average of the two assays, show a recovery in excess of 90% of the WO_3 content of the ore handled.

The above described run was repeated the following day, September 15, 1948, by mixing the recovered concentrates with the gangue material, with the exception of the amount taken for samples. The results were substantially the same. This run was made in the presence of Mr. L. A. Norman, Jr., and Mr. R. J. Sampson of the California State Division of Mines, Los Angeles Office.

COPY

Conclusion

The foregoing report has been compiled in considerable detail in order to assemble the data regarding the performance and tests, and proofs of ability of the dry concentrator.

It appears to the writer that the usefullness of the machine has been demonstrated. I think it has proved its ability to gather the values out of scheelite ore and to leave the tailings without any commercial value. Then the machine, or a battery of the machines, can accomplish this, and turn over a rough primary concentrate running from 10% to 15% WO_3 to the standard wet tables for finishing, it will have accomplished its purpose. The writer considers that the dry concentrator will prove very valuable in handling ore, not only in the desert regions, but also in connection with customary milling, where a primary concentrate is often needed to facilitate the milling procedure.

Respectfully submitted

(Signed) Walter S. Glute
Geologist and Engineer

Los Angeles, California

February 14, 1950

Trinity 4791

COPY

Form 1

LABORATORY REPORT
SMITH-EMERY COMPANY
CHEMICAL ENGINEERS AND CHEMISTS
METALLURGICAL AND TESTING ENGINEERS
920 SANTEE STREET
LOS ANGELES 15

LABORATORY

No. 317743-45

Date January 11, 1950

Sample Ore, Concentrates & Pulp

Received 1-5-50

Marked

Submitted by Walker S. Clute
811 West 7th Street
Los Angeles, 14, California

REPORT OF DETERMINATION

"Sample No. 1 - Heads - Dore 1-4-50 Clute
(sample represents 500 pounds ore)"

Tungsten Trioxide (WO_3) -------- 0.75%

Screen Analysis:

+4 mesh	
-4 mesh +8 mesh	None
-8 mesh +20 mesh	None
-20 mesh +40 mesh	40.1%
-40 mesh +60 mesh	40.4%
-60 mesh +80 mesh	9.1%
-80 mesh +100 mesh	4.3%
-100 mesh +200 mesh	1.4%
-200 mesh	3.5%
	1.2%

-continued

All reports are submitted as the confidential property of clients, authorization of our reports, conclusions, or, extracts from or regarding them is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

Walker S. Olute

317743-45

"Sample No. 2 Concentrates - Bore 1-4-50 Olute"

Weight of sample	1,567.00 grams
Tungsten Trioxide (WO_3)	15.32%
Copper (Cu)	0.03%
Molybdenum (Mo)	0.01%
Phosphorus (P)	0.005%
Sulphur (S)	Trace

SCREEN ANALYSIS:

+4 mesh		None
-4 mesh	+8 mesh	None
-8 "	+20 "	64.8%
-20 "	+40 "	26.2%
-40 "	+60 "	5.7%
-60 "	+80 "	1.7%
-80 "	+100 "	1.1%
-100"	+200 "	1.5%
-200		1.0%

SPECTROGRAPHIC EXAMINATION (Qualitative)

Calcium, Tungsten, Silicon — Major Constituents

Aluminum, Iron — Intermediate Constituents

		Minor Constituents
Sodium	Approximately	1%
Lead	"	0.5%
Magnesium	"	0.5%
Manganese	"	0.1%
Copper	"	0.05%
Zinc	"	0.05%
Barium	"	0.05%
Titanium	"	0.05%
Bismuth	"	0.01%
Vanadium	"	0.005%
Strontium	"	0.005%
Molybdenum	"	0.005%
Chromium	"	0.005%
Boron	"	0.001%
Gallium	"	0.001%
Nickel	"	Trace
Silver		Present

****

"Sample No. 3 - Tails - Bore 1-4-50 - Olute"

Tungsten Trioxide (WO_3) — 0.66%

Respectfully submitted,

(Signed) Smith-Emery Co.
Chemists and Engineers

Copy

Phone
Vandike 9328

ORE TESTING
SAMPLING
and
SUPERVISION OF
ORE SHIPMENTS

ED. EISENHAUER, JR.

ASSAYER -- METALLURGIST -- CHEMIST
320-322 South San Pedro Street
Los Angeles 13, Calif.

Jan 26/50

Mr. R. Dore
Los Angeles
Calif.

Subject : Assays of Rock.

Marked :	Tungstic Oxide (WO_3)
Heads	.51%
Primary Concentrate-1st Pass	12.72%
do do 2nd do	9.60%
do do 3rd do	7.02%
do do 4th do	4.53%
4th pass tailings	.14%
Primary Concentrate-5th pass	2.84%
5th pass tailings	.09%

Respectfully submitted

(signed) Ed. Eisenhauer, Jr.
Ed. Eisenhauer, Jr.
Assayer

COPY

APPENDIX 1.

The D'Ore Pneu-Float Dry Concentrator

The D'ore dry concentrator is a rugged machine, a shaking table designed to separate out the heavier and valuable minerals from a charge of ground ore fed across its surface. The machine is designed for continuous feed, rather than batch feed. It is constructed of standard parts so that replacements can be readily made. It is customarily driven with belt drive, and one machine requires about 2 H.P. The blower also requires 2 H.P.

Experimental research on dry concentration was carried on by Robt. Dore and Walter Deppen, in association with Wm P. Cottrell, owner of the Cottrell Engineering Company, Los Angeles, during the years 1947, 1948, and 1949. The result has been the development of the D'Ore dry concentrator.[1] The machine was designed, to a great extent, with a view to handling the scheelite ore of Shadow Mtn. mining district, a rather low grade tungsten ore that has proved difficult to concentrate on wet tables. The D'Ore concentrator is applicable to the benefaction of a wide range of low grade ores of various metals. The objective is, of course, to gather the values into a rough or bulk concentrate, which product in turn can be conditioned and finished into a marketable high grade concentrate by means of standard wet shaking tables. At the same time, the extraction

1. Another piece of mill equipment designed and built by (or for) Robt. Dore is the D'Ore Mill, a grinding unit. This is a revolving mill, on a horizontal axis, with interior grinding rolls and with adjustable wall-slots that permit the escape of ore when it has reached the desired degree of fineness, thus not remaining within the mill to become pulverized.

of the valuable particles is intended to be so thorough that the tailings from the D'Ore concentrator contain no further commercial value. Assays of the tailings of scheelite ores from the concentrator have shown, for example, .09% (9/100 of 1 per cent) WO_3, which is below the lower economic limit of value.

In the course of experiments, tailings were taken from the piles of former operations of wet tables, and still containing appreciable WO_3 content. These tailings were run through the D'Ore dry concentrator and substantial values were recovered.

The D'Ore concentrator has for its main structural base an adaptation of the Dottrell vibrating table and screen. The well-known Dottrell vibratory rotor is utilized to give the table its shaking motion. In the D'Ore machine the shaking portion is called the deck or table. The deck is 7 feet long and 2-3/4 feet wide, and has a depth of some 1½ inches. The lower or under side of the deck is faced over with a steel screen of about 10 mesh.

In the deck proper there are several transverse slots or receptacles filled with steel shot. Thus, one bed of shot, in one of these receptacles, may be 2-3/4 feet long (extending entirely across the table) and 5 inches wide and about 1 or 1½ inches deep. The the top side of the deck is faced over with a steel screen of 10 mesh, similar to the under screen. The slots extend clear through, so the shot rest on the lower screen.

Air, under a moderate and controllable pressure, is introduced from beneath the deck and blows up through the slots and through the steel shot beds. The amount and speed of the air flow can be regulated readily as it is driven into the machine from a blower.

COPY

The charge of ore is introduced on to the vibrating deck from a bin or hopper at one end — the feed end. The deck normally has a slight slope (3/4 inch) from the feed end down toward the discharge end, though the deck can be set exactly horizontal if desired. The vibratory motion, due to the mechanical construction of the deck in relation to the supporting coil springs, is such that the vibration sends the ore along with a bumping motion which makes the ore progress from the feed end to the discharge end, even on a horizontal deck or slightly up slope. This is because the vibrating motion is not in a flat horizontal plane, but is an upward-andforward motion, a hammering blow directed at an angle upward of 45 degrees. The amount of vibratory motion of the entire deck is about a quarter inch. The operation of the machine, briefly, is as follows:

The finely ground ore flows from the bin on to the head end of the deck and is vibrated along rapidly toward the discharge end. As the ore covers the deck (to a thickness of about 1/2 inch) and is violently shaken, the air from beneath blows up through the shot bede and the ore and causes the lighter particles to be lifted away from the heavier particles.[2] There is a sort of boiling in the material on the deck due to the combined shaking and pneumatic actions.

The material of course tends to fall through the screen and into the shot-beds — at least the heavier (scheelite) particles get through, although it is intended that the air shall prevent the lighter particles

---

2. In tungsten ores, the scheelite (calcium tungstate, $CaWO_4$, with specific gravity 6.0) is much heavier than the customary gangue materials that accompany it, such as quartz with specific gravity 2.66; calcite 2.82; chalcedony 2.6; aragonite 2.9; olivene 3.3; etc.

from falling through the top screen, so far as possible. Certain material, heavy and light, large and small, does drop through the screen into the shot beds; that is, into the spaces or pores between the loose steel shot. It is the function of the shot beds to retain this material and to further agitate and batter it while the air blast carries the light particles back upward (and so discards them) and the heavy particles settle on down through until they drop through the lower screen into a bin or receiver placed to catch them below. These heavier particles are, of course, the desired concentrates.

The separation of the lighter gangue material from the heavier scheelite concentrates is not perfect, of course, nor is it intended to be. The concentrates (called primary concentrates) may consist of, say, 5 pounds of scheelite and 30 pounds of gangue or waste material; and the 35 pounds of scheelite and gangue together may have come from a charge of about 500 pounds of raw ore. It will be understood that the machine is intended to run with continuous feed, though batch runs are commonly made for special purposes.

The concentrates are caught in a tray or receiver beneath the deck, as mentioned. The tailings are discharged off the lower end of the table into a suitable bin, or else directly on to the deck of another similar machine which will repeat the concentrating action still further. It is intended that as many as four or five in series shall constitute a battery of these machines, in order to effect a complete separation and the final tailings will show practically no assay value.

Some of the operating data are as follows:

Dimensions and Capacity of Concentrator[5]

Deck 87" long x 33" wide, equals 2871 square inches deck space.

Feed, ½" thick.

Vol. of 1 deck load, 2871 x ½ = 1435.5 Cu. In.

Speed of rotor, 1250 R.P.M.

Time of travel of material from feed end to discharge end, 17 seconds. This signifies that 1 full deck load may be discharged in 17 seconds; consequently, 3.53 deck loads may be descharged per minute.

Capacity computations:--Weight of material handled, 155.15 pounds per cubic foot. 1435.5 cubic inches of material x 3.53 trips equals 5,067.31 cubic inches per minute, x 60 equal 304,038.6 cubic inches per hour. Then 304,038.6 cubic inches per hour divided by 1728 equals 175.95 cubic feet per hour. This is volume of material moved. Converting to tons:-- 175.95 cubic feet x 155.15 pounds per cubic foot equals 27,298 pounds per hour. Dividing by 2000 equals 13.659 tons per hour. Multiplying by 24 hours equals 327.57 tons per 24 hour day.

The through-put on numerous test runs on Shadow Mtn. scheelite ore has been at the rate of from 5½ tons to 13.649 tons per hour. In terms of milling capacity, these rates represent from 125 tons to 327.57 tons per 24 hour day.

The D'Ore concentrating machine is set up and operating on various ores at the yard of Cottrell Engineering Company, 322 South Avenue 17, in Los Angeles.

---

5. Data furnished by Robt. F. Dore, in connection with test runs made September 14, 1948.

Fig. 5. Concentrator and other equipment in plant of Cottrell Engineering Co., Los Angeles. Air blower for D'Ore concentrator is located on beams above.

Fig. 6. Ralph Baverstock, assayer and engineer (left), confers with Robt.F. Dore, designer of D'Ore concentrator and D'Ore mills.

