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REPORT ON CONGRESS MINE

AND

TAILINGS DUMP

YAVAPAI COUNTY, ARIZONA

The Congress Mine and tailings dump were examined by W. A. Leddell and Gerald Sherman for the Congress Mine Corporation, of 100 Broadway, New York, beginning on June 14, and continuing through the months of July and August, 1935.

From measurements, sampling, and milling tests on the tailings, the following results are calculated:

CONGRESS TAILINGS

QUANTITY

White Tailings	120,000 Tons
Brown Tailings	280,000 Tons
	400,000 Tons

WHITE TAILINGS

Gold	0.0735 ozs. per ton	$2.53 @ 85%	$2.15
Silver	0.45 ozs. per ton	.34 @ 75%	0.25
			$2.40
Operating Cost per Ton			.836
			$1.564

OPERATING PROFIT 120,000 Tons @ $1.564 ..... $187,500

BROWN TAILINGS

Gold	0.525 ozs. per ton	$1.81 @ 70%	$1.26
Silver	0.33 ozs. per ton	.25 @ 65%	0.16
			$1.42
Operating Cost per Ton			.836
			$0.584

OPERATING PROFIT 280,000 Tons @ $0.584 163,500

$351,000

MILL AND PLANT CONSTRUCTION	$92,320	
WATER SUPPLY	15,000	
ENGINEERING	5,300	
CONTINGENCIES	7,380	
WORKING CAPITAL	20,000	140,000

$211,000

The Congress Mine was owned by the Murphy Estate and managed by T. J. Byrne, Attorney, of Prescott, Arizona, as Trustee.

The property is situated in the Martinez Mining district, Yavapai County, Arizona, about 3½ miles north of Congress Junction on the A.T. & S.F. Railway. It is reached by a good road on a slightly ascending grade from Congress Junction. The property consists of 15 patented and 9 unpatented claims.

Patented Claims

Fraction	Niagara Mill-Site
Why Not	Ohio
Mosouri	Rich Quartz
Niagara	Golden Eagle
Congress	Incline
Queen of the Hills	Old State
Excelcior	Snow Storm
Golden Thread	

Unpatented Claims

Bellick	Highland
Remnant	Keystone
Boundary	East Extension of Golden Thread
Sunnyside	Martinez
Ophir	

The Congress Mine was located in 1887, or shortly before. Active production covered the years 1889 to 1891 and 1894 to 1910, since when it has been practically or entirely idle. During these periods it produced in gold and silver sold, $7,649,497, which was taken from 692,332 tons of ore. The recovered value per ton was approximately $11.80, having a gross value of $13.00, which would now be worth in gold and silver contained, about $22.00 per ton

PRODUCTION FROM CONGRESS MINE by W. F. STAUNTON

Production	692,332 Tons
Gold	388,477 Ozs.
Silver	345,598 Ozs.

Value	Gold	$20.67	$8,029,900
	Silver	0.60	204,560
			$8,234,460
Value per ton	Gold	$11.60	
	Silver	.19	
		$11.79	
	Tailings	1.20	
	Gross Value per Ton	$12.99	
Value	Gold	$35.00	$13,597,000
	Silver	0.75	259,000
			$13,856,000
Value per ton Gold		$19.63	
		.37	
		$20.00	
Tailings (Sampled)		1.95	
		$21.95	

These figures were taken from an article by W. F. Staunton, published in the Engineering and Mining Journal of November 13, 1926. Mr. Staunton is a mining engineer, who was Superintendent and Manager of the operations during 1894 to 1910.

The tangible assets of the Congress property consist of the tailings milled during the productive period and now situated in a pile about 1000 ft. long, 300 ft. wide, and of varying thickness up to 37 ft. on the Excelcior and Golden Eagle, with a small extension at a higher level on the Incline Claim.

Attention had been drawn to this tailings dump by a report of The Merrill Company, dated December 31, 1915, in which its quantity and value in gold and silver is estimated with the plant required for its treatment and operating costs, and a statement of probable profits, to be obtained at $20.67 Gold.

This report was investigated, and it was found that the sampling was done by Frank H. Ricker, still of The Merrill Company organization, and Jack Moulton. The final summary and estimate was made by M. H. Kuryla, now Vice-President and General Manager of the United States Smelting and Refining Company of Pachuca, Mexico. The quantity of tailings was estimated at 505,000 tons and the gold at $1.46 per ton ($20.67) and silver at 21¢ per ton. A recovery of about 67% was expected, by regrinding and cyaniding. Under those conditions and at the prevailing price of gold, the project was not attractive, and The Merrill Company allowed it to drop. When the price of gold reached $35.00 per oz., the estimated gross value of the tailings rose to $2.78 per ton, with a much greater increase in the margin of profit.

The Merrill sampling was carefully done with 75 holes drilled and an equal number of cyanide tests, and the data on which the estimates were made were no doubt correct. The recovery by cyaniding was low, but no particular obstacle appeared which might prevent the successful treatment of the tailings. With a greater value, finer grinding and longer agitation would be permissible if it yielded a higher gold recovery.

Several attempts have since been made to treat the tailings, of which only one was successful. Otto Ellerman, now Manager of Perez & Company, Assayers and Metallurgical Engineers of Los Angeles, Calif., then associated with a Mr. Curran and acting for an investor, designed, built, and operated a cyanide plant which treated 10,000 tons of tailings and produced a little less than $12,000 in gold and silver (at $20.67 gold) on which a profit was made. For lack of capital required to pay for the plant already constructed, and provide a better

screen and pump, the operation had to be abandoned.

Another attempt was made to treat the tailings under the direction of J. T. Shimmin, who remodelled and enlarged the Sunshine mill at Kellogg, Idaho, in the winter of 1934 and 1935, and is now associated with the Buchans Mining Company, Buchans, New Foundland. The tailings were sluiced down by water to the plant, but it was discovered that appreciable quantities of the gold were water soluble which were lost in transit. These losses made the operation of the plant unprofitable, and again lack of capital prevented further action.

In 1933, the Congress Gold Inc. obtained a lease on the property to treat the tailings, and later to sort out and treat ore from the mine waste dump. Both operations failed, because of a shortage of equipment which prevented sufficiently fine grinding and time for agitation in solution, when treating the desired tonnage, and a lack of capital to correct it. This operation was followed by a lease and option to the Illinois Mining Corporation, which operated on similar lines, and relinquished their option in the latter part of 1934. In February 1935, an option was given to N. C. Clark, an attorney of Phoenix, Arizona, under which an examination was made by Wasserman & Company, of 40 Wall Street. Their results were not satisfactory to them and they returned the option. It was then given to Gerald Sherman for the Congress Mining Corporation.

It is estimated from survey and drilling records obtained in the examination of June, July, and August, that there are altogether more than 400,000 tons of the tailings. For details of the estimates, reference is made to a plan of drill hole locations and cross sections from surveys at 50 ft. intervals from end to end of the dump, and records of the drill holes, sampling, and calculations based on them.

The tailings first made, were roasted before cyaniding, but in later years, it was found that roasting was not economically necessary and the remainder of the ore was cyanided, raw. The dump, therefore, consists of roasted tailings of a light-brownish color, below, and unroasted tailings which were deposited on top of them, of clean white sand.

Drill sampling showed that there is a difference in the value of the two classes and of their metallurgical characteristics. The white sands carry 0.0735 ozs. of gold per ton, which yielded 85% by cyaniding and the roasted tailings* was noted in all drill holes and separate samples were taken from each class of material.

The roasted tailings do not contain as much gold as indicated by the Merrill Company sampling. The difference was probably caused by the migration of water soluble gold downward into the subsoil during the 20 years since the Merrill sampling was done.

In proportion to the investment, the profits were not particularly attractive and the option was released to Clark. A reduction in the purchase price and the possibility of obtaining a loan from the R.F.C. changed the situation and in January the property was purchased for $17,500.

The above estimate of tonnage and gold and silver content, on page 1, is based on the drilling of 49 holes, 3 vertical channels, and 2 shallow pits. The total feet drilled was 1320. In a number of cases the holes were repeats of those already drilled to check possible errors of sampling. The working data for the estimate is attached, as listed below:

Plan of the dump, showing its outline, and the location of drill holes.

Sections across the dump at intervals of 50 feet used in the calculation of tonnage and value.

List of drill holes and sample returns.

Reconcilement of holes redrilled for checking, or to obtain more material for milling tests.

Average assay value for white and roasted tailings by sections.

Comparison of average assays from drill holes and sectional averages, etc.

Calculation of tonnage and value.

Calculation of weight per cubic foot.

The tailings were moist within a foot or two of the surface and with one or two exceptions, stood without caving when drilled to the original surface.

After putting in a short collar pipe to reach the moist sands, the material in the hole was taken out by "drop" bits, consisting of short length of 2 or 2½ in. pipe with the inside bevelled to a sharp outside edge at the bottom. They were about 2 ft. long and suspended by a bail from a half-inch rope. By raising the bit 2 or 3 ft. and dropping it, by its own weight to the bottom, some of the tailings were wedged up into the tapered bottom of the bit for an inch or so. A sample of moist tailings was thus picked up, lifted out and shaken into a sample sack by striking the pipe. In deep holes, a tripod and light pulley were used.

A few holes were blocked by striking timbers on the way down.

The white sands and roasted tailings were sampled separately, making two samples for each hole. In some cases the white and brown sections were split into an upper and a lower portion, to discover if there is any enrichment near the bottom. In one or two instances this was found to be the case as in the two pits, #32, and #43, which were dug into the subsoil. On the whole, there was no consistent difference between the upper and lower portions either of the unroasted

or roasted tailings, but there are still possibilities of encountering pockets of richer material from which the soluble gold could not drain away.

There are probably 15,000 to 20,000 tons of tailings retreated by former operators and discharged on the flat below the old dump, which average about 0.074 ozs. per ton. They contain not only retreated tailings but tailings from quantities of ore sorted out from the mine dump by the Congress Gold operations and raised to an expected value of $4.00 to $6.00 per ton. This probably accounts for the high samples and may indicate the occurrence of a few thousand tons of tailings on which good profits can be made, but the sampling and measurements are not sufficiently complete to include these piles in the estimate.

Composite samples were made up of each class of ore independently to be sent for testing to John G. Graham, Professor of Mining and Metallurgy at the Texas College of Mines, at El Paso, Texas. Other duplicate lots were sent to the American Cyanamid Company of New York, and a few to the R. A. Perez Company, of 120 North Main Street, Los Angeles, where they were tested under the direction of Otto Ellerman, Manager.

The milling tests were made under the supervision of W. A. Leddell, Metallurgical and Mechanical Engineer, Mills Building, of El Paso, Texas.

The report of Mr. Leddell on the tests with a flow sheet of a mill and estimates for its construction, are attached with accompanying reports by Graham and the American Cyanamid Company.

Mr. Leddell's results are incorporated in the estimate of operating expense and profits, which appear on page 1.

The original water supply was from a well on Martinez Creek

about one mile east of the mine which is now equipped with a pump, and may be used for a mill and domestic supply up to its normal flow. While the Congress was in active production, there was not enough water in Martinez Creek to supply the stamp mill and a community of some hundreds of people. In order to make good the deficiency, wells were sunk on Date Creek about six miles to the north and water pumped over the divide between Date and Martinez Creeks, from which it flowed by gravity to the tanks at the Martinez Creek well and was pumped from there to storage tanks at the mine.

With 15 to 20 men and an economical use of water in milling, it may be possible to operate with the Martinez Creek water. In case this is insufficient, easements for wells and rights of way have been obtained from holders of agricultural and homestead claims on Date Creek, and application has been made for a water right from that creek for a quantity up to 30,000 gals. per day. A pipe line is planned, which would be about seven miles in length following a course indicated on the attached U. S. topographical map.

The Congress Mine:

Most of the information on the Congress Mine was obtained from an article in the Engineering and Mining Journal and letters, by W. F. Staunton, of which copies are attached.

Ore was mined from two veins, the Congress and the Niagara. They both outcrop in the foothills of the Date Creek Mountains, and dip under a minor projecting ridge. Both lie in an area of Granite, probably a part of a similar formation on the west slope of the Bradshaw Mountains.

It is contained in and runs through a greenstone trap dyke about 15 ft. in width, which strikes northwest and southeast and dips at about 25 degrees into the hill to the north. The ore is more often

found on the foot wall but may appear in any part of the dyke. The ore shoot follows in a general way, the intersection of the dyke with a fissure vein in the granite.

The Niagara vein cuts through the granite, strikes more nearly east and west and dips about forty degrees to the north, thus departing from the Congress vein in depth and toward the west. This vein does not accompany a dyke, but it is believed that an intersection with a flat greenstone dyke, striking more to the northwest which cuts it on a line, dipping in a northwesterly direction, has had some influence on the ore shoot found adjacent to it.

The coincidence of both ore shoots being apparently associated with the intersections of veins with dykes, and the occurrence of more or less ore in both formations near the intersections may lead to the discovery of other ore shoots.

Both veins were productive, the Niagara ore probably wider, but the Congress somewhat richer.

The two veins were developed and operated through several inclined shafts, which followed tham down. The Congress shafts are No. 1, 1100 ft.; No. 2, 1700 ft.; and No. 3, 4000 ft. deep. The Niagara shafts are No. 5, 2050 ft.; No. 4, 1000 ft.; and No. 6, 1800 ft. deep. There are some shallow older shafts on the Niagara vein east of No. 5 Shaft toward the eastern fault which cuts off the vein in that direction, and there are also shallow workings on the Queen of the Hills and Bellick claims. Records indicate that the Queen of the Hills produced about 20,000 tons of ore.

All shafts are caved and the underground workings connecting with them are practically inaccessible, except the Congress No. 3 Shaft, open to the water level at about the 1300 Level, and the Niagara No. 5 for 300 ft. By climbing over waste piles caused by broken lagging, some of the level drifts can be followed for severl hundred feet from the

Congress No. 2 Shaft. The Niagara No. 5 Shaft, blocked below 300 ft. is connected with some of the shallower workings toward the eastern fault.

The ore is found in two main shoots, one in the Congress and one in the Niagara vein. The Congress ore shoot appears to have been uniformly good and to have been mined out completely. There is, therefore, practically no ore in place that can be inspected without cleaning out the drifts, for access to the stope faces.

The Congress vein being flat, the ore was broken separately so far as possible and only enough rock to make room for stoping, and to fill the workings and thus support the roof. In this process, fragments of the vein quartz which is friable, were thrown back into the gob and lost. The hanging wall in some cases, carried mineralized stringers that could be mined. During the period of production, material containing less than $7.00 did not pay to mine. It is assumed, therefore, that some high grade (0.35 oz.) ore lost in the process of stoping and the reject of some lean ore which was brought by sorting up to a workable average, and some of the weakly mineralized hanging wall stringers, were left in the fill.

This idea is supported by the letter from W. F. Staunton on the subject, dated October 27, 1933.

In order to check this theory 21 samples were taken from the stope fill on various levels from the No. 2 Congress Shaft, as indicated on the underground map of the Congress vein. They were obtained by cutting the lagging, drawing out the fill and rejecting material that would be sorted out by hand, and using the remainder to represent the fine material that might be profitable, extracted for milling.

The average of all samples of fines was $5.65 per ton. 4 samples averaged $11.57 per ton. 4 additional samples were taken from points

near them which averaged $4.68 per ton.

In the 850 West, 1250 West, 1300 West drifts, the samples yielded $10.35, $10.38 per ton and $7.59, respectively, per ton, at current metal prices.

It is concluded that there are areas accessible from the Congress No. 2 Shaft with slight expense, that can be worked, by roughly sorting out the coarse waste and shovelling or scraping fine material to the level below, the coarse material being packed behind and retained by occasional timbers to support the roof, and the fines sent to the mill. The operation can be best handled by contract, paying for the tonnage and value of the fine material hoisted.

In order to prove out such areas, more extensive sampling would be required, followed by taking out and hoisting all the fill from certain promising sections of the stopes, having a width on the strike of 15 to 20 ft., from one level to the next. On the surface, it would be screened and weighed to obtain the value and quantity that could probably be recovered, per unit of area.

Because of the increase in the value of gold, the edges of the stopes where mining stopped may carry sections that would now pay to take out. The stope boundaries are indicated in the map of the Congress vein, by red and blue lines.

A section of the vein is accessible between the second and third levels west of the No. 2 Shaft. Sampling there over 170 ft. indicates the occurrence of a shorter section that would pay to mine now. This may be assumed to yield as follows:

40 ft. 23"	$10.14 per ton
50 ft. 22"	9.40 per ton
80 ft. 21 "	8.30 per ton

Some ore there is accessible and can be mined at any time if there

were a mill available for its treatment, although there is probably little of it at this spot.

It was reported that the ore shoot above the 1700 Level and mined through No. 2 Shaft, produced the best ore mined. The east and west stope boundaries of this block, have an aggregate length on the vein of at least 3000 ft. It is very likely that ore extensions will be found east or west from those lines some one or two of which may extend for considerable distances and produce important quantities of ore.

While cleaning out the old stopes and exposing the faces pointing out into new ground, enough information may be obtained on which to base more extended explorations.

It would cost little to repair the Congress shaft and lay track to the water level. As the mine made so little water that it was taken out by bailing, the water level could be lowered to the 1700 Level at small expense.

The Niagara vein was rather lower in grade than the Congress. It is Staunton's opinion that it is likely to produce marginal ore from the untouched vein, made profitable by the increase in gold price, than the Congress, but its development would cost considerably more and work on it would be postponed until more information can be collected on its possibilities.

No value is set on the mine, but conditions are believed to be favorable for development.

Within the past few weeks, applications have been made to us for leases on the Queen of the Hills and earlier, to open the Niagara No. 6 Shaft. This might provide a foothold for further work.

No other development work in the mine is desirable until the dump

operation has been well established. In the case that ore from the fills or from fresh faces can be produced, it would be necessary to provide a fine crushing plant to feed the grinding mill before the ore could be treated by cyaniding.

Plans:

During construction, pumping tests would be made on the Martinez well and the construction of the pipe line and wells at Date Creek would not be started until it has been proved to be necessary.

The details of mill design will be completed and construction begun as quickly as possible.

Tests of the Martinez well will be made and it will probably be necessary to lay a pipe line and put in a small semi-automatic gasolene-driven pump at Date Creek.

Since the white sands lie above the roasted tailings, it is proposed to treat them first in order to liquidate the cost of the plant as rapidly as possible.

When production is well established, attention will be directed to the mine.

Gerald Sherman.

March 17, 1936

CONGRESS MINE

OPERATING SCHEDULE

PLANT DESIGN AND ERECTION		6 Months
TAILINGS TREATMENT:		
75,000 Tons White Tailings 25,000 Tons Brown Tailings		12 Months
TREATMENT:		
25,000 Tons White Tailings 25,000 Tons Brown Tailings		6 Months
TREATMENT:		
20,000 Tons White Tailings 230,000 Tons Brown Tailings		30 Months
	4½ Years	54 Months

SUMMARY OF CONGRESS DRILL HOLES IN TAILINGS DUMP

JUNE - AUGUST 27, 1935

Hole No.	White		Red		Total	
	Feet	Assay	Feet	Assay	Feet	Assay
1	20.0	0.07	15.0	0.046	35.0	0.059
2	26.75	0.07	11.25	0.046	38.0	0.063
3	8.0	0.07	28.0	0.046	36.0	0.051
4	15.0	0.07	10.0	0.046	25.0	0.06
5	16.0	Lost	.	.	.	.
6	.	.	10.5	0.046	10.5	0.046
7	.	.	12.0	0.05	12.0	0.05
8	.	.	5.0	0.05	5.0	0.05
9	.	.	5.0	0.05	5.0	0.05
10	.	.	13.0	0.05	13.0	0.05
11	.	.	9.0	0.05	9.0	0.05
12	.	.	13.0	0.05	13.0	0.05
13	.	.	8.5 12.0 8.5	0.06) 0.02) 0.04)	29.0	0.038
14	12.0	0.07	Caved		12.0	0.07
15	10.0 8.0	0.08) 0.11)	6.0	0.06	24.0	0.085
16	.	.	20.0	0.06	20.0	0.06
17	5.5	0.10	19.5 7.0	0.07) 0.07)	32.0	0.076
18	.	.	9.0	0.06	9.0	0.06

SUMMARY OF CONGRESS DRILL HOLES

(continued)

Hole No.	White Feet	White Assay	Red Feet	Red Assay	Total Feet	Total Assay
19	.	.	33.7	0.06	33.7	0.06
20	31.5	0.05	.	.	31.5	0.05
21	.	.	24.5	0.04	24.5	0.04
22	9.4 14.6	0.07) 0.07) (a)	9.5	0.05	33.5	0.064
23	16.0	0.10	16.75	0.08	32.75	0.089
24	3.5	0.07	19.0	0.04	22.5	0.044
25	.	.	17.0 12.5	0.05) 0.04)	29.5	0.045
26	.	.	9.6	0.04	9.6	0.04
27	.	.	8.5	0.04	8.5	0.04
29	.	.	8.0 12.1 10.4 1.4	0.06) 0.06) 0.04) 0.065)	31.9	0.054
30	16.9	0.065	15.6	0.045	32.5	0.055
31	.	.	29.4	0.04	29.4	0.04
35	20.7 5.2	0.07) 0.12) (b)	8.2 3.5	) 0.045)	37.6	.
36	28.5	0.07	6.4	0.065	34.9	0.069
37	34.6	0.065	0.7	0.09	35.3	0.065
38	33.0	0.075	.	.	33.0	0.075
39	Lost	.	.	.	.	.
39a	3.6	0.09	21.6 1.1	0.055) 0.06)	26.3	0.06
46	.	.	14.5	0.075	14.5	0.075
51	31.7	0.08	.	.	31.7	0.08
52	.	.	25.0	0.04	25.0	0.04
61	.	.	29.2	0.06	29.2	0.06

Note (a) - Assay 0.23
(b) - Assayed 0.17 - use 0.12 for estimate

SUMMARY OF CONGRESS DRILL HOLES

(continued)

Hole No.	White		Red		Total	
	Feet	Assay	Feet	Assay	Feet	Assay
1a	0		28.2	0.05	28.2	0.05
3a	8.2	0.08	24.3	0.055	32.5	0.061
13a	3.5	0.065	23.5	0.05	27.0	0.052
16a	0		33.8	0.05	33.8	0.05
17a	8.2	0.06	20.2	0.05	28.4	0.052
62	16.0	0.09	21.2	0.04	37.2	0.062
63	12.0	0.055	24.0	0.07	36.0	0.065
64	19.0	0.09	14.5	0.08	33.5	0.086
65	0		27.1	0.055	27.1	0.055
66	0		28.7	0.07	28.7	0.07

Not used in estimates

PITS

Pit No.			Depth	Perez	Goeglein
32 (a)	Bottom sand	9.3' to 10.3'	1.0	0.095	0.12
	Subsoil	10.3' to 10.9'	0.6	0.08	0.12
	Subsoil	10.9' to 11.9'	1.0	0.04	0.08
43			9.8	0.07	0.08
			1.0	0.095	0.10
			1.0	0.10	0.11

Note (a) - Sampled for bottom sands and subsoil only

VERTICAL CHANNELS

Channel No.	White		Red		Total	
	Feet	Assay	Feet	Assay	Feet	Assay
1	9.0	0.16	13.0	0.06	22.0	0.10
2	.	.	14.0	0.03	14.0	0.03
3	.	.	15.0	0.05	15.0	0.05
4	.	.	20.0	0.06	20.0	0.06
		Average		0.051	71.0	0.064

CONGRESS ~~VEIN~~ Tailings

HOLES DRILLED

49 Holes	1227.0 ft.
3 Vertical Channels	71.0
2 Pits	21.7
6 Holes in re-treated tailings	32.0
	1351.7 ft.

Nine shallow holes were drilled with an auger to locate the bottom of the tailings without sampling.