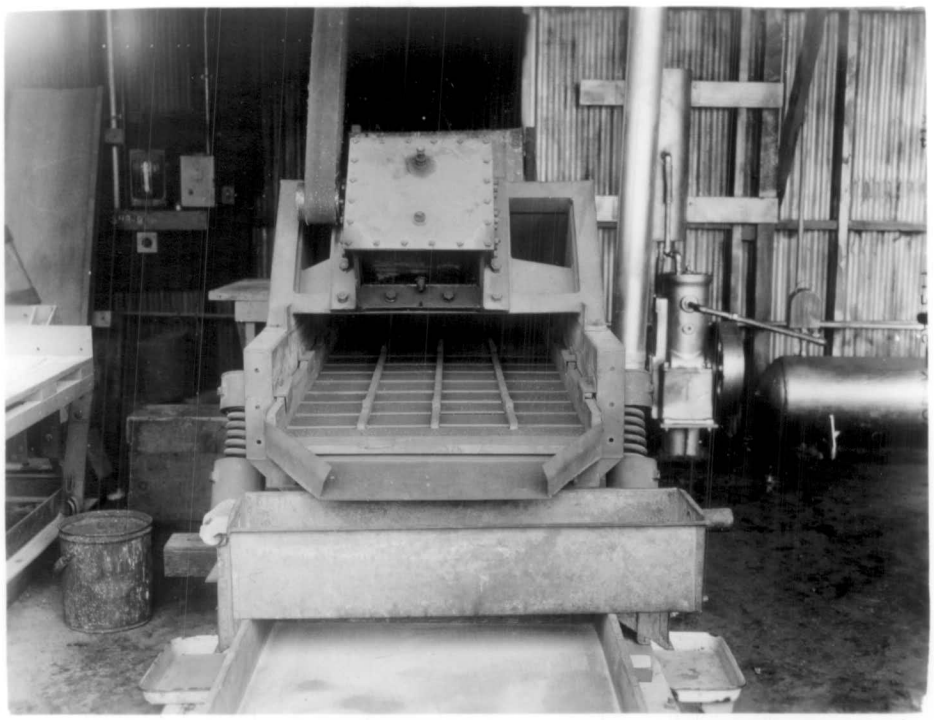


Fig. 3. Rotor and vibrating table, from discharge end. The heavy rotor (belt driven) and table or deck, vibrate as a unit, being assembled in one frame and mounted on the coil springs.

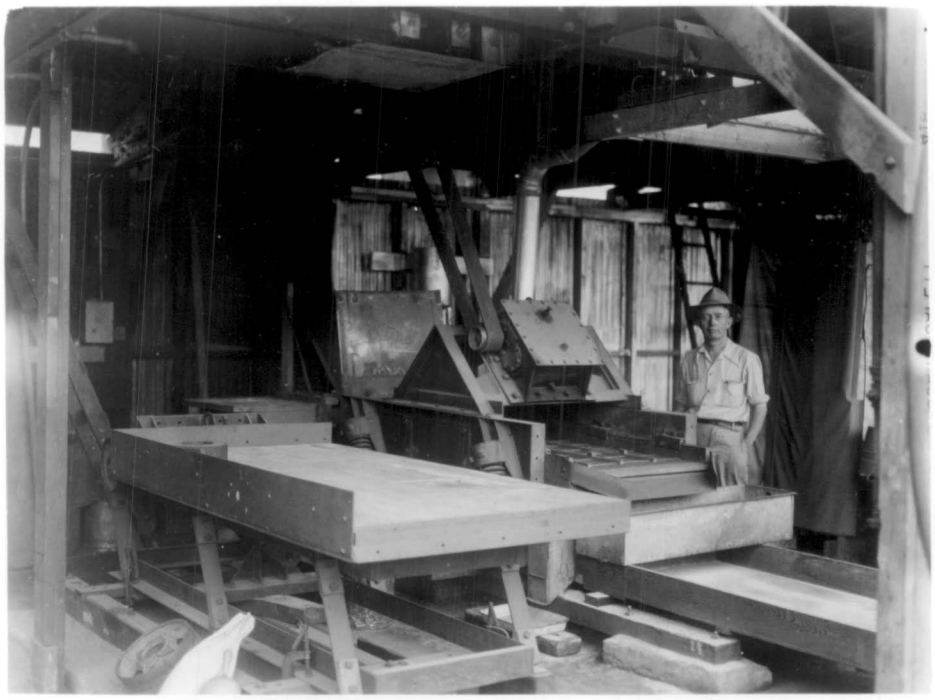


Fig. 4. D'Ore Dry Concentrator, with designer Robt. F. Dore.

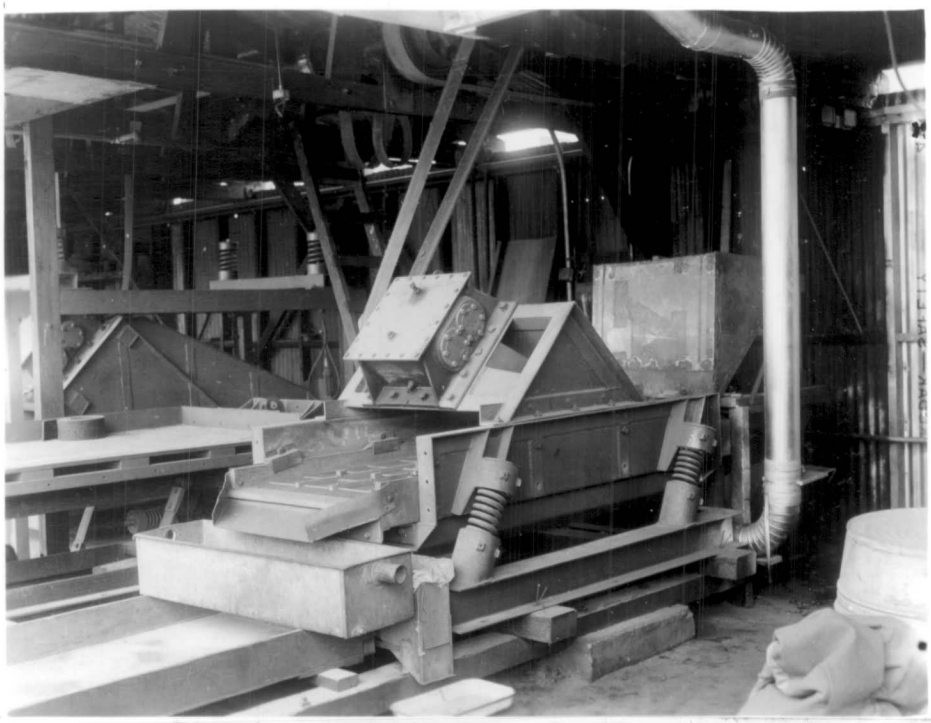


Fig. 1. D'Ore Pneu-Float Dry Concentrator. Feed bin at right end; air pipe coming down from blower above; rotor-vibrator (belt-driven) in center; ore tailings discharge into troughs toward the left; concentrates are taken off in tray or receiver at "C".

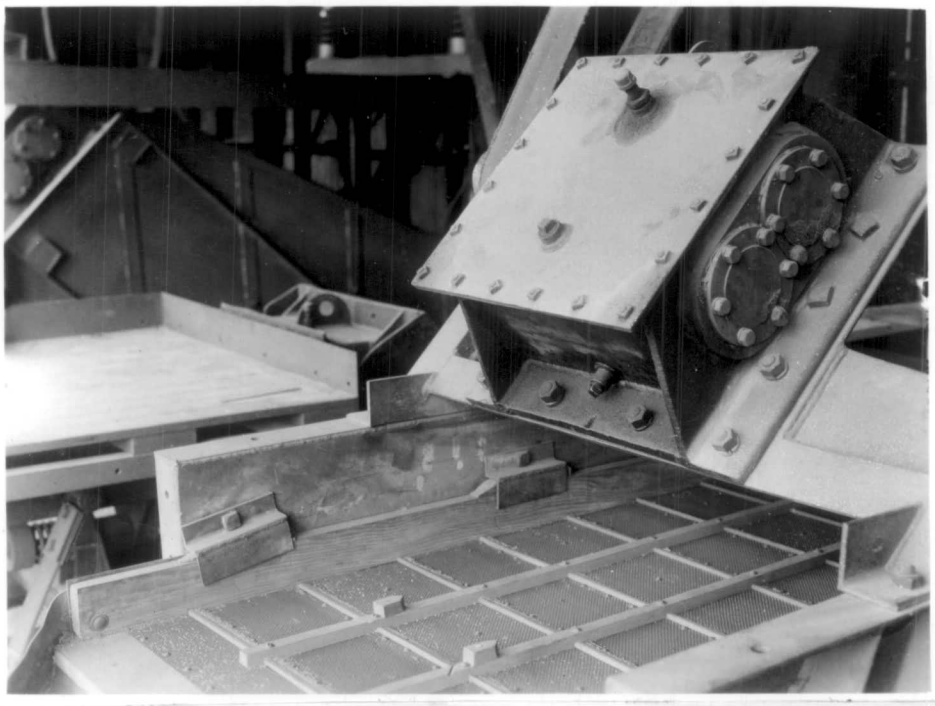
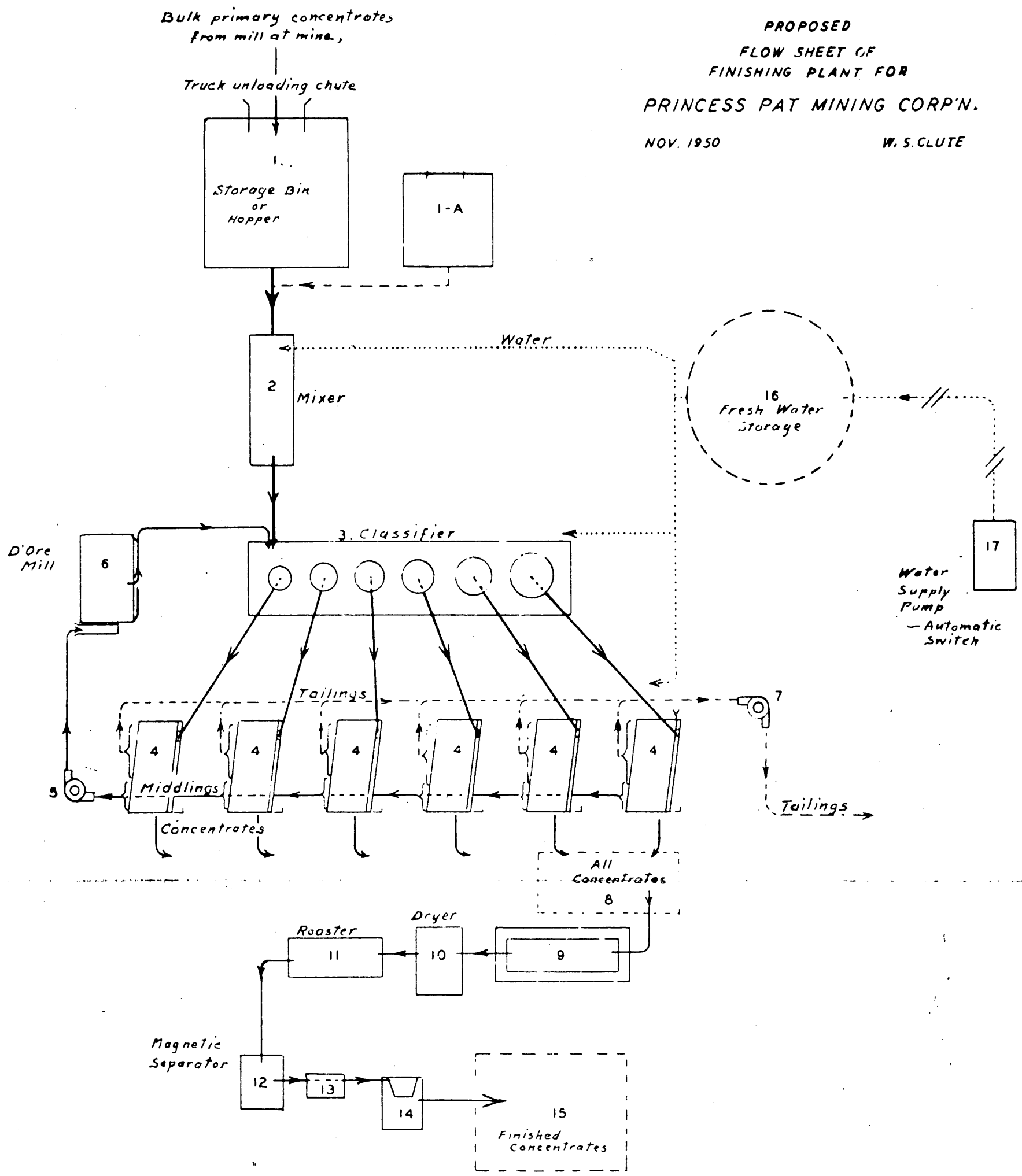


Fig. 2. Showing Cottrell Double-Rotor vibrator mechanism (enclosed), upper right; and screen deck of concentrator table below.

PROPOSED
FLOW SHEET OF
FINISHING PLANT FOR
PRINCESS PAT MINING CORP'N.