#40
#44
#45
#46
#47
#48
#50
#58
#59

RECONCILEMENT OF REDRILLED HOLES

Hole No.	White Feet	White Assay	Red Feet	Red Assay	Total Feet	Total Assay
1	20.0	0.07	15.0	0.046	35.0	0.059
1a	.	.	28.2	0.05	28.2	0.05
Used in Estimate						
	10.0	0.07	25.0	0.048	35.0	0.055
3	8.0	0.07	28.0	0.046	36.0	0.051
3a	8.2	0.08	24.3	0.055	32.5	0.061
Used in Estimate						
	8.0	0.075	28.0	0.050	36.0	0.56
13	.	.	29.0	0.038	29.0	0.038
29	.	.	31.9	0.054	31.9	0.054
13a	3.5	0.065	23.5	0.05	27.0	0.052
Used in Estimate						
	3.5	0.065	28.4	0.047	31.9	0.047
16	.	.	20.0	0.06	20.0	0.06
16a	.	.	33.8	0.05	33.8	0.05
Used in Estimate						
	.	.	33.8	0.054	33.8	0.054
17	5.5	0.10	26.5	0.07	32.0	0.076
17a	8.2	0.06	20.2	0.05	28.4	0.052
Used in Estimate						
	6.8	0.076	25.2	0.061	32.0	0.064

RECONCILEMENT OF REDRILLED HOLES

(continued)

Hole No.	White Feet	White Assay	Red Feet	Red Assay	Total Feet	Total Assay
21	.	.	24.5	0.02*	24.5	0.02
52	.	.	25.0	0.04	25.0	0.04
Used in Estimate						
	.	.	25.0	0.04	25.0	0.04

* Assay of duplicate sample ran 0.04

14	12.0	0.07	.	.	12.0	0.07
62	16.0	0.09	21.2	0.04	37.2	0.061
Used in Estimate						
	16.0	0.081	21.2	0.04	37.2	0.063

CONGRESS TAILINGS DUMP

DRILL HOLES AND SAMPLING ON CROSS SECTIONS FOR ESTIMATES

Cross Section	Drill Hole	White Tailings		Brown Tailings	
0+50	24	3.5 ft.	0.07 ozs.	19.0 ft.	0.04 ozs.
1	30	16.9	0.065	15.6	0.045
	64 (½)	9.5	0.09	7.2	0.08
Average		26.4	0.074	22.8	0.056
1+50	23	16.0	0.10	16.75	0.08
	64 (½)	9.5	0.09	7.2	0.08
Average		25.5	0.096	23.95	0.08
2	4	15.0	0.07	10.0	0.046
	22	24.0	0.07	9.5	0.05
	13) 29) 13a) (½)	1.8	0.065	14.2	0.047
Average		40.8	0.07	33.7	0.047
2+50	13) 29) 13a) (½)	1.8	0.065	14.2	0.047
	35	25.9	0.08	8.2	0.045
	18 (½)	.	.	4.5	0.06
Average		27.7	0.078	27.4	0.047
3	21) 52)	.	.	25.0	0.04
	63 (½)	6.0	0.055	12.0	0.07
	18 (½)	.	.	4.5	0.06
	43 Pit				
Average		6.0	0.055	41.5	0.051

CONGRESS TAILINGS DUMP

Cross Section	Drill Hole	White Tailings		Brown Tailings	
3+50	31	.	.	29.4 ft.	0.04 ozs.
	16) 16a)	.	.	33.8	0.054
	63 (½)	6.0 ft.	0.055 ozs.	12.0	0.07
	43 Pit				
Average		6.0	0.055	75.2	0.051
4	7	.	.	12.0	0.05
	19	.	.	33.7	0.06
Average		.	.	45.7	0.0575
4+50	1) 1a)	10.0	0.070	25.0	0.048
	15 (½)	9.0	0.093	3.0	0.06
	26 (½)	.	.	4.8	0.04
Average		19.0	0.081	32.8	0.048
5	20	31.5	0.05	.	.
	26 (½)	.	.	4.8	0.04
	15 (½)	9.0	0.093	3.0	0.06
Average		40.5	0.060	7.8	0.048
5+50	14) 62)	16.0	0.081	21.2	0.040
	8 (½)	.	.	2.5	0.050
	9 (½)	.	.	2.5	0.050
Average		16.0	0.081	26.2	0.042
6	36	28.5	0.07	6.4	0.065
	9 (½)	.	.	2.5	0.05
	8 (½)	.	.	2.5	0.05
	27 (½)	.	.	4.2	0.04
Average		28.5	0.07	15.6	0.0534

CONGRESS TAILINGS DUMP

Cross Section	Drill Hole	White Tailings		Brown Tailings	
6+50	2	26.8 ft.	0.07 ozs.	11.2 ft.	0.046 ozs.
	17) 17a)	6.8	0.076	25.2	0.061
	27 (½)	.	.	4.2	0.04
Average		33.6	0.071	40.6	0.545
7	37	34.6	0.065	0.7	0.09
	10 (½)	.	.	6.5	0.05
Average		34.6	0.065	7.2	0.054
7+50	51	31.7	0.08	.	.
	3) 3a)	8.0	0.075	28.0	0.050
	10 (½)	.	.	6.5	0.050
Average		39.7	0.078	34.5	0.050
8	38	33.0	0.075	.	.
	61	.	.	29.2	0.06
Average		33.0	0.075	29.2	0.06
8+50	39) 39a)	3.6	0.09	22.7	0.0552
9	12	.	.	13.0	0.05
	65	.	.	27.1	0.055
	11 (½)	.	.	4.5	0.05
Average		.	.	44.6	0.053
9+50	1 (½)	.	.	4.5	0.05

CONGRESS TAILINGS

Estimate of Quantity and Value

White Tailings			120,000 Tons
Brown Tailings	Main Dump	255,000 Tons	
	Upper Dump	25,000 Tons	280,000 Tons
			400,000 Tons

Retreated Tailings

East Dump	10,000 Tons	0.07 ozs.	
West Dump	5,000 Tons	0.06 ozs.	15,000 Tons
			415,000 Tons

White Tailings

Average all drill holes	421 ft.	0.0735 ozs. Gold
Weighted Average by sections		.0739

Brown Tailings

Average all drill holes	806 ft.	0.0527 ozs.
Weighted Average by sections		.0527

Mill Test Heads

		Gold		Silver	
White Tailings #1	69.75 ft.	0.08 Graham 0.07 Diehl 0.059 Am.Cyan.	0.0697 ozs	0.47 0.50	0.485 ozs
#2	66.9 ft.	0.083 Graham .08 Perez .0692 Am.Cyan		0.5 0.5 0.51	0.50 ozs
Brown Tailings #1	74.75 ft.	0.045 Graham 0.04 Diehl 0.054 Am.Cyan.	0.0463 ozs	0.43 0.43	0.43 ozs
#2	189.7 ft.	0.050 Graham 0.045 Perez 0.053 Am.Cyan.	0.0493	0.40 0.40 0.44	0.41 ozs

RETREATED TAILINGS

By Burns and others

East Dump — Rough Estimate - 19,000 tons

	Depth	Goeglein	Diehl
Auger Sample		0.10 ozs gold	
Pits			
A	7.5'		0.14 ozs gold
B	7.5'		0.05 ozs gold
C	6.2'		0.06 ozs gold

West Dump — Rough Estimate - 7,000 tons

	Depth	Goeglein	Diehl
Auger Sample		0.08 ozs gold	
Pits			
D	8.0'		0.06 ozs gold
E	2.8'		0.07 ozs gold

WEIGHT OF TAILINGS

Weight of Brown Tailings in Place -

Cut hole in sand in place 18" x 18" x 15.59 equals 2.92 cu. ft.

Weight wet equals 326#

Weight dry equals 286#

40# Moisture

Wet sand contains 12.26% moisture.

286#/292 Equals 97.9# per cu. ft. in place.

20.5 cu. ft. per ton

Weight of White Tailings in Place -

White sand was tested separately and weighed approximately 97# per cu. ft. in place.

Metal containers were filled with white tailings and weighed against the same filled with water.

Brown tailings checked August 9th, made 102.06# per cubic foot.

CONGRESS MINE

Total Tailings March 11, 1936

Cross Section	Square Feet	Square Feet	Tons
0	1594	797	1992
0+50	4451	3022	7555
1	5895	5173	12932
1+50	8171	7033	17582
2	11509	9840	24600
2+50	9792	10650	26625
3	10906	10349	25872
3+50	10894	10900	27250
4	8271	9582	23955
4+50	8632	8452	21130
5	7398	8015	20037
5+50	5985	6692	16730
6	8050	7018	17545
6+50	7819	7934	19835
7	7940	7880	19700
7+50	9634	8787	21968
8	10858	10246	25615
8+50	7008	8933	22332
9	3714	5360	13400
9+50	2286	3000	7500
10	150807	1143	2857
		150806 Sq. Ft.	377012 Tons

Average Area of Cross Section x 50 ft. ÷ 20 = Area x 2.5 = Tons

CONGRESS TAILINGS

Calculation of Tonnage

White Tailings

Cross Section	Sq. Ft.	Tons
0		
0+50	2179	5188
1	3158	7518
1+50	4266	10157
2	5267	12541
2+50	4049	9641
3	1709	4212
3+50	746	1776
4	421	1002
4+50	2112	5029
5	4266	10157
5+50	3935	9369
6	3136	7467
6+50	3075	7322
7	3483	8283
7+50	4199	9998
8	4520	10762
		120,422 Tons

Average areas x 50 ft. ÷ 21 = Area x 2.381 = Tons

CONGRESS TAILINGS

White Tailings Average Gold Content

Cross Section	Gold	Area in Sq. In.	Product
0	0.07 ozs.	2.550	17850
0+50	0.07	4.411	30877
1	0.074	5.694	42136
1+50	0.096	7.956	76378
2	0.07	8.897	62279
2+50	0.078	4.056	31637
3	0.055	1.604	8822
3+50	0.055	.781	4296
4	0.06	.566	3396
4+50	0.081	6.191	50147
5	0.06	7.459	44754
5+50	0.081	5.133	41577
6	0.07	4.903	34321
6+50	0.071	4.936	35046
7	0.065	6.209	40358
7+50	0.078	7.229	56386
8	0.075	7.234	54255
		85.811 Sq. In.	634,515

Average Gold 0.0739 ozs. per ton

CONGRESS MINE

BROWN TAILINGS

Cross Section	Total Tons	White	Brown
0	1992		1992
0+50	7555	5188	2367
1	12932	7518	5414
1+50	17582	10157	7425
2	24600	12541	12059
2+50	26625	9641	16984
3	25872	4212	21660
3+50	27250	1776	25474
4	23955	1002	22953
4+50	21130	5029	16101
5	20037	10157	9880
5+50	16730	9369	7361
6	17745	7467	10278
6+50	19835	7322	12513
7	19700	8283	11417
7+50	21968	9998	11970
8	25615	10762	14853
8+50	22332	0	22332
9	13400	0	13400
9+50	7500	0	7500
10	2857	0	2857
	377, 012 Tons	120,422 Tons	256,590 Tons
		Upper Dump	23,000
		Roasted Tailings	279,590

CONGRESS TAILINGS

Brown Tailings — Average Gold Content

Cross Section	Gold	Square Feet
0		0
0+50	0.0400 ozs.	1694
1	0.0560	2336
1+50	0.0800	3199
2	0.0470	5948
2+50	0.0470	7256
3	0.0510	9904
3+50	0.0510	10406
4	0.0575	7917
4+50	0.0480	4763
5	0.0480	2736
5+50	0.0420	2777
6	0.0534	4986
6+50	0.0550	4734
7	0.0540	4059
7+50	0.0500	5116
8	0.0600	6337
8+50	0.0552	7008
9	0.0530	3714
9+50	0.0500	2286
10		97176
	Average	0.0527 ozs.

CONGRESS MINE

UPPER DUMP ON INCLINE CLAIM

BROWN TAILINGS

Hole	Depth	Gold
# 6	10.5 ft.	0.046 ozs. *
#25	29.5	0.045
#66	28.7	0.07
	Average	0.055 ozs.

The upper dump was estimated in 1918 to contain 34,000 tons of roasted tailings. In this estimate the whole dump contained 9,275,000 cu. ft. although 6 out of the 11 holes did not reach bottom. The upper dump was estimated at 850,000 cu. ft.

For this report, the dump is assumed at 460,000 cu. ft. but at 20 cu. ft. per ton instead of 25.

* Struck timber and was abandoned.

CONGRESS VEIN

@ $35/oz.

Gob Samples #2 Shaft

Location and Level			No.*	1st Series	2nd Series	Average
850 West	141	From Station	1	$16.29		
	153	" "	2		$4.48	$10.38
1100 West	312	From Station	3	$ 5.52		
	334	" "	4		$2.76	$ 4.14
1225 West	213	From Station	5	$13.11		
	66	" "	6		$7.60	$10.35
1300 West	20	From Station	7	$11.38		
	50	" "	8		$3.80	$ 7.59
		Averages		$11.57	$4.68	

Total Average - $8.11 0.232 y

Above samples were taken from the best of the stoped area.

When the first samples proved to be valuable, the second series was taken from points somewhere near the first samples on the same levels.

Samples were taken by cutting the lagging, throwing back the coarse rock and sampling the finer fill left behind. It is difficult to get a correct proportion of coarse and fine material.

It is evident that material now having a value was left, or sorted out and thrown into the fill. There must be good and poor areas.

The fill can be tested by drawing out a narrow stope from level to level, hoisting both coarse and fine, screening out the coarse on the surface and sampling the finer portion. This will give the value and proportion of the fine material and indicate the cost of extraction.

*Sample Number

OTHER SAMPLES #2 SHAFT

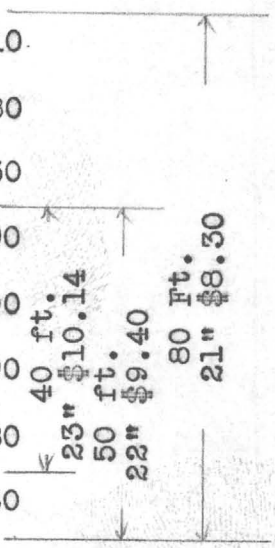
Sample No.	Level & Location	Value
1	300 West	$5.17
2	300 West	$3.45
3	550 East	$2.10
4	650 East	$9.10
5	700 West	$6.55
6	700 West	$7.00
7	700 East	$4.20
8	750 West	$0.69
9	750 East	$3.50
10	750 West	$5.60
11	800 West	$1.40
12	1050 West	$4.14
13	1050 West	$1.40
	Average	$4.17 per ton
	8 Samples - Average	$8.11 per ton
	Total 21 Samples - Average	$5.65 per ton

CONGRESS VEIN

Shaft #2 — 200 to 300 Level West

Ore Face in Stope

Sample No.	Width Sampled	Gold	Value
25	14"	.44	$15.40
26	6"	.02	.70
27	16"	.10	3.50
28	32"	.02	.70
29	60"	.10	3.50
30	60"	.04	1.40
31	27"	.26	9.10
32	5"	.08	2.80
33	24"	.10	3.50
34	29"	.34	11.90
35	24"	.20	7.00
36	18"	.34	11.90
37	22"	.28	9.80
38	18"	.16	5.60
39	27"	.08	2.80
40	31"	.06	2.10
41	16"	.06	2.10



170 ft. sampled at 10 foot intervals

CONGRESS MINE

PATENTED CLAIMS

Claim	Mineral Survey Number	
Queen of the Hills	879	
Congress	878	
Fraction	883	
Niagara	880	
Mosouri	881	
Why Not	882	
Incline	1193	
Golden Thread	1352	
Golden Eagle	1191	
Excelcior	921	
Rich Quartz	1192	
Ohio	1190	
Old State	1189	To cover well
Snow Storm	1188	
Niagara Mill-Site	880	Covers well on Martinez Creek

CONGRESS MINE

UNPATENTED CLAIMS

CLAIM	DATE OF LOCATION	RECORD BOOK OF LOCATION NOTICE	PAGES
Bellick	September 6, 1887	24	291
Remnant	March 12, 1888	25	314
Boundary	February 1, 1893	35	161
Sunnyside	February 20, 1897	45	499
Highland	February 20, 1897	45	496
Keystone	January 4, 1899	50	364
East Extension of Golden Thread	March 8, 1899	51	156
Martinez	February 4, 1903	66	591
Ophir	November 30, 1912	86	341

PRODUCTION FROM CONGRESS MINE by W. F. STAUNTON

Production		692,332 Tons	
Gold		388,477 Ozs.	
Silver		345,598 Ozs.	
Value	Gold	$20.67	$8,029,900
	Silver	0.60	204,560
			$8,234,460
Value per ton	Gold	$11.60	
	Silver	.19	
		$11.79	
	Tailings	1.20	
	Gross Value per Ton	$12.99	
Value	Gold	$35.00	$13,597,000
	Silver	0.75	259,000
			$13,856,000
Value per ton	Gold	$19.63	
		.37	
		$20.00	
Tailings (Sampled)		1.95	
		$21.95	

@ 80.00 au 31,078,160
200 ag 691,196
1973 $31,769256

WAGE SCALE

CLASS OF LABOR UNDERGROUND:	Per Hour	7 Hour Day
Shift Boss	$ .70	$ 4.90
Timberman	.57	3.99
Timberman Helper	.50	3.50
Miner	.57	3.99
Slusherman	.57	3.99
Trammer - mule tram	.50	3.50
Trammer - hand	.50	3.50
Mucker	.50	3.50
Laborer	.50	3.50
Hoistman	.57	3.99
Tool Nipper	.50	3.50
Repairman	.57	3.99
Repairman Helper	.50	3.50
Miscellaneous	.50	3.50

MILLING:		8 Hour Day
Mill Operator	$ .63	$ 5.04
Mill Helper	.50	4.00
Mill Labor	.43	3.44

SHOPS - SURFACE:		7 Hour Day
Shop Boss	$ .70	$ 4.90
Blacksmith	.64	4.48
Welder	.64	4.48
Electrician	.64	4.48
Carpenter	.64 and .75	4.48 and 5.25
Shop Helper	.57	3.99
Shop Labor	.50	3.50
Miscellaneous	.43	3.01

REPORT UPON CONGRESS TAILINGS
MERRILL METALLURGICAL COMPANY,
December 31, 1915

Sampling

This deposit was first sampled in a preliminary way by a representative of the Merrill Metallurgical Company, early in August, 1915. As a result of this first sampling, the deposit was estimated to contain 400,000 tons, assaying $1.42 gold, and $0.18 silver, or a total of $1.60.

A second sampling was made three months later and the deposit was very carefully drilled with approximately 75 holes, the cores being divided into approximately 150 assay samples. At the same time, the dumps were very carefully surveyed and contoured.

As a result of this work, a very accurate estimate of tonnage and value is possible and this final estimate is as follows:

Present Price

Total tons tailings available.....	505,000	
Average assay value.....	$1.46 gold	$ 2.47
Average assay value.....	$ .21 silver	$ .31
Total assay value.....	$1.67	$ 2.78
Total value tailings.....	$843,360	$1,310,000

Testing

Approximately eighty-five separate cyanide tests were made, most of them upon an average sample of the total tailings; a number of tests were also made upon individual portions of the tailings - roasted, unroasted and slime. Tests were run with and without regrinding, and with varying cyanide strengths and treatment periods. The results of these tests may be summarized as follows:

Sand must be ground to pass at least 100 mesh.
Time of treatment required: 24 to 36 hours.
Average recovery value per ton $1.10
Average cyanide consumption per ton 0.6#
Average zinc consumption per ton 0.2#
Average lime consumption per ton 10.0#

Operating Cost

After a careful study of local conditions at the mine, particularly as regards labor and power supplies, the following estimate of costs and profits is obtained.

Transportation, dump to mill bins.....		$0.10
Power, exclusive of drag lines and water supply....		.10
Labor, exclusive of drag lines:		
3 @ $4	- $12.00	
3 @ 2.50	- 7.50	
1 @ 4.50	- 4.50	
1 @ 3.00	- 3.00	
2 @ 2.50	- 5.00	
1 @ 8.00	- 8.00 - $40.00.....	.10

Supplies, Kcy .6# @ 30¢	$0.18	
Zinc 1/5# PTO 80# @ 25¢	.05	
Lime 10# PTO @ 1/2¢	.05	
Miscellaneous	.05	
Water Supply	.03	
Stacking tailings	.05	
Miscellaneous	.04	$0.75

Estimated recovery on general average sample:

Total gold and silver	1.10	
Total operating	.75	
Gross Profit	.35	
Royalty 10%	.035	
Net Profit	.315	
Cost of plant, $75,000.00	.148 PTO	
	.167	
Interest on $75,000, 3½ years @ 6%	.03 PTO	
Actual net profit	$0.137	$69,185.00

Construction Cost

The following estimate covers the actual construction cost of a 400-ton regrinding, agitation, filtration, cyanide plant to retreat to Congress tailings:

Drag Line, boiler and hoist	$1,300.00
Drag Line, cable 2500 ft. @ $0.82	205.00
Drag Line bucket	75.00
Loading pocket (old timber)	250.00
Belt conveyor and trestle (old and new), or bucket elevator	600.00
Conveyor over bins	250.00
400 ton bin (new timber)	1,500.00
Slime pulping equipment	500.00
Sluicing feeders and launders	200.00
Classifiers - 2	1,000.00
Tube Mills, 2 (erected)	6,000.00
Lime shafting and pulleys	500.00
1 - 240 HP Diesel Eng (erected comp) 4 cyl, 14x21, 88,500#	18,000.00
1 - 35 HP generator	350.00
1 - 10 HP, 3-5 HP, 1-3 HP motors	750.00
Electric wiring and installations	750.00
Sand pumps, 2 - 3"	500.00
Dorr thickness 26'x7' (old tanks) 3 @ 1,400	4,200.00
Dorr agitators, 30'x12' - 4 @ 2,300	9,200.00
Filters, 3 - 12"x16', $12,000 f.o.b.(erected)	13,500.00
Vacuum pump 870 f.o.b. NY (erected)	1,250.00
Air compressor 300 cu. ft. @ 20#, $500 fob La	750.00
Solution sumps, 5 (old tanks) moving and erect	750.00
Pumps: 1-3" triplex 4" GPM) 2-3" centrifugal, Sol. fob 70.)	250.00
Clarifying equipment (vacuum leaves)	500.00

Precipitation equipment, 1 40 frame 36" comp.....	4,500.00
Tailings conveyor and trestle.....	500.00
Tailings drag line.....	1,580.00
Buildings.....	3,500.00
Piping, air, solution, water, oil.....	1,290.00
Miscellaneous.....	1,000.00
TOTAL.....	$75,500.00

Comments

The question of power plant has been very closely studied, the total requirements approximating 240 HP exclusive of drag line equipment.

There are two feasible ways of obtaining this power - to equip the existing No. 2 steam plant with generators, electric transmission and motors in the cyanide plant, or to install a new Diesel gas engine unit in the cyanide plant, with approximately 85% of the power belted directly from the main line shaft.

The first of these alternatives allows a savings in initial installation cost of approximately $11,000.00, but in spite of this the use of a Diesel type power plant shows an economy which may reasonably be expected to yield a net saving from $10,000 to $15,000. in three the one-half years operations. Furthermore, the #2 power plant might be requisitioned by the Congress Company should work be resumed in the mine.

A filter plant is essential in handling these tailings, first because a very close saving of the soluble values must be had, and second because it appears highly desirable to stack the re-treated tailings on company land.

In the Estimate of Plant Cost, account has been taken of such tanks and material as will be available for use in building the new plant, and it is to be remembered that all new machinery and equipment is figured at from 5 to 20% discount allowed the Merrill Metallurgical Company as dealers. In other words, the cost of this plant, if built under usual purchasing conditions, would undoubtedly be from 10% to 15% above these figures.