NOV. 1950 W. S. CLUTE



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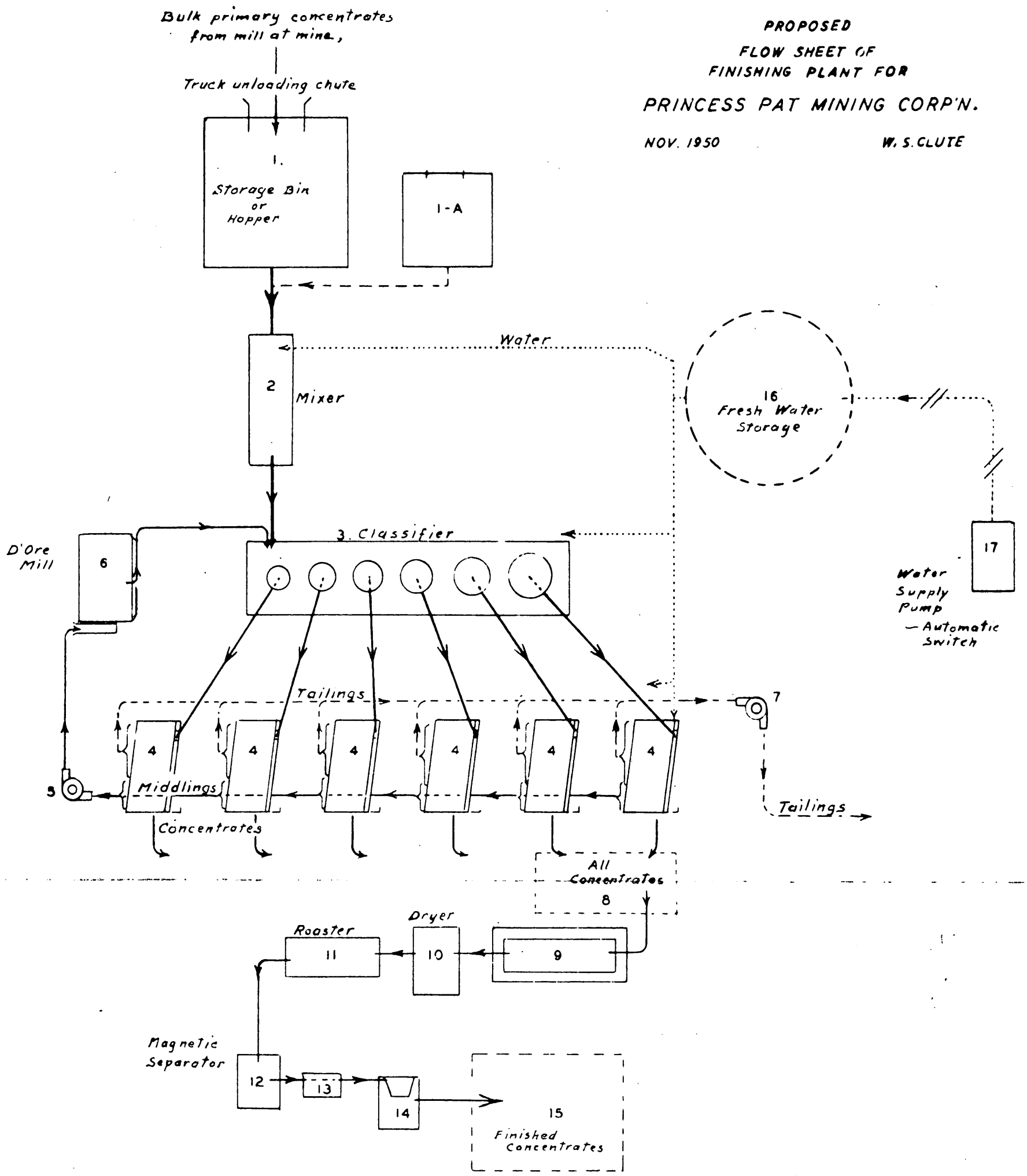

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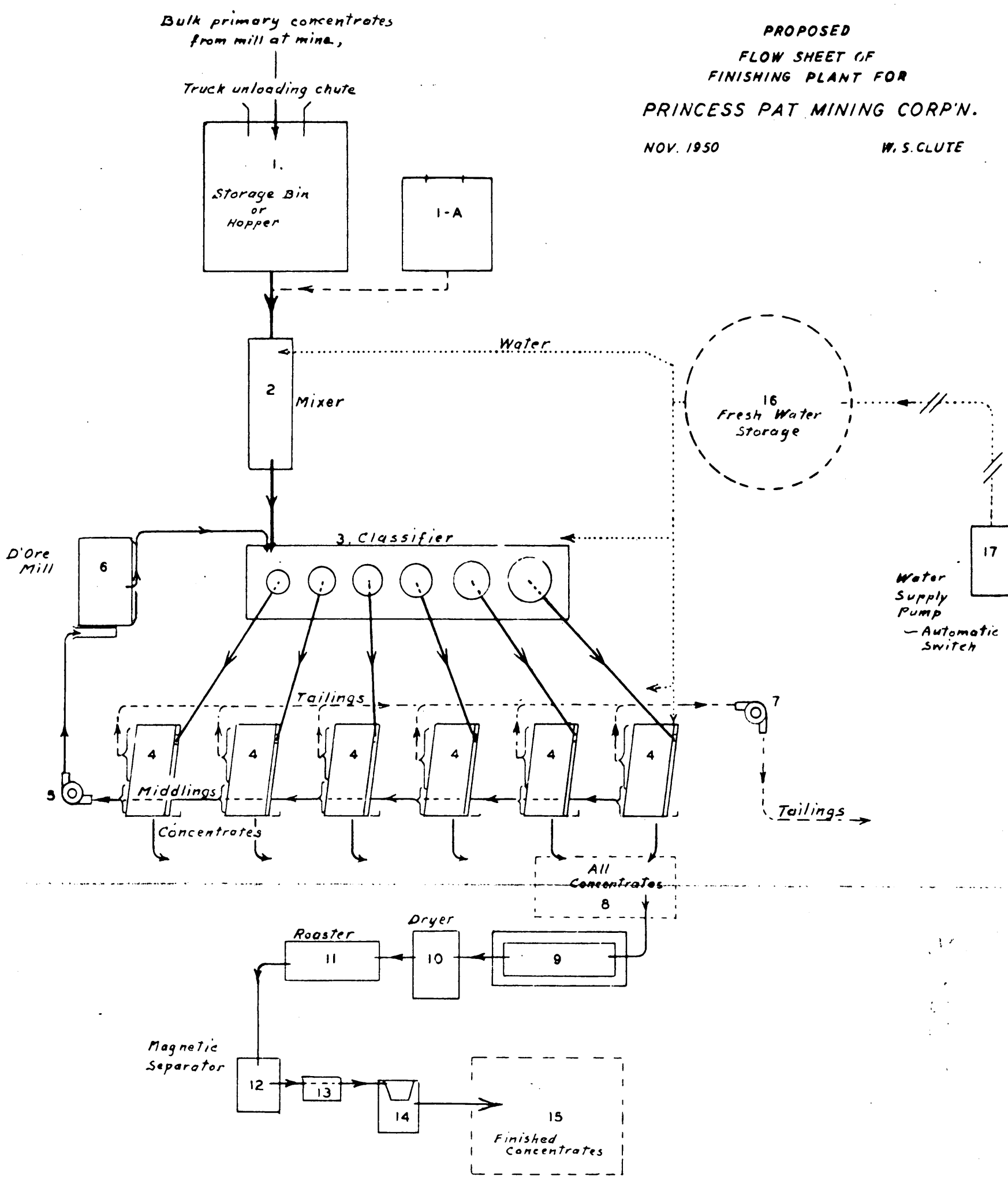

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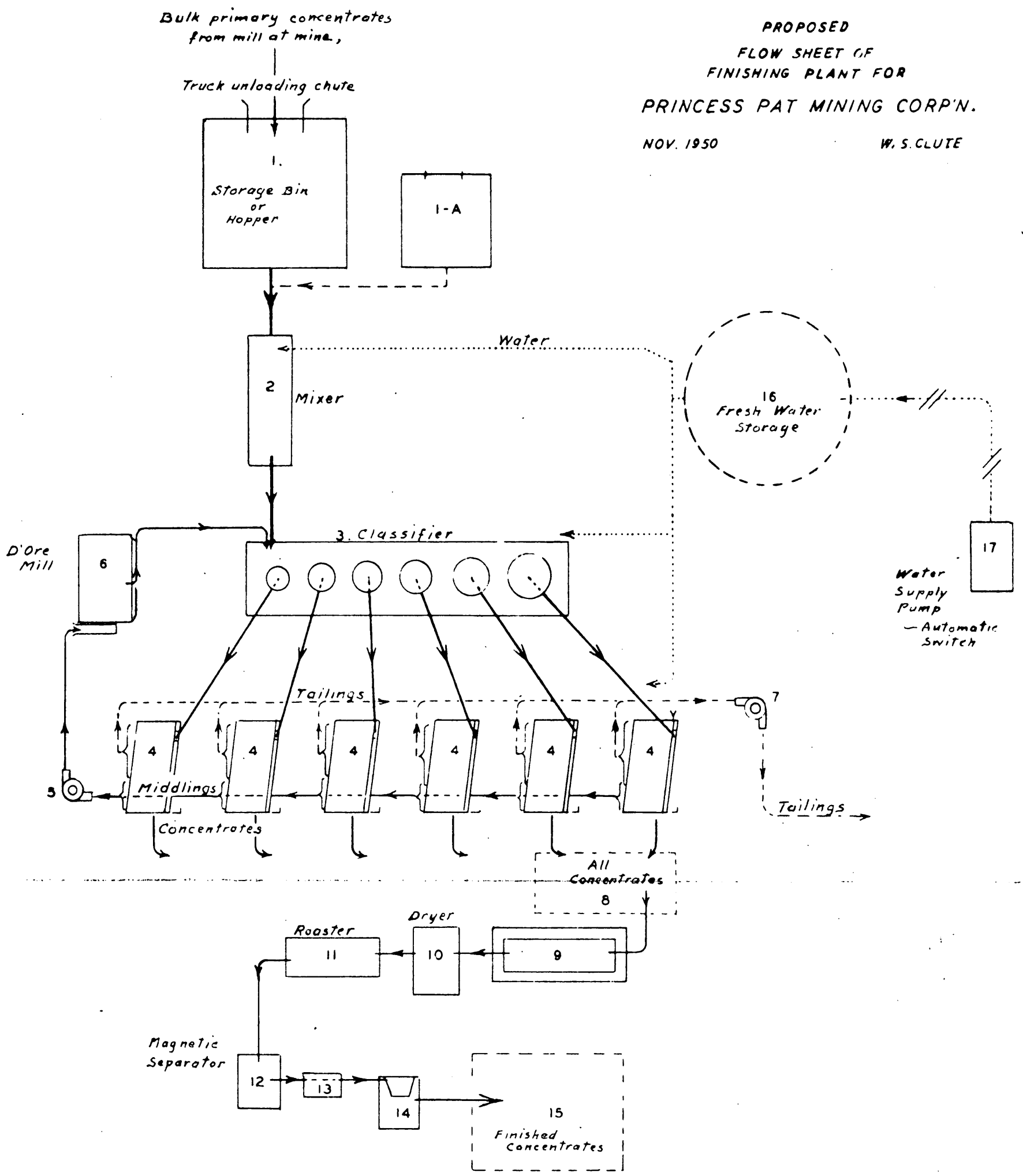