Obviously the two barriers to the profitable treatment of these tailings are the poor extraction obtained, even with very fine grinding, and the high cost of chemicals consumed. Under normal prices for cyanide and zinc, the gross profits would be increased by $40,000.00. Also, there are indications, at this time that fuel oil may continue to advance in price, at least during the continuance of the war.

MERRILL METALLURGICAL COMPANY

C O P Y

Charles W. Merrill
Louis D. Mills
Frank H. Ricker
Herbert S. Shuey

Please Address all business communications to the Company

THE MERRILL COMPANY

ENGINEERS
343 SANSOME STREET
SAN FRANCISCO, CALIFORNIA

Subsidiary Companies
The Alloys Company
Merco Centrifugal Separator Co., Ltd

Cable Address "LURCO"
Codes { Bentley's, Bedford McNeill, Moreing and Neal, Western Union

October 27th, 1933

Mr. W. A. Leddell,
Mills Building,
El Paso, TEXAS.

CONFIRMATION COPY BY REGULAR MAIL

AIR MAIL

Read Leo Moulton

Dear Leddell:

Now V.P. U.S.S.R.&M.Co.

Upon my return from a trip into Nevada, I found your letter had been here for some time.

In regard to your question about the Congress dump, will say that Jack Moulton and Frank Ricker of The Merrill Company, did the work in connection with the sampling of the dump. M.H.Kuryla also of The Merrill Company, compiled the data and made out the reports. Mr.Mills says that considerable money was spent on this work, and considering the qualifications of the above mentioned Engineers, I should believe the results very reliable. The price of silver at that time - 1915, was rated at 50 cents. However, you apparently have one of these reports available, in which gold plays the leading role.

You ask about cyanide regeneration for a 100 ton plant, using 10# cyanide per ton. There would be no chance for the successful application of this Process where a low tonnage is involved, unless some extraordinary condition were present.

In looking over our files, I find that about a year ago we quoted you on the Merrill-Crowe and again on the Crowe Precipitation Process. The Kildun Mining Co. whose mine is located in Mexico, was at that time considering a cyanide plant. Also, you had mentioned the possibilities of a plant going in as the Hassayampa Gold Mine, Phoenix, Arizona, with Arthur N. Flagg, Manager. And again you mentioned that El Oro Mining Co. of Hillsboro, New Mexico was putting in a 300 ton plant. Is anything likely to result from these possibilities of a year ago?

We have now in operation, in several cyanide plants, our new Simultaneous Clarification-Precipitation Type units. These were originally intended for small plants, up to 200 tons of solution, using the bags for the precipitation. We have two 1000 ton plants of the same type in operation. These units are considerably cheaper than the old type, where the clarification equipment was purchased as a separate unit.

I am sorry that my reply regarding the Congress dump was delayed.

Yours very truly,

L.W. Lennox

LWL:FOB L.W.LENNOX

MERCO

14-M 9-33 5M

HARRY T. CURRAN, E. M.

OTTO ELLERMAN, E. M.

R. A. PEREZ CO.

ASSAYERS, METALLURGISTS,
INDUSTRIAL CHEMISTS.
EST. 1895

120 NORTH MAIN STREET

PHONE VANDIKE 6897

LOS ANGELES, CALIF.

MINE EXAMINATION-MANAGEMENT
INDUSTRIAL AND MINE SAFETY
MINING GEOLOGY;
PLANT CONSTRUCTION AND
SUPERVISION

Sept. 9,1933

Mr. J. T. Sherman,
Care American Cyamid Company,
535 Fifth Ave., New York City.

Dear Sir:

At the suggestion of Mr. K. Krebs I am writing you with reference to the Congress property in Arizona.
Mr. Curran(now deceased) and myself were the engineers who sampled, tested the tailings pond and mine dumps. We made extensive tests on the tailings both in the laboratory and in a test plant on the property. After we were satisfied that a profitable recovery could be made we designed the counter current cyanide mill on the property. One change was made in our original plans and that was the elimination of classification. We operated the plant for several months and treated approximately 10,000 tons which gave a bullion recovery of nearly $12,000.00. We recommended after the first ten days operation that classification to put in in order to make the operation more satisfactory and remove the larger pieces of rock and old wire, that would constantly give trouble in diaphram pumps. The people whom we did the work for had borrowed the money for the milling plant. We did not know this and when it became a matter of the investment of an additional $5000.00 they could not get more money so lost the property. Others have since tried to work the pond profitably but in every instance it was a case of not knowing how this could be done. I believe we are the only parties that have milled the tailing and actually showed a profit. The tailings will average $1.45 in gold with less than an ounce of silver. There are about 500,000 to 600,000 tons. There is a small amount of copper in some of the material. Our mill records, which I have show a cyanide consumption of 0.7 lb. per ton of ore. The tails require from 10 to 20 pounds lime per ton, depending on which tailings are being milled.
Water is secured from a well about 3/4 miles away and connected to property by pipe line. Most of the water for milling was taken from the mine and while it contains considerable soluble salts thatpreduced the value of the precipitates, yet it is satisfactory and there is sufficient for several years operation.

I have tried to give you just a few points regarding the property. In my opinion the property will show a nice profit, if handled right. Our total costs on a 250 ton daily capacity were 75 cts. a ton. If the property can be had right there is money to be made from the operation.

If there is anything further you might want I will be glad to let you have it.

Yours very truly, Otto Ellerman

SAN JUAN METALS CORPORATION
BOX NO. 1701
TELLURIDE, COLORADO

May 27th, 1935.

Mr. Gerald Sherman
120 East 85th Street
New York, N. Y.

Dear Mr. Sherman:

I have your letter of May 20th regarding the Congress Dump. My entire file on this is in Los Angeles.

From recollection, the tailings dump from my own work I am confident will stand up to Merrills' sampling and values. From my own work recyaniding these tailings better than a 65% recovery can be expected without regrinding, provided a scrubbing agitator is used ahead of common agitating tanks. Scrubbing action is for the purpose of breaking up small slime lumps that are very difficult to wet in a cyanide solution in this particular class of material.

I do not think any degree of success can be obtained by direct flotation on the old mill tailings. Very satisfactory recovery can be obtained by flotation on the old mine dumps without following flotation with cyanidation. I do think it would be advisable to cyanide the flotation concentrates merely as a matter of economy. As I recall it the ratio of concentration by flotation is very low due to the high iron content.

If there is any further information you desire in this connection please feel free to call on me.

Kindest personal regards.

Sincerely,

J. T. Shimmin

JTS/G

W. F. STAUNTON
MINING ENGINEER
124 WEST FOURTH STREET
LOS ANGELES. CAL.

Los Angeles, Calif., Oct. 27, 1933

Mr. Gerald Sherman,
120 East 85th Street,
New York, N. Y.

Dear Mr. Sherman:

I have not been able to answer your letter of the 14th as soon as I should have done. It was welcome, however, and I am quite willing to give you any information I may have relating to the Congress mine about which you wrote. Also, your letter brings to mind meetings with you many years ago, when you were at Bisbee, which I remember with pleasure.

I have no doubt that somewhat better metallurgical results could be obtained today, and considerable reduction in costs also, as compared with our rather crude methods of 30 years ago. For one thing, our practice involved bedding and drying the tailings from the concentrating mill and then reclaiming them for cyanidation, all the cost of which would be eliminated today. I think our recovery was a little better than your figures seem to show. The concentrate recovery was very low. I have yearly figures from 1894 to 1910 showing the amount of gold to account for in the concentrating mill, by tons milled and battery assays, as $7,118,644. and gold actually paid for as $4,062,239. This would indicate a saving of only 57.20%. The cyanide plant figures for the same time show $3,192,219. contained and $2,769,566. paid for, a recovery of 86.76%. Taken together the total recovery seems to have been 94.33%. It is partly confirmatory that nobody has yet succeeded in reworking our tailings, although many have tried.

You mention smelter recovery. I find a memorandum of a yearly contract I made in 1894 with the Kansas City Works (shipment probably to El Paso) showing the following rates: Silver, 95%, gold, $19.50. Freight and treatment, $15.00 per ton f.o.b. Prescott. Iron, 15¢ up or down from neutral basis. As the excess of iron was about 30% this gave a net rate of $10.50 frt. & Treatment f.o.b. Prescott. It cost us $12.80 a ton to haul the concentrates to Prescott, so that the total charge on concentrates was $23.30 per ton. As the average grade was 7 oz., this meant a charge of $3.33 per ounce of gold. Adding the $1.11 difference between $19.50 and $20.67 makes a total charge on the gold of $4.44 per ounce.

We did better after the railroad was built, but the last contract I have a memorandum of, made for three years in 1901, was: Silver, 95%; gold, $19.50; Freight & Treatment f.o.b. Congress Junction, $16.00 per ton, with 15¢ per unit for iron in excess of silica (say, $4.50) leaving a net charge of $11.50 freight and treatment.

I do not think there is very much to be looked for in increased mill recovery; possibly 50¢ a ton at most. But if the concentrates should prove susceptible to cyanide treatment so as to put the whole product into bullion, there would be a large saving, perhaps $1.00 a ton.

The really big difference today is, of course, the 50% increase in the price of gold. We used to consider $7.00 a ton as about the splitting point as between ore and waste, that is, roughly, 0.35 oz. Today, with $30. gold, this would be only 0.233 oz. It seems probable that, allowing for savings under modern conditions, anything above 0.2 oz would pay. The question is, how much ore above that grade can be reasonably counted on, and I don't see any way of arriving at an answer to that than actual examination and sampling. I believe there is a large tonnage in the Niagara mine, but this is a mere guess.

In the Congress mine itself, as distinguished from the Niagara, I think there are possibilities in the old stope fillings, on account of the way in which mining was done. The vein being narrow and flat, about 25 deg. dip, it was usually necessary to blast some of the hanging wall, which, however, frequently carried high grade stringers. This wall rock constituted the filling which kept close to the stoping faces. The mineral was very brittle and high grade and while attempts were made to keep split lagging between the working face and the filling, a great deal of fine mineral was undoubtedly blasted into the filling and lost. This condition may easily prove to have given sufficient value to the gob to make reworking profitable under modern conditions, as, for instance, the use of drag scrapers and local separation of fine and coarse and perhaps some hand sorting, the reject going directly back into the stopes, saving hoisting on all but the rough concentrates.

In regard to tonnage of such gob available, there should be at least as much as, and probably more than, the amount of ore produced, say 700,000 tons.

Certain parties have undertaken to work the surface waste dumps. I have never regarded them as valuable.

Owing the the increased price of gold, there are certainly some possibilities in reworking the old stope fills on the Congress vein, and in milling ore already opened on the Niagara vein, but I think there is a really good chance in the Niagara in new ground at greater depth.

Underlying the Niagara vein, which has an easterly-westerly strike, and dip of perhaps 40 deg., there is a greenstone dike with slightly different strike, and dip of around 25 deg. This dike is almost identical in character with the Congress dike which carried the ore in that mine. The Niagara vein intersected this dike at about 1975 feet depth in the extreme easterly part of the mine close to the big fault. The dike was heavily mineralized at the intersection and the ore in the dike was of the same character and grade as in the Congress as distinguished from that in the Niagara vein, which belongs to the class entirely in the granite. This high grade extended easterly to the big fault where it was cut off. To the west the work was at first confined to the dike but as the distance from the intersection increased the high grade gradually failed and crosscuts were run into the hanging to the Niagara, and thereafter the work was done on that vein. The line of intersection would run downward to the northwest.

The Niagara shaft is an incline on the vein and its course happens to coincide closely with the course of the intersection of the planes of the two veins. It seems highly probable that a new line of high grade stopes

can be opened by sinking the Niagara shaft a few hundred feet below its present depth of 2050 feet. The 1900 level is connected to the No. 4 shaft, 700 feet west, so that there is good ventilation. Sinking of this character is comparatively cheap. The little water met with is readily bailed. It amounts to little more than running a drift on an incline.

You will perhaps be surprised at having drawn down on yourself such a wordy reply. My apology is my interest in the old Congress from my many years connection and my belief that it has a future for somebody.

Sincerely yours,

W. F. Stanton

WFS/H

W. F. STAUNTON
MINING ENGINEER
124 WEST FOURTH STREET
LOS ANGELES, CAL.

Los Angeles, Calif., Jan. 11, 1935.