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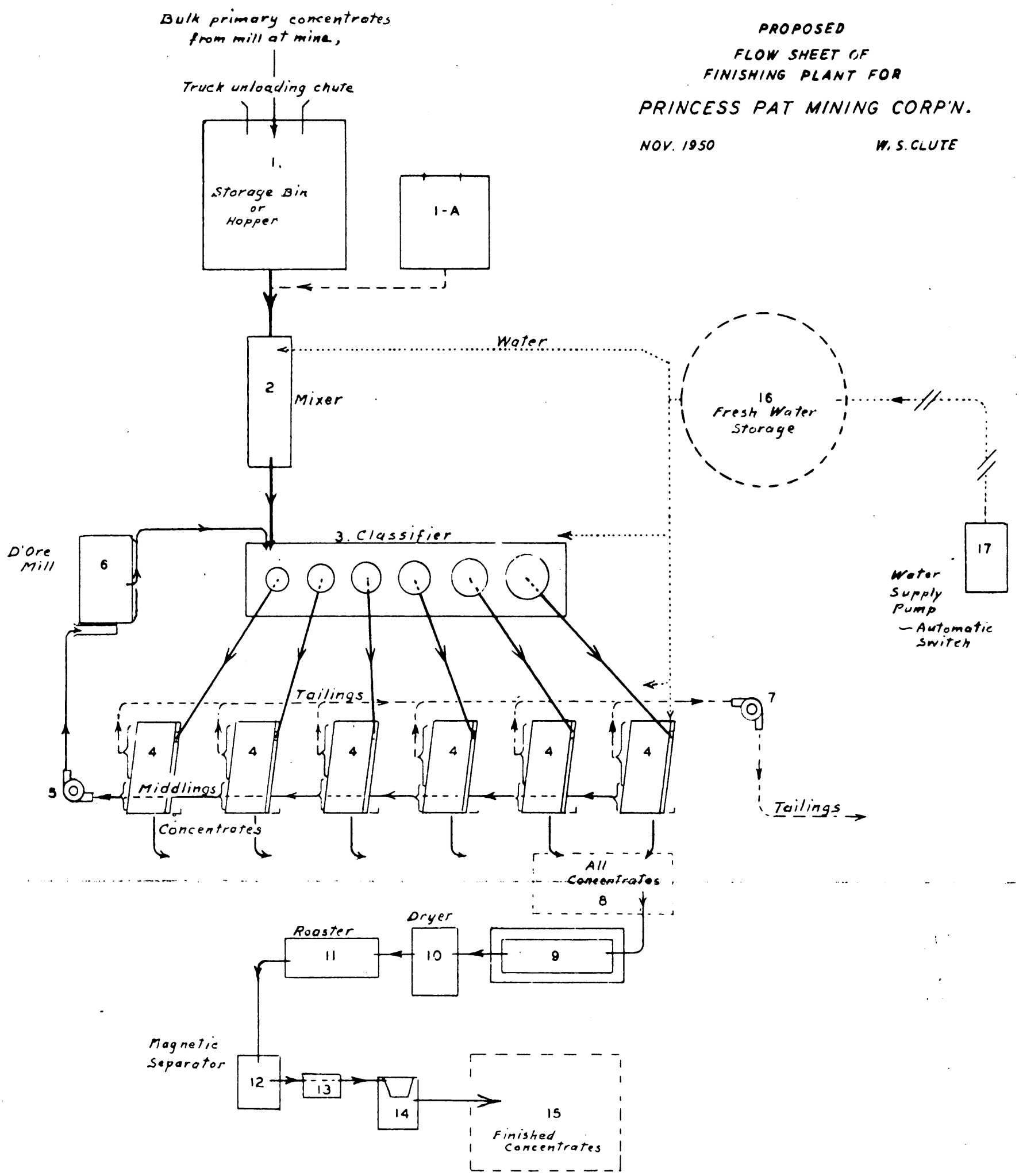

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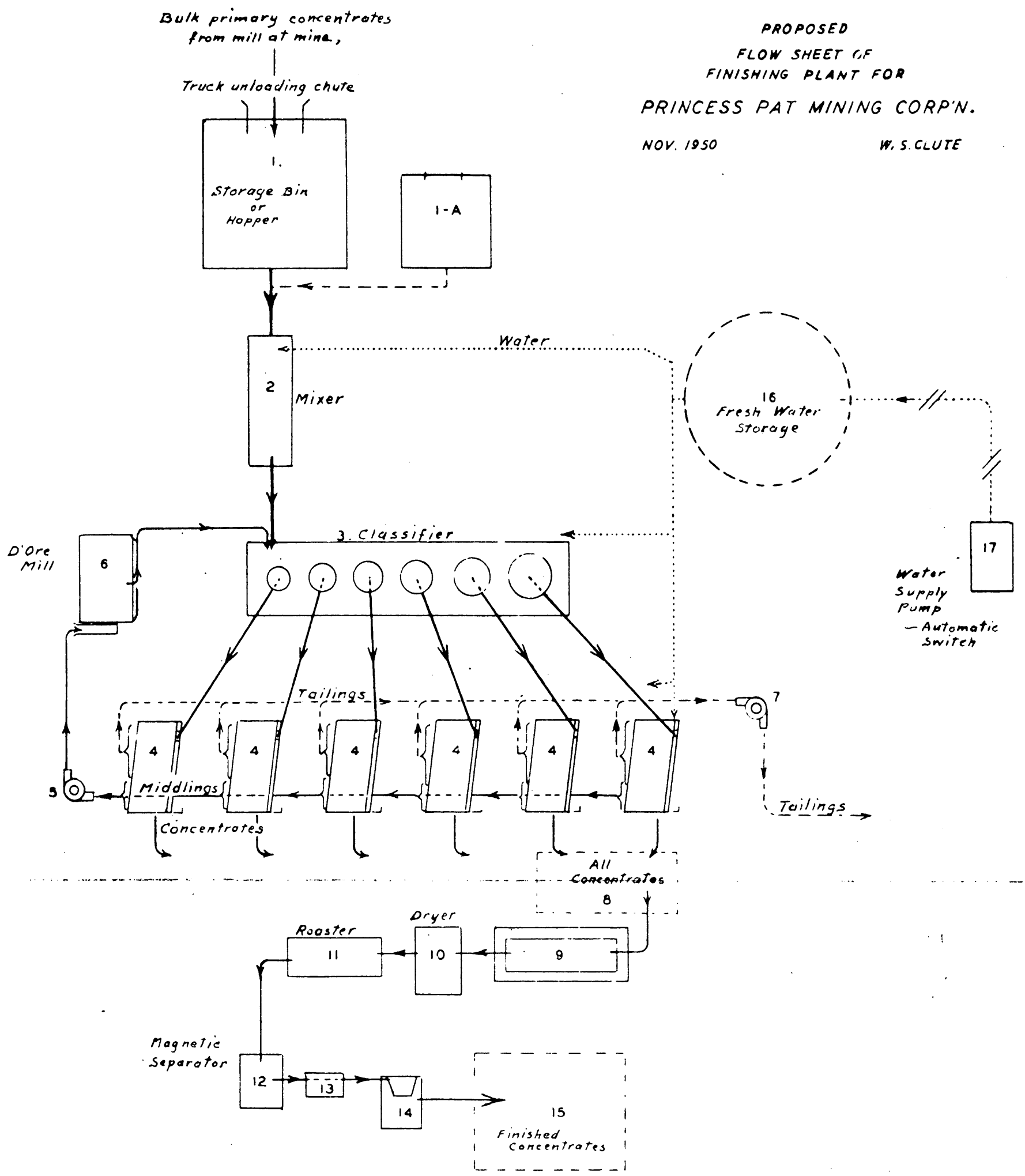

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SHADOW MOUNTAIN TUNGSTEN MINING PROPERTIES

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PRINCESS PAT MINING COMPANY

SHADOW MOUNTAIN TUNGSTEN MINING PROPERTIES

LOCATION: The Shadow Mountain Tungsten Mining Properties, consisting of twenty two (22) lode mining claims, held by right of Mining Locations and Quit Claim Deeds, properly filed and recorded in the office of the County Recorder of San Bernardino County, California, by Just Associates, a California Limited Partnership, (owners) are free and clear of any and all incumbrances and are located 18 miles north and west of Adelanto, San Bernardino County, California, via, 13 miles north of Adelanto, on highway 395 to sign marked "Shadow Mountain Tungsten Mines""Just Associates Owners", thense 5 miles west on good dirt road to mill site and workings, an easy three hour drive from downtown Los Angeles, California.

LEASE: A very favorable lease agreement has been executed by and between Just Associates, a Limited California Partnership, owners and Lessor and Robert F. Dore of Los Angeles, California, Lessee, dated May 26th, 1948, together with Extension Agreement dated September 28th, 1948, and continues for a period of twenty years and as long thereafter as minerals are produced therefrom, in commercial quantities by the Lessee or parties in privity with him, conforming to and with the provision of said Lease.
Lease provides for no cash bonus, and the payment of ten (10%) percent of all ores and minerals extracted, mined and milled from the property as gross royalty and rent for said mining property, less selling expenses, including transportation of final concentrates and selling commission to third parties to obtain selling

price, with further provision that the Lessor has the right at its option, by giving ten days written notice to receive its reserved royalty in kind at any particular stage of the processing and at the point of production.

ORE RESERVES: Many eminent mining engineers and geologists have made extensive examinations and analytical reports of the property in detail, including Mr. Walker S. Clute, Geologist and Engineer, Mr. Fay L. Wright, Consulting Geologist, Mr. H. B. Bessac, Geologist, who made a geological map of the area, and the late Frances Benjamin Chapman, Mining Engineer, the latter in a letter to Mr. C. S. Valentine of Chicago, Illinois, under date of March 4th, 1940, stated in part . . . . (Quote) "it is not possible to arrive at any real idea of the potentialities for development of tremendous ore bodies, until one has been on the ground"... ; Mr. Chapman, further, in the same letter referred to the report by Mr. Walker S. Clute and Geological map by Mr. H. B. Bessac, stated in part . . . . (Quote) "on this map you will note in the first lime belt the ore body which has been opened up by trenching, by power shovel, over an area of practically 200 ft. X 800 ft. This small area opened in the proven ore body indicated in excess of 700,000 tons of milling ore, and the above ore body is only one of several which can be developed at a profit, and I am in accord with other engineers who have examined the property that, with further development, sufficient ore would be opened up to supply a mill having a daily capacity of 1000 tons for many years". . . (end of quote).

On page 6 of the detail report made by Mr. Walker S. Clute, Mr. Clute states in part . . . . (Quote) "Extensive use has been made of the ultra-violet light in prospecting these properties. After the power-shovel trenches were dug, the trenches were sur-

veyed and mapped accurately. Then using the quartz tube lamps (110-volt) every foot of the walls and floors were gone over for fluorescence, and the relative amounts of scheelite were not only mapped, but also the classification was painted on the rocks as grade 1, 2, 3 and 4, ore. Assays were of course made, to accompany or guide this classification. Omitting a no. 1, grade for the time being, as representing a superior grade average or (such as 2% or above), the no. 2 grade may be said to represent 1% ore; no. 3, grade 3/4% ore; no. 4, grade ½% ore, etc., although this classification cannot hope to be accurate. It will serve to direct the first mining. It also serves to confine the present estimate of ore to the restricted locality between the trenches where both the light and the assays and the mill runs have proven the scheelite to exist". . . . (end of quote).

The markings referred to by Mr. Clute have recently been checked by Mr. Fay L. Wright, Mr. Walter Deppen, Mr. E. Richard Just and Mr. Robert F. Dore, using the mineral light, resulting in an unanimous opinion that the markings as to grade of ore are approximately correct.

EXHIBITS: The above referred to information, reports, maps and photographs are all available, as well as the real property, for inspection, examination and study.

PLAN OF OPERATION FOR SHADOW MOUNTAIN TUNGSTEN MINING PROPERTIES

MINING OPERATIONS: Mining will be conducted for a long period by the well known quarry method of blasting the exposed ore from hillside benches, (before considering underground workings) utilizing wagon drilling machine, portable and stationary compressors, the most modern effective explosives, a combination bull-dozer and power shovel, and two five-yard trucks, to mine,

load and deliver 500 tons of ore to the milling plant bunker, approximately one quarter mile, requiring an operating crew of five men, working the equipment one eight-hour shift per day.

MILLING OPERATIONS: Mill site is virtually prepared for the erection of a 500-ton ultra modern milling plant, protected from blasting operations at the mine. Most of the excavation work, together with heavy concrete foundations, is in as of this writing, on the well known hill-side bench design for conduction of material by gravity flow through the plant and tailing disposal; this work will be utilized to the full.

Milling plant will contain primary and secondary rock crushers, automatic feeders, grizzlys, bunkers, bins, conveyors, elevators, blowers, driers, dust collectors, cyclone air equipment, mesh sizing units (both air and screening), mesh sized controlled grinding units, power plant, generators, motors, jigs and concentration units, tools and buildings to round out a complete dry concentration plant on the ground, with a definite control in each stage of reduction, eliminating circulating load build up and bring out the maximum recovery efficiency of any and all concentration units in the flow sheet, producing a high grade over-all bulk concentrate, reflected in minimum operating (labor) man power, requiring an operating crew of two men per shift in concentrating plant, one combination diesel and rock crushing operator per shift, one combination master mechanic and mill superintendent and one truck driver, making a milling plant operating crew of $10\frac{1}{2}$ men to operate plant 24 hours or three 8-hour shifts per day, as the truck driver mentioned would also haul supplies and water for mining purposes, or a total over-all operating crew of 16 men for mining and milling 500 tons of material per day.

The above plant will produce an overall bulk concentrate averaging about 15% grade wo3 scheelite at the rate of approximately one unit (twenty pounds) of wo3 scheelite per each four tons of material handled, (by the application of selective mining and blending of the ore as feed to the milling plant) ratio of concentration approximately 70 to 1 or one ton of concentrates for each seventy tons handled through the plant, disposing of approximately 492½ tons to tailings and producing 7½ tons of rough concentrates containing 80% or better of the scheelite, worth at current market quotations as published in Engineering and Mining Journal @ $28.00 per unit $3150.00 per day.

Estimated operating costs per day covering labor, fuel and overhead, but does not cover depreciation and taxes and computing labor at an average rate of $13.00 per hour or an average of $13.00 per man per shift (twenty pounds) of wo3 scheelite per each four tons of

16 men @ $13.00 ----------	$208.00	per day
100% on direct labor for over-head ---------	208.00	" "
Diesel Fuel and Gasoline ----------	50.00	" "
Total covering items mentioned above	$466.00	per day

7½ ton rough bulk concentrates containing 15% wo3 scheelite	$3150.00
Production costs per day	466.00
Gross dollar value before taxes and depreciation	$2684.00
Less 10% royalty of gross recovery	315.00
Balance after royalty per operating day	$2369.00
Balance after royalty per 26 day operating month	$61,591.60

In analysing the above it will be noted that the royalty figure represents an average of $0.63 cents per ton and is a fixed item based entirely upon the amount of wo3 scheelite actually recovered, this figure also indicates an average recovery of slightly over 70% of the wo3 scheelite based on the lowest estimated general

average of .35% WO_3 scheelite taking the known ore body as a whole, in this connection it is also known that an average recovery of 80% or better has definitely been proven to be practical.

The production cost figure represents an average cost of $0.93 cents per ton on handling the material through the plant, this figure is not only subject to, but will actually change from time to time, due to a multiplicity of possible uncontrollable reasons that cannot be predetermined, such as, unavoidable delays in obtaining supplies, strikes, increased labor costs, action of the elements, governmental regulations, an occasional incompetent operator of any machine and the like, etc..

In this connection it should be firmly kept in mind, that should production costs increase, due to any unavoidable reason what ever, by 2, or 3, or 4, or in the extreme to 5 times the estimate or in event of an equivilent decline in obtainable selling price of finished scheelite concentrates, there is a sufficient margin of safety factors to cushion such contingencies and maintain a healthy profit on the capital investment.
The lease and extension agreement also provide in part . . . . "should such causes effect the operations of the lessee to the extent that said Lessee cannot operate and produce a marketable concentrates at a reasonable profit, sufficient to protect his capital investment, then in that event the lessee shall have the right at any time and from time to time at his option, to suspend operations on said mining property until the said condition has been corrected". . . .

The rough bulk concentrates of approximately 7½ tons per day will be trucked to a conditioning plant to be established in or near Victorville, California, a distance of 26 miles over hard surfaced highway, where a number of sites are available, either by purchase or lease rental basis, where both power and water are

easily obtained.

This plant will handle in one shift the entire production of rough bulk concentrates from the production plant on the property and will condition or process such concentrates by conventional wet methods into marketable products to command the highest market price and will contain such equipment as standard classification and screening units to size the feed to roughers, sand and slime concentrators, a small D'Ore mill grinding unit for regrinding middling cuts from concentrating tables, a drier for drying finished concentrates, a magnetic separator to remove such impurities as iron, epidote and garnet and storage vaults for storing finished concentrates awaiting shipment etc..
Arrangements have also been made to have such concentrates officially assayed and sealed at the conditioning plant so that shipment can be made to market without further handling.

Preliminery estimate of cost of machinery and equipment for a 500 ton mining and milling production plant on the property and a conditioning plant at Victorville, to handle the output of concentrates is attached hereto. This estimate is itemized and self explanatory.

<u>COMMERCIAL SCALE TEST RUNS</u>: Experimental research dry concentration has been repeatedly and successfully carried on, dating from November, 1947, up to the present writing by Robert F. Dore and Walter Deppen and in connection with Mr. William P. Cottrell, owner of Cottrell Engineering Company, 322 South Avenue 17, Los Angeles, California, resulting in the development of a dry concentrator, that is not only practical from every conceivable point, but is also unquestionably, applicable to the benefaction of a wide range of low grade ores into high grade ores or over-all bulk concentrates, which in turn can be conditioned, in many cases,

into most any desired grade of marketable ore or concentrates by age old conventional methods under careful control without danger of loss, at a remarkably low operating cost per ton of material handled, even at present high labor and supply costs, if considered on an operating scale of five tons or more per hour.

The through put on the numerous test runs on Shadow Mountain scheelite ore has been at the rate of from 5½ tons to 13.649 tons per hour, or in the terms of milling plant capacities of 125 tons to 327.576 tons per 24 hour day which is definitely a commercial scale operation.

The significant part in connection with these test runs is, that tailings from previous pilot plant operation on the property, in which the ore was ground through a ball mill passed through a wet jig and over a standard size wet concentrating table, this material being the lowest in WO_3 scheelite value was used in the development of the dry concentrator, was naturally of mixed sizes and the recovered values were the residue or what was lost to the tailings by the former wet operation.

Following this, picked samples of ore were obtained from the property representing as near as could be determined, approximately the highest WO_3 scheelite in the opened up area, for the purpose of making a determination of the recoverable WO_3 values from both the high and the low scheelite values as known to exist.

These tests on a commercial scale basis are not only most gratifying, but prove conclusively that an over-all bulk concentrate can and will be made on the property averaging 15% or better WO_3 scheelite as previously outlined.

The following is a report of an official test run made on Shadow Mountain ore Tuesday, September 14th, 1948, at Cottrell Engineering Company, 322 South Avenue 17, Los Angeles 31, California, at 2 o'clock P.M..

Present to observe the tests were:

Mr. John Herman, of Smith-Emory Company

Mr. Gage D. Dub, Consulting Mining Engineer

Mr. Walter Haggerty, Mining Operator, Beverly Hills

Mr. Fred Carlson, Mining

Mr. J. J. Jessup, Former City Engineer, City of Los Angeles

Mr. Fay L. Wright, Geologist and Engineer

Mr. E. Richard Just, General Partner, Just Associates, owners of Property.

Mr. E. D. Arthur, Secretary Mining Division, Los Angeles Chamber of Commerce.

Mr. William P. Cottrell, owner, Cottrell Engineering Company

Mr. Walter Deppen, Operator and developer of equipment used

Mr. Robert F. Dore, Operator and developer of equipment used

ORE: 500 pounds Shadow Mountain ore ground to minus 14 mesh size in D'Ore Mill.

Dimensions and capacity of concentrator;

Deck 87" long X 33" wide equals 2871 square inches deck space.

Feed ½" thick.

Speed of rotor, 1250 R.P.M.

Time of travel of material from feed end to discharge end 17 seconds or 3.53 time full deck load per minute.

Weight of material handled 155.15 pounds per cubic foot.

1435.5 cubic inches of material X 3.53 equals 5067.31 cubic inches per minute X 60 equals 304,038.60 cubic inches per hour divided by 1728 equals 175.95 cubic feet per hour X 155.15 pounds per cubic foot equals 27,298 pounds per hour divided by 2000 equals 13.659 tons per hour X 24 hours equals 327.576 tons per 24 hour day.

Results: Ratio of concentration approximately 70 to 1 of

material handled to concentrates recovered, disposing of 492½ pounds of material to tailings, recovering 7½ pounds of rough concentrates, leaving only a trace of scheelite showing under the mineral light.

ASSAYS: Assays by A. V. Herr Laboratory, 5176 Hollywood Blvd., Certificate no. 10519 - Heads 1.01% WO3, Tails 0.11% WO3, concentrates 15.24% WO3.

Smith-Emery Company, 920 Santee Street, Los Angeles.

Certificate No. 297568-9 - Heads 1.09% WO3, Tails (no sample) concentrates 15.62% WO3.

Average of the two; Heads 1.05% WO3, Tails 0.11% WO3, concentrates 15.43% WO3.

These reported results show a recovery by taking the average of the two assay reports in excess of 90% of the wo3 content of the ore handled, while all estimated figues in this report as to wo3 recovery, converted into dollar value recovery are based on an actual of approximately 70%.

The above described run was repeated the following day, September 15th, 1948, by mixing the recovered concentrates with the gangue material, with the exception of the amount taken for samples, the results were principally the same. This run was made in the presence of Mr. L. A. Norman, Jr. and Mr. R. J. Sampson of the California State Division of Mines, Los Angeles office, and as previously stated, many runs have been made to insure accuracy.

Many engineers, familiar with Shadow Mountain scheelite ore, who have followed the preliminary research test work, together with the planned mining and milling operations, have expressed the opinion this operation, if carried out as planned, will result in an outstanding development, not only from the point of

employing a long sought after practical method of dry concentration where water is not immediately available, but also, and more important, an exceptionally high degree of recovery at a remarkably low operating cost per ton of material handled.

DRYING: It has long been known that under certain conditions and providing the moisture in ore was reduced to bone dryness, that ores in many cases could be successfully concentrated. However, it is quite evident that many engineers and operators have given too little attention or consideration to the practical side of benefaction of ore by dry methods on the theory that the costs of thoroughly drying the ore would be prohibitive. The theory of excessive costs in drying ores for large scale commercial operations applied to mining, has been completely disproved by the drying and heating of material for the nations vast network of highways and city streets; reference is made on this subject to a paper prepared by Mr. J.J. Jessup, who, during the past forty years, has been City Engineer for the cities of Berkeley, Torrance, and Los Angeles, California, respectively; and, now active in a consulting capacity, Mr. Jessup points to the many hundreds of tons of wet gravel being dried by the cities of California each day at a cost of about one gallon of oil per ton, or relatively a few cents per ton to reduce the moisture in ore to dryness with proper equipment. A copy of Mr. Jessup's paper in letter form and Mr. Jessup personally, are available.

Shadow Mountain ore being pricipally of crystalline limestone formation contains very little moisture in place, therefore, does not offer a drying problem....being located in an arid, desert region, will require little or no drying during the dry summer months and only a small amount of drying during damp, rainy weather of moisture picked up in the course of mining and transportation of

ore to the milling plant. Moisture in this case is principally confined to the outside of the ore particles, as the physical formation will absorb very little moisture on the inside of the particles....the crushed ore to mill feed size will pass through a rotary drier and fed directly to the grinding units....passed through the concentration units....concentrates removed and the bulk of material tailings, at only a fraction of a gallon of fuel oil per ton of material dried, reflected in a cost of only a few cents per ton for over-all year round production.

POWER: Electric Power installation by California Electric Power Company of Riverside, California....running a line from Adelanto, California.

VERSUS

Diesel Electric Power installation as oringinally listed in my preliminary estimate prior to complete information on electric power installation and power costs becoming available.

POWER REQUIRED - for both mining and milling operations connected load....electric motor ratings operated 8 hours - - 534 H.P.
Electric motor ratings operated additional 16 hours -334.H.P.
Average continous electric motor rated load - - - - -434 H.P.
Estimated power consumed or dissipated in the course of operations, two-thirds (2/3) of average electric motor load ratings - - - - - - - - - - - - - - - - - - 290 H.P.
Electric power installed with lines to mining and milling plant sites .... initial cash deposit required $60,000.00 rebatable at the rate of 20% discounts on power bills for a ten (10) year period....effective power rate about .01¢ per KW-H, to be confirmed by California Electric Power Company.

Estimated power costs....mining operations 8 hours per day.... milling operations 24 hours per day....average continous power consumed and dissipated estimated at two-thirs (2/3) of average

connected electric motor load or 290 H.P. x 746 watts per H.P.....
216,340 watts or approximately 216 KW-H @ .01¢, $2.16 per hour x
24 hour day - $ 52.84
x 26 operating days per month - - - - - - - - - - - 1,373.84
less 20% rebate discount - - - - - - - - - - - - - - 274.76
Net power costs estimate per operating month - - $1,099.08

DIESEL ELECTRIC POWER: Quoted by Beeson Bros.-

1 - twin engine 250 KVA general motors full diesel electric set complete with all equipment....this unit is quoted far below list price as it was built for Don Lee Television and never used - $20,000.00

Estimated transportation, installation and housing - 3,000.00

Maximum H.P. with safety 300 H.P. could be used for - $23,000.00

Milling operations only .... additional equipment

1 - 35 H.P. gasoline electric generating set (war surplus) - 900.00

to be used for electric arc welding, lighting and comparable use.

1 - Ingersoll-Rand 500 cubic foot compressor with 121 H.P. fuel oil engine, $9,990.00 plus freight $720.00 - 10,710.00

Total estimated cost of equipment to develop 435 H.P. - $34,610.00

on the ground as compared with an electric power connected load of 534 H.P.