Mr. Gerald Sherman,
120 East 85th Street,
New York, N. Y.

Dear Mr. Sherman:

We are being constantly told by the New Dealers that history and human experience are no longer safe guides; that similar causes can no longer be depended on for similar effects and as precedents have gone the way of supply and demand, but I guess I am old fashioned and feel better able to guess what will happen if I know what has already happened. So I am going to be historical in replying to your letter of January 7 asking about the water supply at Congress, and to do so, I have been digging into sundry old note books.

We bought the mine from the Diamond Joe Reynolds estate early in 1894, and I went there in June as superintendent. We had been told that the well in Martinez Creek could be depended on for an ample supply for the 40 stamp mill and the camp.

We seem to have had a little shortage at first, on account of imperfect arrangements for saving water, which were being improved, after which we got along fairly well through the summer, which was very dry, with no good rain until late in October.

The first definite note I find is dated July 29, 1894 and is as follows:

> "Water for mill supplied by 7-1/2 x 4 x 10 Knowles pump (in well) running at 120 total strokes per min. 6-1/2 hrs per 24. This includes all water used at hoist and town as well as mill, and figures 25,567 gals. at full stroke and no allowance for slip. Probably 20,000 gals a day runs everything. Water raised 500 ft. through about 1 mile of 4 in. pipe."

That was the picture when we started. As we were milling 100 tons a day, it would appear that we were getting along on the almost incredibly small allowance of 200 gals. per ton. We began experimenting with the cyanide process, and, of course, the camp use of water increased, and I find a note dated Nov. 11, 1894 showing that I made a check-up and decided that we needed 30,000 gals. a day of new water for everything. That would be 300 gals. per ton, which is probably about right.

Under normal weather conditions the Martinez well proved sufficient for the 40 stamps. In dry spells we dug ditches to bed rock in the sand, leading them to the well, and in a year or two I had a series of shallow wells put down up stream from the main well, and connected by a 4 in. pipe line that was made to act as a siphon. With such expedients, and in extreme cases by having the railroad people dump some cars of water into the well, we kept things going until we built the second 40 stamp mill, in 1901, when we bought the O'Neil ranch on Date Creek 8 miles north, where there is an abundant supply, and put in a 4 in. pipe line.

At that time the fiscal year of the company was from Sept. 1 to Aug.31, and the only definite and complete statement I can find fortunately covers parts of 1901 and 1902 when we bought the O'Neil ranch. The statement is seggregated by months, but I will condense to totals.

Year September 1, 1901 - Aug. 31, 1902.

Tons milled, 51,538. Average battery assay, $13.43.
Tons cyanided, 58,935.

Net returns, concentrates,		$362,812.
" " cyanide bullion,		290,869.
Sundry rec'ts., store, boarding house, etc.,		43,371.
		697,052.
Disbursements:		
Operating,	515,461.	
All other,	59,940.	
		575,401.
Net,		$121,651.

Included in "other" expense are Capital items:

Purchase of Date Creek Ranch and improving same for water supply,	19,292.	
Repairs and improvements to No. 1 mill preparatory to starting same,	17,404.	36,696.
Actual profit above operating expense and mine development,		$158,347.

In regard to the actual cost of water supply, I find the following tabulation in one of the old note books:

Water Supply, - Cost.

Year.	Tons Milled.	Fuel Cost.	Labor and All other Expense.	Total Cost Of Water.
1894	22,826.	$2,338.88	$2,141.23	$4,480.11
1895	36,623	2,433.81	3,067.93	5,501.74
1896	34,110	2,049.58	3,072.60	5,122.18
1897	36,411	1,725.30	1,914.40	3,639.70
1898	38,336	2,131.50	3,585.41	5,716.91
1899	35,093	2,310.64	8,407.14	10,717.78
1900	35,212	3,367.66	8,844.82	12,212.48
1901	44,868	3,691.27	2,982.52	6,673.79
	283,479	20,048.64	34,016.05	54,064.69

I am unable to account for the two excessively high years, unless it was that we were buying water from the railroad before putting in the Date Creek plant. The average cost, 19¢ per ton, seems very high.

I am told that people who have been recently trying to work the tailings have relied on the mine water. I could have told them that it did'nt amount to anything. I have a memorandum of the amount of water hoisted from the 2050 level of the No. 5 shaft for the year 1906-7, which was 12,983 tons, and that, if I have figured it correctly, corresponds to only about 6 gallons per minute.

With best wishes, I am,

Sincerely yours,

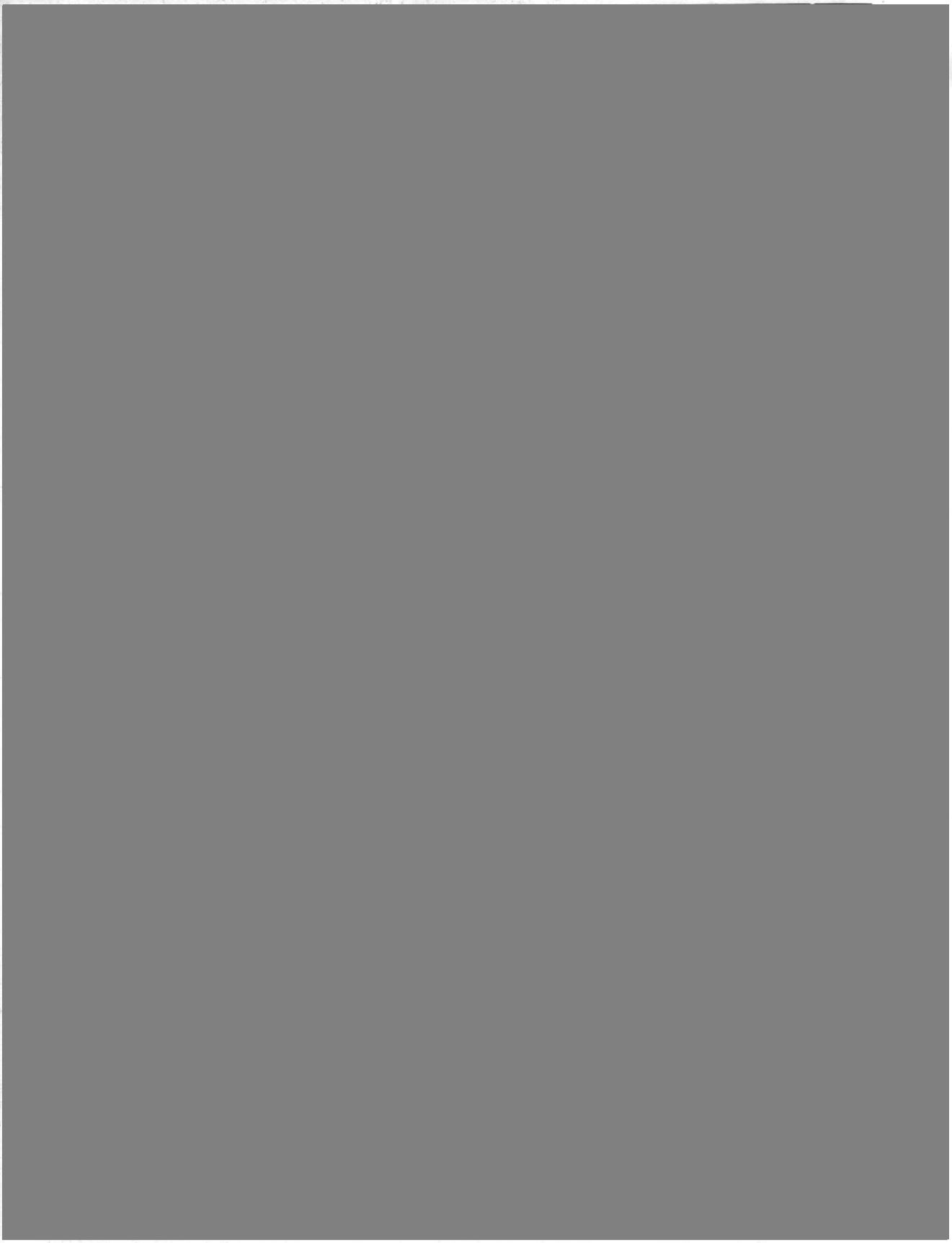
W. F. Staunton

WFS/H

Ore Possibilities at the Congress Mine

Geological History of This Interesting Old Property Suggests Advisability of Further Exploratory Work and Development

[redacted]



No. 3 shaft on Congress vein. It is 4,000 ft. deep on a 25-degree incline

[redacted]

CONGRESS MINE

METALLURGICAL REPORT

CYANIDE PLANT

FOR

TAILINGS DUMP

BY

W. A. LEDDELL

March 16, 1936

W. A. LEDDELL
MECHANICAL AND
METALLURGICAL ENGINEER

MILLS BLDG.
EL PASO, TEXAS

511-5th AVE.
NEW YORK CITY, N. Y.

March 16, 1936.

The Congress Mining Corporation,
100 Broadway,
New York City, N.Y.

Gentlemen:

In accordance with your request, I am herewith submitting my report on the cost of rehabilitation of the present cyanide plant for the treatment of the old tailings from the Congress Mills.

In order to obtain this desired information, it was necessary to:

1st - Survey and sample the dump for quantity and value; maps, weighted values of samples and tonnages are submitted in a separate report.

2nd - Using representative samples of the above sampling, make the necessary metallurgical tests in order to obtain the information for planning the most suitable treatment and flow sheet with the percentage of recovery to be expected. Reports by the American Cyanimid Company and Professor John F. Graham are attached.

3rd - Design the flow sheet and calculate the size of the equipment in each stage of the treatment.

1. The result of the survey referred to above gave as conservative figures a tonnage of 120,000 tons of the white or unroasted tailings and 280,000 tons of the brown or roasted tailings; total 400,000 tons. Assays of the white sand samples averaged 0.0734

oz. in gold and 0.45 oz. in silver per ton. Assays of samples of the brown sand tailings averaged 0.0527 oz. in gold and 0.33 oz. in silver per ton.

2. As a conservative figure a recovery of 85% of the gold and 75% of the silver can be expected on the white sand and 70% of the gold and 65% of the silver can be expected on the brown or roasted tailings.

3. The third item above "Design the Flow Sheet and Calculate the Size of the Equipment" is taken up in detail under the following:

1st - Metallurgaical Treatment in General and the Recoveries to be Expected;

2nd - Explanation of Flow Sheet Selected;

3rd - Estimate of Operating Power Required;

4th - Estimate of Operating Costs;

5th - Estimate of the Cost of Plant Changes and Additions.

METALLURGICAL TREATMENT IN GENERAL:

One of the first conditions to be investigated was to determine, if any of the gold was in a water soluble state. This was not found to be so.

Flotation was tried but resulted in low recoveries.

The cyanide tests made were to determine the fineness of grinding necessary, the time of agitation treatment, the dilution ratio advisable, and the amount of lime required per ton of ore to give protective alkalinity.

Grinding to 78% -200 mesh seems to be the economic limit to which to grind, although the extraction is improved, by finer grinding. Time of agitation treatment is to a certain extent interchangeable for finer grinding and to a certain extent is cheaper than excessive power and steel cost to produce the finer meshes.

The time of agitation treatment is found to be at least 48 hours on the coarser meshes. Extraction may be improved by continuing this treatment for 60 hours which can be done in the same agitators by changing the dilution ratio of sand to liquid.

Agitation will take place at dilution ratios of 2 to 1 or 1-1/2 to 1.

The amount of lime required is found to be from 12# per ton of ore for the white sands to 20# per ton for the brown sands. A high recovery of tailings water may lower this lime consumption.

The settling ratio of the ore is very rapid indeed and no extra lime will be required to assist the settling rate as is often the case.

A summary of the tests on both white and brown sands indicated that recoveries as follows can be relied upon:

	Gold	Silver
White Sands	85%	75%
Brown Sands	70%	65%

EXPLANATION OF THE FLOW SHEET SELECTED:

Recovery of Tailings.- The most economical method of collecting and delivering the tailings to the mill will be by means of a slusher hoist and a belt conveyor.