ELECTRIC POWER: Initial cash deposit (capital outlay for installation) - - - - - - - - - - - - - - - - - - $60,000.00

1 - Ingersoll-Rand X.R.B.-500 cubic foot stationary compressor complete - - - - - - - - - - - - - - - - 6,534.00

1 - 100 H.P. electric motor and drive - - - - - - - - - -	1,268.00
Freight from Painted Post, New York - - - - - - - - - - -	707.60
Total estimated initial capital outlay to effect Electric Power installation -	$68,509.60
Less cost of diesel, gasoline and fuel oil equipment	34,610.00
	$33,899.60
Difference in initial capital outlay requirements - -	$33,899.60

COMPARATIVE EFFECTIVE OPERATING POWER COSTS, ESTIMATED:

Developing power on the ground via diesel, gasoline and fuel oil equipment and the installation of Electric Power Lines:

Labor required to operate diesel plant, three diesel engineers (one each 8 hour shift) @$15.00 or a labor cost per day of $45.00. 33,899.60 divided by 45. equals 754 operating days, 29 months of 26 days each or 2 years 5 months of operating time for the effective savings in labor costs alone to retire the difference in initial capital outlay and provide an abundant source of uninterrupted electric power for all mining and milling purposes with no maintenance costs.

OR

If the generally established figure of .02¢ per KW-H over a wide range of industrial operations be accepted as the cost of developing diesel electric power on the ground, the estimated diesel power

cost per day would be - - - - - - - - - - - - - - - - - -	$ 105.68
per 26 day operating month - - - - - - - - - - - - - - -	2,747.68
per operating year -	32,972.16
Estimated electric power cost per year - $16,486.08	
Less rebate discount of 20% - - - - - -	3,297.21
Estimated net electric power costs per year - - - - -	13,188.27
Estimated difference electric power costs over diesel -	$19,783.89

per year.

This difference would retire the additional capital outlay in

approximately 21 months with the advantage of a 20% discount on power bills for the remainder of a ten year period. Therefore, this writer firmly recommends that sufficient initial capital be provided to install electric power lines to both the milling and mining sites.

PRODUCTION SCHEDULE: Main production plant on property will handle a minimum of 500 tons of raw material per day, producing approximately an average of 492½ tons of tailings and 7½ tons of rough concentrates, containing an average value of 15% WO3 or better.

CONDITIONING PLANT AT VICTORVILLE: Conditioning plant at Victorville will handle the entire production of rough concentrates from 24 hour operations of the main plant in one 8 hour shift (conditioning plant capacity in excess of 40 tons per day) and will process such rough concentrates into finished concentrates with a minimum WO3 content of 60% or better.

Rough concentrates containing 15% WO3 or better, 7½ tons or 15,000 pounds.

Will produce .... tailings - 11,350 pounds - finished concentrates for shipment - - - - - - - - - 3,650 pounds.

Minimum WO3 content 60% of 3,650 pounds or 2,190 pounds of WO3 equaling 109½ - 20 pound units of WO3. 109½ units WO3 at current published market quotations of $28.50 per unit, reflects a gross dollar value per day of $3,120.75.

OVER-ALL OPERATIONS: Over-all operations will produce approximately one - 50 ton car load of finished concentrates for shipment every 27 operating days.

50 tons finished concentrates equals 100,000 pounds.

Minimum Scheelite content - - - - - - - - - - - - - - - 60% equals 60,000 pounds of WO3 or a minimum of 3000 units WO3. 3000 units WO3

@ $28.50 as currently published in Engineering and Mining Journal - $85,500.00

DEDUCTIONS: Royalty to Just Associates, 10% gross production 8550.00

$76,950.00

Depletion of ore body allowance 15% of balance - - - - - 11,542.50

Depreciation of machinery and equipment 65,407.50

written off over 5 year period or 60 months - - - - - - - 2,310.53

$63,096.97

Estimated operating costs covering labor, power, explosives, supplies and overhead @$1.05 per ton of material handled

500 tons per day x 27 days - - - 13,500 tons @$1.05 - - - 14,175.00

Estimated taxable earned income per month - - - - - - - - - $48,921.97

Federal income tax - - - - - - - - - - 38%

State of California income tax - - - 4%

San Bernardino County and other taxes estimated at - - - - - - - - - - - - - - 3%

Estimated taxes on net earned income 45% 22,010.38

$26,911.59

Add depletion of ore body previously deducted - - - - - - 11,542.50

Net monthly earned income per estimated production schedule $38,454.09

INITIAL CAPITAL RETIREMENT: By the allocation of 75% of the net profit returns from the sale of concentrates, a capital investment of $300,000.00 can be fully retired well under 12 operating months after full scheduled production has been reached and in addition add close to $10,000.00 per month to capital surplus for later distribution.

It is anticipated that there will be little difficulty in bringing minimum production up to and maintaining scheduled capacity of 500 tons per 24 hour day, as all crushing, feeder, grinding and concentrating units listed in this report are rated well under actual capacity.

Each unit is also equiped with variable speed controls so that the flow of material to each machine unit used in the flow sheet can quickly and easily be synchronized while in operation.

DETERMINATIONS:

I - - A firm determination has been made by the most eminent Geologists and Engineers, that a large body of milling ore consisting of 700,000 tons or more is available for immediate operations or an ore reserve for approximately 5 years continous operation at the rate of 500 tons per day as scheduled in this report, with strong indications, that by such operations additional ore will be developed to warrant the expansion to double the proposed scheduled production.

II -- A firm determination has been made, that the recoverable dollar value from the present visible supply of ore by means of the process developed for that one purposed and previously covered in this report, will be well in excess of $7,000,000.00, which would justify a capital investment of many times the actual capital investment required to bring this project into full scheduled production.

III - A firm determination has been made, by actual commercial scale operation that the ore properly ground concentrates very readily, with an exceptionally high degree or percentage of recovery, with in excess of one years repeated research and experimenting behind it to insure accuracy.

IV -- A firm determination has been made by repeated actual operations that a ratio of concentration of approximately 70 to 1 of material handled to concentrates recovered or for every 500 tons of material handled 7½ tons of concentrates will be produced containing 80% or better of the Scheelite contained in the original 500 tons.

V - - A firm determination has been made by actual operation, that the rough concentrates so produced can be processed and conditioned into practically any grade of marketable product desired without danger of loss (except for a minute amount too low for serious consideration) to command the highest market price.

VI -- A firm determination has been made that an operation on the above scheduled scale, properly engineered, brings out maximum efficiency in recovery and economy of operations, reflected in low costs per ton of material handled.

VII - A firm determination has been made and provisions made to provide ample safety factors in the lease agreement and operation plans to cushion any and all conditions and contingencies that can be predetermined for the protection of invested capital and the enterprise by protecting both the Lessee and the Lessor.

VIII A firm determination has been made by the complete processing of all conditions in connection with the financing and operation of the project to provide a sound channel for the employment and retirement of invested capital. This will become quite clear to the reader of this report with proper investigation.

MARKET: The demand for Scheelite concentrates and the number of new and expanded peace time uses for tungsten has never been greater in the history of the United States than at the present time, with strong indications that such a demand will continue for a long period, with prospects for a much greater demand.

Recent contracts awarded airplane manufacturers for the production of jet propelled planes and missiles requires large quantities of tungsten alloyed steel to withstand the heat. This field of industry alone will develop an expanding demand for more and more tungsten.

A new book recently published by McGraw-Hill Book Company Inc., by Mr. John B. DeMille, Geologist and Senior Engineer, Reconstruction Finance Corporation, titled, "Strategic Minerals", Mr. DeMille ably covers world production by countries, imports to the United States, expanded peace time uses and demands, particularly tungsten. In this connection, Mr. DeMille's book can well be considered authoritative as the acquisition and importing of critical and strategic minerals particularly during the war years was handled by the R.F.C. A paragraph under the caption of tungsten in the book is devoted to a statement of Mr. Harold L. Ickes as Secretary of the Interior, December, 1945. QUOTE: "The Prodegal Harvest of Minerals that we have reaped to win this war (20,750 tons of tungsten between January 1, 1940 and January 1, 1945) has bankrupted some of our most vital mineral resources. We no longer deserve to be listed with the British Empire and Russia as one of the "Have Nations". We should be listed with the "Have Nots", such as Germany and Japan....We have less than a 35 year peacetime commercial supply of tungsten and 20 other minerals"., end of quote.

Invested capital required to bring this project into full scheduled production and maintain such production to the shipment of and returns from the sale of concentrates $300,000.00.

<u>CONSTRUCTION:</u> Construction of machinery and equipement together with preparatory work on the property will begin within 24 hours after the required capital is made available.

Estimated period of construction approximately 6 months and it is anticipated that full scheduled production will be reached within 30 days after completion of plant construction. This project is sound from all points of analysis, the writer therefore, firmly recommends that capital be made available for immediate construction.

Respectfully submitted,

Robert F. Dore 11/11/48

Robert F. Dore
1709½ S. Bonnie Brea St., Los Angeles

PRINCESS PAT MINING COMPANY

PRELIMINARY ESTIMATE

Cost of machinery and equipment for a 500 ton per 24 hour day milling and mining operation.

1	- Electric Power installation by California Electric Power Company, running a power line from Adelanto, California .. Estimated deposit required - - - - -	$60,000.00
2	- 1-15x38 Pacific Jaw Crusher (primary) - - - - - -	6,500.00
3	- 1-15x38 feeder grissley - - - - - - - - - - - - - -	1,180.00
4	- 1-60 H.P. Electric motor - - - - - - - - - - - - - -	899.95
5	- 1-10x20 Pacific Jaw crusher (secondary) - - - - -	2,100.00
6	- 1-10x20 feeder screen - - - - - - - - - - - - - - -	365.00
7	- 1-25 H.P. Electric motor - - - - - - - - - - - - - -	460.95
8	- 2-D'ore mill 250 ton grinding units - @ 8,750.00) -	
9	- 2-Reeves Variabl speed transmission units - - - - - - - - - - - - - - - - - @ 934.00)	21,824.00
10	- 2-40 H.P. 1200 R.P.M. electric motors -@ 578.00)	
11	- 2-sets of 12 each "D Section" V belts @ 650.00)	
13	- 2-Sutarbelt cyclone air suction units @ 2500)	6,204.00
14	- 2-50 H.P. 1150 R.P.M. electric motors @ 602)	
15	- 1-Sutorbelt air conveyor (tailings disposal unit) 6,000.00)	
16	- 1-100 H.P. 1150 R.P.M. electric motor and drive 1,268.00)	9,368.00
17	- 700 feet 18" pipe -@$3.00 ft. 2,100.00	
18	- 6 New dry concentration units complet with blowers @ 1,500.00	9,000.00
19	- 1-D6 caterpiller diesel traxcavator with 1¾ yard lift scoop and attachable bulldozer blade - - - - -	1 4,712.60
20	- 2-International KB-14 5 cubic yard dump trucks cab and chassis - - - - - - - - - - - - - @ 8,222.12)	

Extra heavy duty off the highway tires (6) @ 175.00) $22,746.24

Auxiliary transmission - - - @ 676.00)

Dump body and hydraulic hoist @2,000.00)

Frame reinforcements - - - - -@ 300.00)

21 - 1-Ingersoll-Rand XRB-2 - 500 cubic foot stationary air compressor complete - - - - - - 6,634.00)

1-100 H.P. motor and drive - - - - - 1,268.00) 8,639.00

Freight from Painted Post, New York 737.00)

22 - 1-Rotary 36"x30' drier complete with hood and fan - 5,500.00

23 - 2-11'6" x 20' steel tanks - - - - - @800.00 1,600.00

24 - 1-Ingersoll-Rand, wagon drill - - - - - - - - - - 3,500.00

25 - 1200 ft. 3" air pipe coupling and gaskets @.73¢ per ft876.00

26 - Air hose and fittings - - - - - - - - - - - - - - - 500.00

27 - 1-Ford Truck with enclosed dump bed - - - - - - - 2,600.00

28 - 3-15 H.P. Electric motors - - - - - - - - - @341.25 1,023.75

29 - 1-5000 gallon water tank - - - - - - - - - - - - - 750.00

30 - 1-2000 gallon diesel fuel tank - - - - - - - - - - 350.00

31 - 18" x 30' conveyor - - - - - - - - - - - - - - - - 600.00

32 - 300 feet No. 2 electric cable @ 1.35 per ft. - - - 405.00

33 - 500 feet No. 6 electric cable @68.20 per m. - - - 34.10

34 - 1000 feet No. 12 electric cable @17.60 per M. - - 17.60

35 - Small tools - - - - - - - - - - - - - - - - - - - 1,000.00

36 - Black Smith equipment and drill bit sharpner - - 1,500.00

37 - 1-Syntron F-225 automatic feeder - - - - - - - - 425.00
Freight - 35.00

38 - 2-Syntron Fo2-2 automatic feeders - - @400.00 - - 800.00
Freight - 60.00

39 - 1-26' elevator complete with drive and motor 7" x12" buckets - Link Belt Co. - - - - - - - - - - - - - - 1,900.00

40 - 12-2 H.P. electric motors - - - - - @ 75.60 - - - 907.20

41 - 2-5 H.P. electric motors - - - - - @85.00 - - - - 170.00

42 - 1-gas welding equipment - - - - - - - - - - - - - 100.00

43 - 1-arc- electric welding machine complete - - - -	$ 375.00
	189,028.39
44 - Installation and housing equipment - - - - - - -	20,000.00
	$209,028.39

CONDITIONING PLANT:

Located near Victorville, California, where water and power are easily available.

Estimated purchase of mill site north of Victorville and erection of suitable building not to exceed	$ 5,000.00
6-Wet concentrating tables @ 600.00 - - - - - - - - -	3,600.00
1-Classifier including screens - - - - - - - - - - - -	1,000.00
1-36" x 36" D'Ore Mill - - - - - - - - - - - - - - - -	2,600.00
7-2 H.P. electric motors @ 75.60 - - - - - - - - - -	509.20
1-7½ H.P. electric motor - - - - - - - - - - - - - - -	176.00
1-Dengs 3 paleomagnetic separator with motor feeder and all accessories - - - - - - - - - - - - - - - - - -	1,200.00
1-Rubber lined sand pump - - - - - - - - - - - - - - -	350.00
1-Drier for drying concentrates - - - - - - - - - - - -	1,000.00
	15,435.20
Estimated trucking and installation costs - - - - - -	1,224.40
Total Conditioning Plant at Victorville - - - - - - -	$16,659.60
Main Production Plant on Property - - - - - - - - - -	209,028.33
Total Estimate both plants - - - - - - - - - - - - -	$225,687.93

The estimate and prices are all on new, modern machinery and equipment. All prices are quoted at list, with no competative quotations or consideration given to available dealer discounts by the purchase of equipment through affiliated deals. These items will par off a considerable slice from the total estimate and strengthen the financial position of the organization.

Respectfully submitted,

Robert F. Dore 11/11/48

Robert F. Dore
1709½ South Bonnie Brea Street
Los Angeles 6, California
RI - 7-5780

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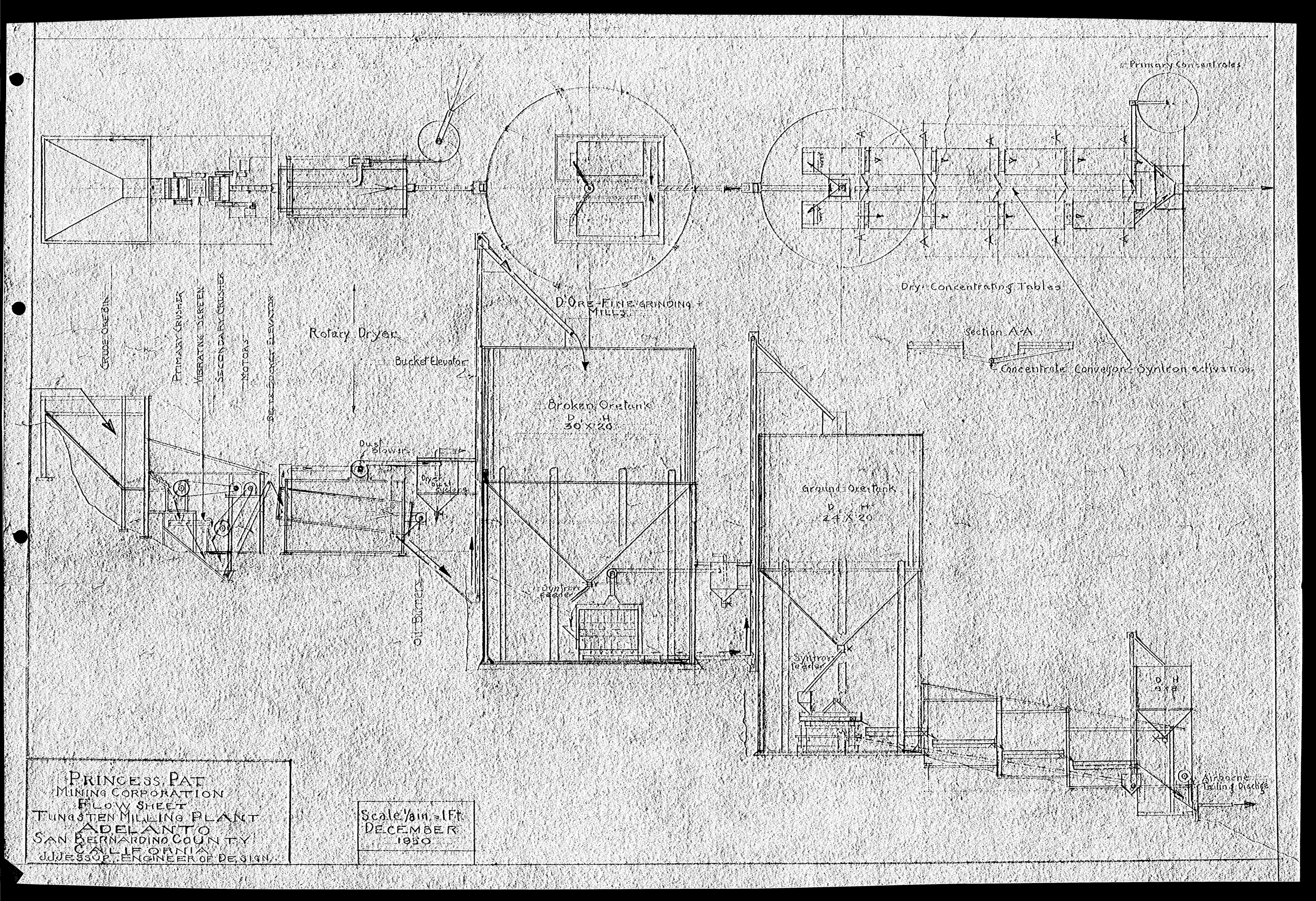
[illegible]

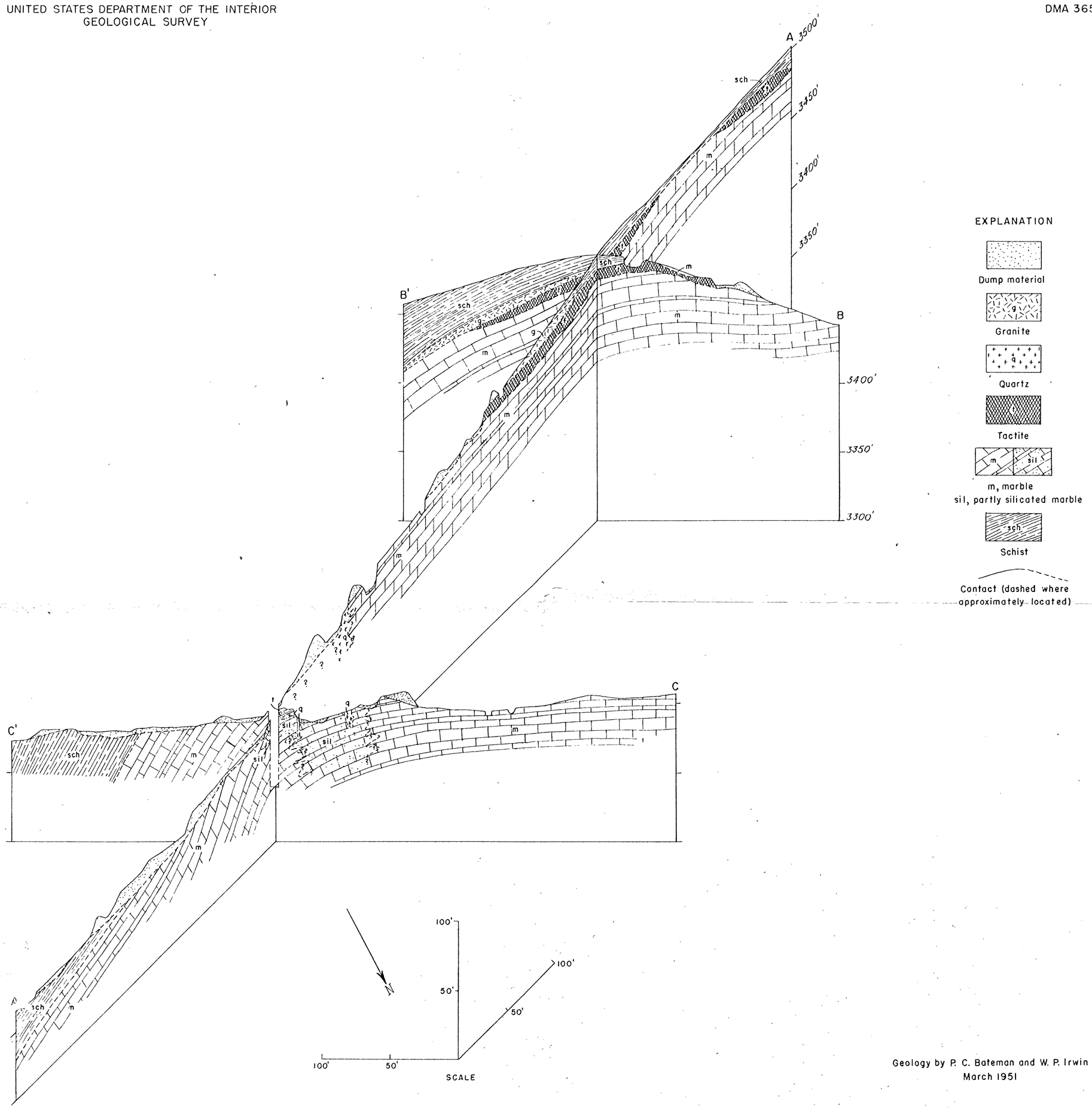


PRINCESS, PAT
MINING CORPORATION
FLOW SHEET
TUNGSTEN MILLING PLANT
ADELANTO
SAN BERNARDINO COUNTY
CALIFORNIA
J.J. JESSUP, ENGINEER OF DESIGN.

Scale 1/8 in. = 1 Ft.
DECEMBER
1950

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DMA 365



EXPLANATION

Dump material

Granite

Quartz

Tactite

m, marble
sil, partly silicated marble

Schist

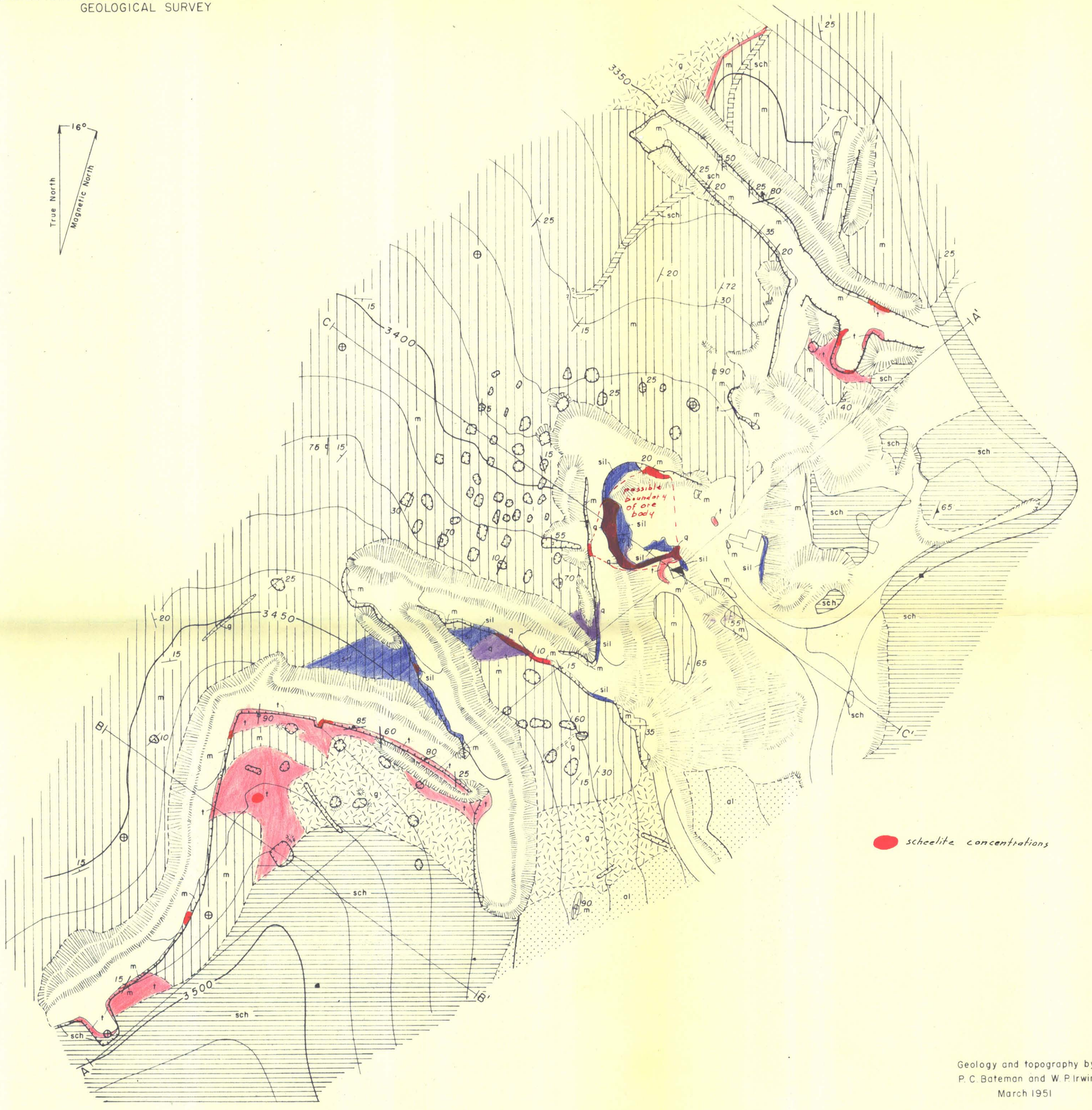
Contact (dashed where approximately located)