A 35-H.P. hoist has been recommended by the manufacturers for the work of handling 300 tons in 8 to 10 hours. In order to provide ample power it is proposed to power this hoist with a 50-60-H.P. Diesel engine.

The tailings sands are very clean and have practically no old timber in the sand but the slusher hoist will deliver to a grizzly and screen over the movable hopper feeder over the belt conveyor which will deliver to the present storage bins at the mill.

In addition to the bins the conveyor equipment is on hand for most of the incline conveyor.

Later in the operation a 200 to 300-ft. cross conveyor will have to be added to gather the sands from each end of the tailings deposit. This is provided for in the estimate.

Mill Bins.- The 250-ton mill bin which is already erected on the property is divided and it will therefore have to be provided with 2 feeders to deliver the sands to a common conveyor which will deliver these sands to the bowl of the bowl classifier which is arranged in closed circuit with the ball mill.

Lime will have to be fed to the ball mill in amounts of approximately 1-1/2 to 3 tons per day. Optionally it could be added to the feeder conveyor.

Grinding.- The ball mill at present in the plant is a 6' x 4' Colorado Iron Works mill but is somewhat small for the required tonnage. Therefore, a larger mill (7' x 36") has been provided for in the estimate.

By feeding the sands directly to the bowl of the bowl classifier it is intended to classify out as much as possible of the 55% of -200 mesh material in the original feed.

Theoretically the amount of grinding to be done could be accomplished by about 50 H.P. However, the actual tonnage of -100 mesh which will be required will be affected by so many variables, such as the efficiency of the classifier, the hardness of the ore, etc. that while the present ball mill, which requires when fully loaded about 60 H.P., the actual reduction of 300 tons per day of sands to all minus 100 mesh material would be a little in doubt. Therefore a 100-H.P. motor is recommended.

One other point in favor of more mill capacity is the fact that finer grinding improves the percentage of recovery.

If the present mill should be used it would have to be provided with a new lining, scoop and possibly have the grates in the end removed.

Classification.- In order to get efficiency in the grinding circuit, there should be good classification. This will require a bowl classifier and in order to get good separation on the finer mesh sizes a high dilution must be carried in the classifier. This is the reason for the separate solution circuit of 75 G.P.M. shown in the flow sheet.

Settling.- The capacity of a cyanide plant is also limited by the area of the thickeners. Preliminary tests have been made which show a very high settling rate.

At a plant capacity of 300 tons per day the settling rate in the last thickener will be 2.85 sq.ft. per ton per 24 hours.

Agitation.- The underflow from the primary thickener "U" is delivered by a 4" duplex diaphragm pump to a series of 3 - 36' x 17' Dorr type agitators. The flow sheet indicates agitation at 2 to 1 but the agitators are calculated to give 60 hours agitation at a dilution of 1-1/2 to 1. They will require about 100 cu.ft. of free air per minute at 20 to 25 pounds pressure. This will require about 10 H.P. which with the mechanical power will give a total of 15 H.P. for the agitator power.

Decantation.- The pulp from the agitators is diluted and discharged by gravity to the decantation thickeners. The overflow of thickener "V" is returned by pumping to the mill solution tank for further enrichment in the grinding circuit.

Fresh water and barren solution enter the circuit at either "X" or "Y" as practice may indicate. Discharge from thickeners is at a dilution of 1 to 1. Four-inch Duplex Diaphragm pumps will be required to handle the underflow of each thickener.

Tailings Disposal.- As the proposed tailings pond site is almost level transportation of these tailings should be by means of a pipe line and a Wilfley pump. Water can be added to tailings at this point if found advisable.

About 60% of the tailings water should be recovered for mill use.

Clarification.- Clarification will be by means of duplicate sand filters. These will be provided with wood screens, cocoa matting and burlap, over which is spread the sand.

An optional method of clarification would be a Butters filter with a wet vacuum pump.

Precipitation.- In order to hold down capital costs duplicate zinc boxes are planned for use in precipitation on zinc shavings.

We have in the present mill a Crowe Vacuum tank for use with zinc dust equipment but the use of this might necessitate the purchase of patent rights for a short-lived operation. Also it is understood that the Crowe patent is due to expire shortly.

Zinc box precipitates can be expressed in sealed cans to a refinery or a melting furnace can be installed and the bars shipped to a mint for parting. The refinery treatment charges are usually very reasonable and this method would save the cost of a furnace installation.

Miscellaneous.- Calcium cyanide will be dissolved in a small Pachuca tank which will then be diluted in a stock solution tank for use in the mill circuit.

Four triplex Diaphragm pumps now available at the plant will have one bowl removed from each as they are over-capacity for our circuit. These four bowls will be sufficient to build up two new duplex pumps with timber frames.

As the plant will be located on almost a level site a Wilfley pump will have to be used to lift the classifier overflow into primary thickener "U".

A number of small pumps now at the plant will be used on the most suitable service, after reconditioning.

Four of the present thickeners with their tanks and superstructures will be used in the reconditioned plant. The original superstructures were weak, but can be suitably reinforced.

The original agitator tanks were so small that only a few hours agitation was possible. These tanks can be utilized in some other service.

It is proposed to use the following old equipment which is already on the property:

1 - Conveyor idlers and belt to deliver the tailings from the slusher hoist to the mill bins

2 - The Mill bins of about 250 tons capacity

3 - Four thickeners erected and in place at the present time

4 - Four #4 Triplex Diaphragm Pumps

5 - Precipitation building

6 - Various pumps, some of which can be utilized to eliminate purchase of new equipment

7 - An assay office partially equipped

8 - The Martinez pump station supplying water to the mill. It is intended to install a small pump and pipe line near Date Creek to augment the water supply in dry seasons

9 - Various wood and steel tanks which may be utilized

10 - A 6' x 4' Ball Mill which is somewhat small for the requirements. It may, however, be utilized.

11 - A quantity of pipe and fittings

12 - A number of motors which may be reconditioned for use

ESTIMATE OF OPERATING POWER REQUIRED:

	Horse Power Requirements
Conveyor to Mill Bins	7 H.P.
Feeders and Feed Conveyor	2 H.P.
Classifier	10 H.P.
Ball Mill	100 H.P.
Wilfley Pump	10 H.P.
5 Tickeners at 2 H.P.	10 H.P.
Primary solution Pump	3 H.P.
Mill Solution Pump	5 H.P.
Barren Solution Pump	7 H.P.
Wilfley Tailings Pump	15 H.P.
Agitators Mech. H.P.	5 H.P.
Agitators Air Compressor	10 H.P.
Tailings Water Return Pump	10 H.P.
Machine Shop	5 H.P.
Extra	5 H.P.
	204 H.P. Connected Load

Assume actual horse-power at 80% of connected load.

Then 204 x 0.80 = 163.2 H.P. actual

163.2 x 0.746 = 122 K.W.

ESTIMATE OF OPERATING COSTS:

In estimating the operating costs of the plant, for the labor estimate the prevailing local rates have been used.

The crew for the plant and their rates per day are as follows:

1 Superintendent	$10.00
1 Bookkeeper	5.00
1 Master Mechanic & engineer	8.50
3 Mill Shifters at $5.00	15.00
3 Helpers at $4.00	12.00
3 Laborers at $3.50	10.50
1 Assayer at $5.00	5.00
Total	$66.00

This gives a labor cost for 300 tons per day of

$\frac{66.00}{300}$ or $0.22 per ton for labor,

and the estimate of operating costs will then be:

Cost of placing tailings in mill bins, including operating labor on hoist	$0.12
Labor cost in mill proper	0.22
Supplies:	
KCN 0.6# at 0.16	0.096
Zinc 0.4# at 0.13	0.052
Lime 21# at 80% efficiency at $11.00 per ton	0.12
Steel	0.04
Other chemicals	0.04
Water	0.03
Tailings Disposal	0.02
Power - 14 KWH per ton at 0.007	0.098
	0.836

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ESTIMATE OF THE COST OF THE PLANT CHANGES AND ADDITIONS:

1 - Sullivan Slusher Hoist driven by 50-60 H.P. Diesel Motor - complete with scraper and ropes	$ 4,270.00
Freight and installation	300.00
1 - Grizzley in place	150.00
1 - Screen	350.00
1 - Hopper (lined)	100.00
1 - Belt conveyor (material on hand) Erection only (4 M ft. timber at $50.00)	200.00
1 - 300' cross conveyor erected complete	3,600.00
2 - Feeders	60.00
	9,030.00

	Forward		$ 9,030.00
1 - Conveyor under Bins			400.00
Supports for above, 2 M ft. timber at $60.00			120.00
1 - Bowl classifier			4,975.00
Supports for above, 3 M ft. timber erected at $60.			180.00
Motor and drive			300.00
1 - 7' x 36" Hardinge Ball Mill, delivered and erected			4,600.00
Ball Mill Foundation			1,000.00
1 - Ball Mill motor and control, erected			1,850.00
Foundation for motor			50.00
Belting for above			40.00
3 - 36 x 17 Dorr agitators, Wt. 6,000#	1,500.00		
Freight	120.00		
Superstructure	300.00		
Piping	50.00		
Tank erected	1,400.00		
Foundations	300.00		
Timber	200.00		
Clearing site	100.00		
	3,970.00		
	x 3 =		11,910.00
1 - Wilfley Pump and Motor for classifer to primary thickener			600.00
1 - 33' new Dorr thickener, 8,600#	1,285.00		
Freight	170.00		
Erection	100.00		
Piping erected	100.00		
Tank erected	1,400.00		
Foundations	300.00		
Timber	200.00		
Clearing site	100.00		3,655.00
2 - New Diaphragm pump frames			100.00
5 - Thickener gear motor drives complete with belts for pump and mechanism			900.00
			$ 39,710.00

7540.00

	Forward	$ 39,710.00
1 - 20' x 10' Barren solution tank		450.00
1 - 25 x 12 Mill solution tank		650.00
Clearing site and foundations for above 2 tanks		500.00
2 - 25 x 8 sand clarifier tanks	1,200.00	
Foundations for above	600.00	
8 M ft. timber at $50.00	400.00	
Cocoa matting and burlap	100.00	
Sand filling	50.00	2,350.00
1 - Wilfley tailings pump and motors		650.00
General Mill piping		1,000.00
Cleaning out all present tankage		500.00
Excavation under present tanks		500.00
Machine shop and tools		3,000.00
50 H.P. Standby Engine and Generator (An old auto engine will do for this)		750.00
New transmission belting		300.00
Shed over ball mill and classifier		1,000.00
Hoppers and chutes under ore bins		500.00
1 - 110 Cu.ft. low-pressure compressor complete with 10 H.P. motor and Vpbelt drive delivered		760.00
Foundation and erection of above		150.00
1 - Grinding water circulating pump from thickener "U" to Mill Solution tank - motor pump for 100 G.P.M. installed		300.00
3 - 2 H.P. gear motors for present thickeners		500.00
1 - 5 H.P. gear motor for agitator drive		200.00
Repairing all old motors		400.00
Repairing all old machinery		2,000.00
		$ 56,170.00

	Forward	$ 56,170.00
1 -	Barren Solution Return Pump, 200 G.P.M. motor pump installed	225.00
	Erection of 3 new agitators and one new thickener	800.00
	Timber for walkways, launders, etc.	1,500.00
2 -	Zinc boxes at $400.00	800.00
	Barren solution sump	400.00
	Clarified solution sump	250.00
	Wilfley tailings sump	100.00
	Tailings Pipe Line	500.00
	Tailings water pump and return pipe line	600.00
	New tailings launders	500.00
1 -	Cyanide dissolver	75.00
1 -	20' x 10' Stock solution tank, erected in place	1,700.00
1 -	Lime feeder	200.00
1 -	Lime storage bin	500.00
1	All iron valves and fittings	1,500.00
	Concrete floor under thickeners and agitators	1,000.00
1 -	Tilting Furnace	500.00
	Miscellaneous	
1 -	Mill water pumping plant and pipe line	15,000.00
1 -	200 H.P. Diesel Engine erected in place	17,000.00
1 -	Tailings Pond Fence	1,500.00
	Repairs to plant fence	500.00
		101,320.00