Geology by P. C. Bateman and W. P. Irwin
March 1951

FENCE DIAGRAM OF THE PRINCESS PAT MINE AREA

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DMA 365



EXPLANATION

al — Slope wash and soil cover

g — Granite

q — Quartz

t — Tactite

m, sil — m, marble; sil, partly silicated marble

sch — Schist

Contact (dashed where approximately located)

80 — Fault, showing dip

20 — Strike and dip of beds

Horizontal beds

65 — Strike and dip of foliation

Strike of vertical foliation

85 — Strike and dip of joints

60 — Strike and dip of joints filled with quartz and silicate minerals

90 — Strike of vertical joints filled with quartz and silicate minerals

Rim of open cut or prospect pit

Dump

Shaft at surface

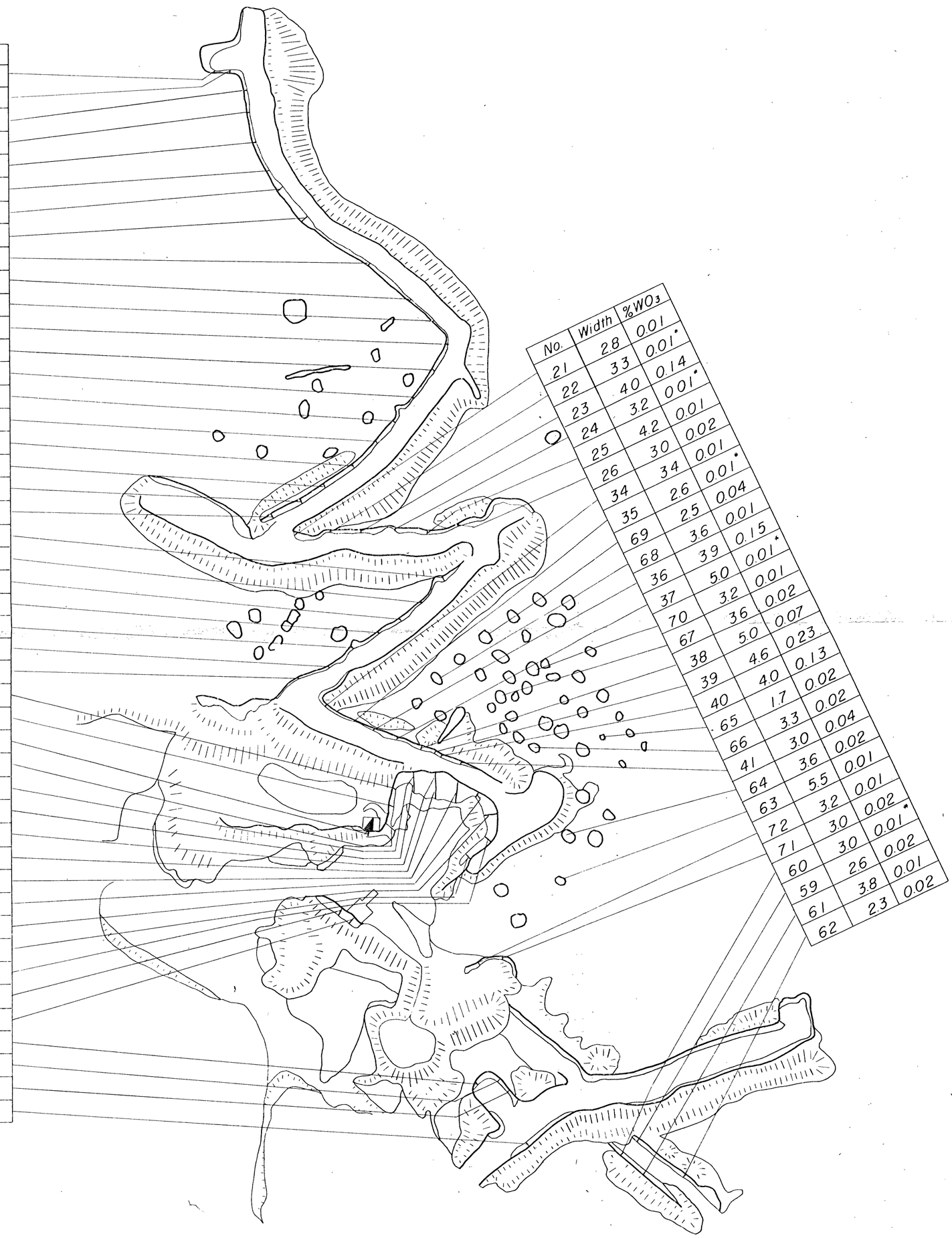
Geology and topography by
P. C. Bateman and W. P. Irwin
March 1951

GEOLOGIC MAP OF THE PRINCESS PAT MINE, SHADOW MOUNTAIN AREA, SAN BERNARDINO COUNTY, CALIFORNIA

0 50 100 150 200 Feet

Contour interval 10 feet
Datum is approximate mean sea level

No.	Width	% WO_3	% Mo
1	3.3	0.04	
2	3.8	0.02	
3	6.0	0.06	
4	3.9	0.02	
5	2.4	0.02	
6	3.5	0.02	
7	2.0	0.26	
8	2.5	0.03	
9	3.0	0.02	
10	2.5	0.02	
11	2.5	0.21	
12	3.2	0.04	
13	2.8	0.03	
14	5.0	0.03	
15	4.7	0.35	
16	4.9	0.07	
17	4.4	0.06	
18	3.8	0.02	
19	4.2	0.02	
20	3.7	0.03	
27	3.5	0.02	
28	3.7	0.01*	
29	4.0	0.06	
30	3.0	0.57	0.02
31	3.2	0.27	
32	5.3	0.01*	
33	4.8	0.01*	
45	5.5	0.39	0.04
44	7.0	0.23	
42	3.9	0.09	
43	7.5	0.28	
46	7.5	0.38	0.03
46A	7.5	0.06	
47	10.0	0.37	
47A	9.0	0.17	
48	10.0	0.46	0.04
49	4.0	0.10	
50	6.0	0.02	
52	4.0	0.38	0.04
51	3.5	0.02	
54	3.3	0.01	
53	3.5	1.04	0.06
58	3.2	0.18	
57	3.3	0.01*	
56	3.5	0.21	
55	3.0	0.18	



No.	Width	% WO_3
21	2.8	0.01
22	3.3	0.01*
23	4.0	0.14
24	3.2	0.01*
25	4.2	0.01
26	3.0	0.02
34	3.4	0.01
35	2.6	0.01*
69	2.5	0.04
68	3.6	0.01
36	3.9	0.15
37	5.0	0.01*
70	3.2	0.01
67	3.6	0.02
38	5.0	0.07
39	4.6	0.23
40	4.0	0.13
65	1.7	0.02
66	3.3	0.02
41	3.0	0.04
64	3.6	0.02
63	5.5	0.01
72	3.2	0.01
71	3.0	0.02
60	3.0	0.01*
59	2.6	0.02
61	3.8	0.01
62	2.3	0.02

Explanation

Sample

Slope of trench wall

Trench floor

Excavated material

* Less than

0 50 100 150

Scale of feet

Sampling and analyses by U. S. Bureau of Mines
March 1951

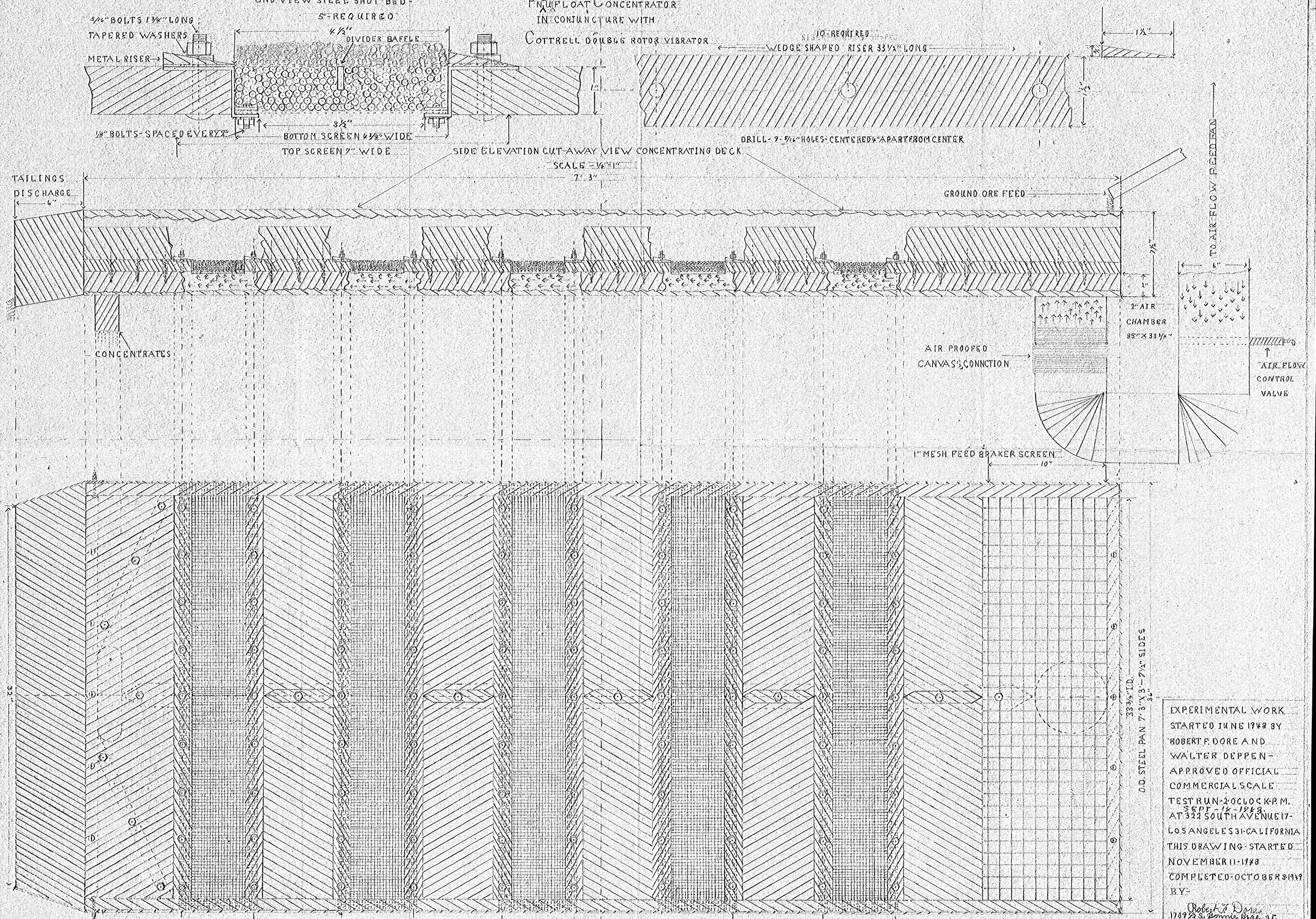
Figure - Plan showing assays, Princess Pat Mining Corporation

DRAWING "A"

D'ORE PNUFLOAT CONCENTRATOR

IN CONJUNCTURE WITH

COTTRELL DOUBLE ROTOR VIBRATOR



EXPERIMENTAL WORK
STARTED JUNE 1948 BY
ROBERT F. DORE AND
WALTER DEPPEN -
APPROVED OFFICIAL
COMMERCIAL SCALE
TEST RUN - 2 O'CLOCK P.M.
SEPT - 18 - 1948.
AT 322 SOUTH AVENUE 17 -
LOS ANGELES 31 - CALIFORNIA
THIS DRAWING - STARTED
NOVEMBER 11 - 1948
COMPLETED - OCTOBER 3 - 1949
BY -

Robert F. Dore
1709 1/2 S. Bonnie Brae St.
Los Angeles 6, California