Forward	$ 101,320.00
1 - Telephone Line	500.00
1 - Power house for Diesel Engine	1,000.00
Repairs to houses	1,500.00
1 - Truck	1,000.00
1 - Warehouse and yard	1,000.00
Additional assay equipment	1,000.00
	$ 107,320.00
Engineering	5,300.00
Contingencies	7,380.00
	$ 120,000.00

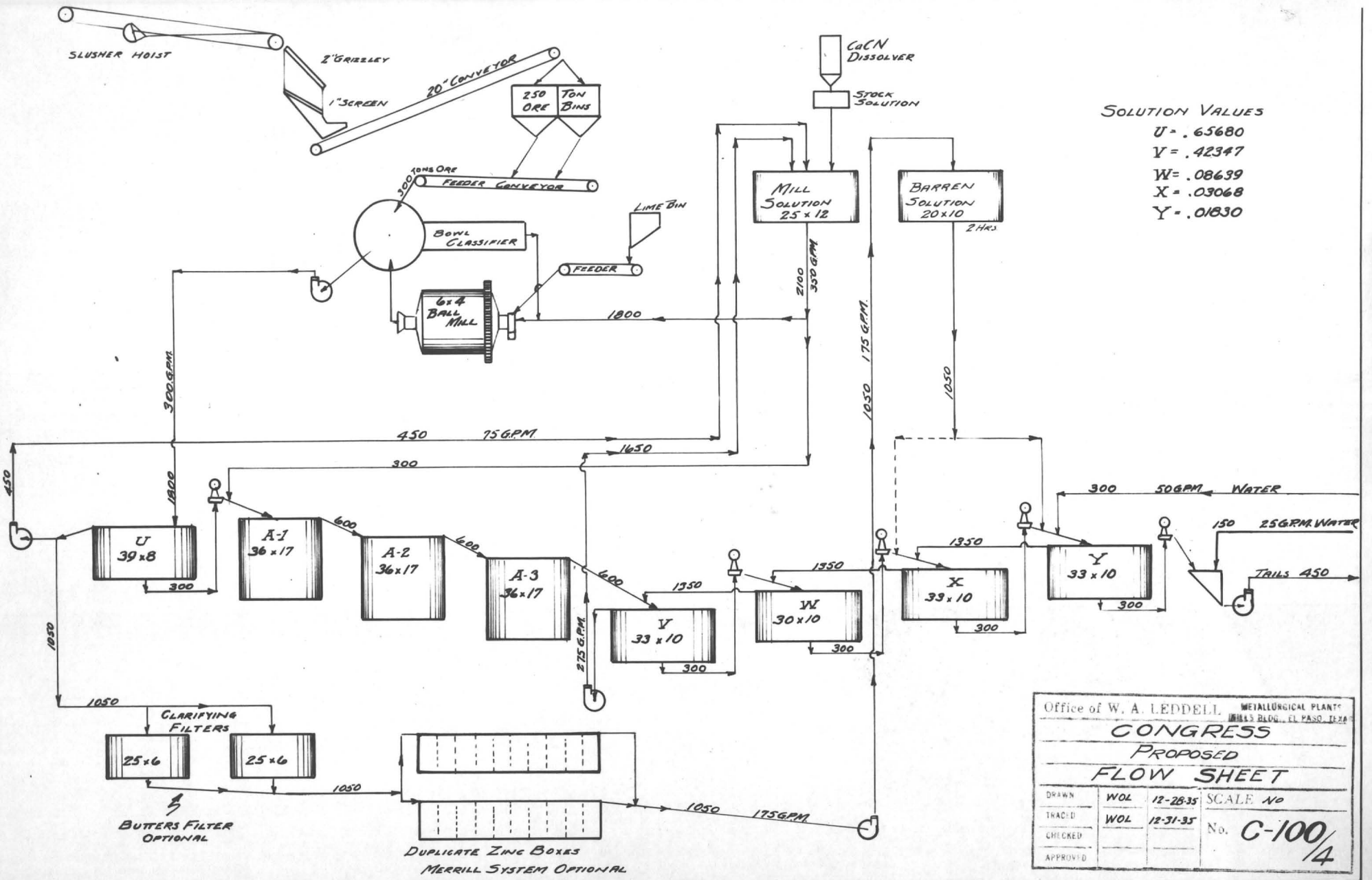
I am of the opinion that an expenditure of $120,000.00 should be ample to construct complete at Congress a cyanide plant of 300 tons daily capacity as described in the foregoing.

In conclusion, it might be said that equipment vital to good plant operation will be purchased new or will be carefully inspected before purchase if used machinery is selected.

As the details of the plant are taken up carefully in the design of the new plant further economies may be found possible by the use of equipment already on the property.

Respectfully submitted,

W.A. LEDDELL



Office of W. A. LEDDELL METALLURGICAL PLANTS
MILLS BLDG., EL PASO, TEXAS

CONGRESS
PROPOSED
FLOW SHEET

DRAWN	WOL	12-28-35	SCALE NO
TRACED	WOL	12-31-35	No. C-100/4
CHECKED			
APPROVED			

AMERICAN CYANAMID COMPANY
ORE DRESSING LABORATORY

Final Report

Cyanidation Tests on Samples of Congress Junction Tailings Submitted by Mr. G. T. Sherman

Introduction:

The following samples designated as "Congress Junction Tailings, Congress Junction, Arizona", were received at the laboratory for metallurgical testing:

An express shipment consisting of four 50 pound sacks and two 5 pint bottles of water. The four sacks containing the samples were marked No. 1, No. 2, No. 3-A, and No. 3-B, respectively. One of the bottles was marked, "Martinez Creek 'A'" and the other "Date Creek 'B'".

Two small samples weighing about 12 pounds each were received by messenger from our New York Office. One of these samples was marked: "Composite 500, Composite of 8 holes" and the other, "Composite #600 Holes Congress Dump - 3-13-17-62-63-64".

The foregoing samples were submitted for cyanidation tests as the results of an arrangement between our Mr. J. T. Sherman and Mr. Gerald T. Sherman.

Description of Samples:

The tailings dump from which these samples were taken was stated to contain two distinct types of material, namely; a roasted and an unroasted material. These products are distinguished from each other by their color and have been classified as "Brownish sands" (roasted) and "White sands" (unroasted).

Samples "No. 2" and "Composite sample 500 composite sample of 8 holes" were classified as brownish sands, whereas, Sample "No. 1" and "Composite #600, holes Congress dump 3-13-17-62-63-64" were designated as white sands.

Samples Nos. 3-A and 3-B were composites made by mixing Samples 1 and 2.

The tailings pile from which these samples were taken was stated to have been standing in the dump for about 30 years. The samples received for testing purposes were essentially all -10 mesh dry sands. They did, however, contain some soft lumps of the finer material, which were easily broken up by screening.

Purpose of Tests:

We were requested by Mr. Gerald T. Sherman to conduct cyanidation tests on samples No. 1, No. 2, Composite No. 500 and Composite No. 600. No cyanidation tests were run on the composite samples Nos. 3-A and 3-B.

Preliminary Investigation:

Preparation of the Samples for Testing:

Samples No. 1 and No. 2

The samples were treated separately. Each sample was screened thru a 10 mesh sieve to break up the lumps, mixed thoroughly and halved by riffling. One half of each sample was then mixed thoroughly and divided into 600 gram test charges. A head sample of each of the samples was riffled out and submitted for assay. The partial analyses of these head samples are presented in Table 1.

Samples Composite 500 and Composite 600

These two samples were treated separately and each were prepared for testing as follows:

The total amount was screened thru a 10 mesh sieve to break up the lumps, mixed thoroughly by rolling on a rolling cloth. The tailings were then spread out into a flat circular pile. Representative charges of 600 grams each were removed by dipping out small amounts of the tailings with a spatula from

numerous parts of this pile. A 600 gram charge was ground wet in the laboratory rod mill and a representative amount of this charge constituted the head sample. In case of the composite No. 500 two head samples were cut out, one was pulverized dry in the usual manner and the other was washed to determine the water-soluble values.

The partial analyses of these samples are presented in Table 1.

Table I

Analyses of Head Samples

Sample No.	Pb %	S %	Orig. Au oz./ton	Duplicates Au oz./ton (a)	Duplicates Au oz./ton (b)	Average Au oz./ton	Average Ag oz./ton
No. 1	0.031	0.40	0.0495	0.0685	-	0.0590	0.500
No. 2	0.036	0.41	0.0535	0.0545	-	0.0540	0.430
No. 3-A	0.031*	0.42*	0.0575	0.0635	-	0.0605	0.450
No. 3-B			0.0600	-	-	0.0600	0.450
Composite 500 (dry)			0.0453	0.0735	0.0420	0.0536	0.441
" 500 washed			0.0459	0.0405	0.0845	0.0569	0.441
" 600			0.0620	0.0765	-	0.0692	0.509

* Composite of samples 3-A and 3-B.

It will be observed that the gold values were "spotty" i.e., not uniformly distributed thruout the samples.

The following special method of assaying for gold and silver was used in obtaining the foregoing and all subsequent results:

Two 2-assay ton charges in duplicate, a total of 8 assay tons of each sample, were fused. Two of the charges were inquarted with silver and the other two were not. The lead buttons of the two inquarted charges were combined, scorified, cupelled, parted and assayed in the usual manner for gold. The lead buttons from the other two charges were combined, scorified, cupelled and the doré weighed. This doré was then parted in the usual manner and the gold bead weighed. It will be noted that this method of assaying requires the fusion of at

least 8 assay tons of the sample and the weighing of a gold bead representing 4 assay tons. It, therefore, is a means of minimizing the errors introduced by the "spotty" nature of this ore.

Microscopical Examination:

Sample No. 2 (Brownish Sands)

A representative charge of sample No. 2 was ground in the rod mill for 21 minutes and this ground pulp was panned. The panned concentrates were examined with a binocular microscope at 36X. The principal sulfide mineral was pyrite which, in the majority of instances, was tarnished. An occasional particle of what appeared to be fine, free, "rusty" gold, was noted.

Composite Sample #600

A representative sample was panned and the resultant concentrates were examined with a binocular microscope at 36X. Pyrite was the principal sulfide mineral, which, in the majority of instances was tarnished. Some clean bright pyrite was also found, but no free gold was noted.

Analyses of Water Samples:

Partial analyses of the two samples of water are presented in Table II.

Table II

Analyses of Water

	Martinez Creek "A"	Date Creek "B"
CaO parts per million	102.0	74.3
MgO " " "	26.4	10.7
pH	6.8	7.4
Remarks	Slight sediment in water. Colorless solution.	Clear and colorless

The pH of Warners tap water which was used in conducting the cyanidation tests was 6.6.

We would not anticipate any cyanidation difficulties when using the type of water as represented by either one of these samples. However, if there were a choice, the above analyses would seem to indicate that the Date Creek water might be more suitable than the Martinez Creek water.

Cyanidation Testing Procedure:

The following general testing procedure was used in conducting our cyanidation tests:

The 600 gram charge of -10 mesh tailings sample was ground in a laboratory rod mill at 67 % solids for specified periods of time. Aero Brand cyanide solution, of the same strength as used during subsequent agitation, and dry lime were added to the grinding circuit. The ground pulp was transferred to 5 gallon wide-mouth bottles, which were placed upon revolving wooden rolls. This method of agitation provides excellent aeration of the pulp, because the rotation of the large bottles causes a thin film of solution to be carried around the inside surface of the bottle. After agitation the pulp was filtered and washed twice with tap water. The ratio of water to ore was 2:1 for each wash.

The screen analyses of the various feeds to cyanidation are presented in Table III.

Table III

Screen Analyses of Feeds

	Brownish Sands					White Sands			
Test Numbers	1-5-6 & 7	10	2	11	3 & 4	8	12	9	13
Min. Grinding	10	10	16	16	21	12	12	18	18
Mesh Tyler Sieves	% Wt.	% Wt.	% Wt.	% Wt.	% Wt.	% Wt.	% Wt.	% Wt.	% Wt.
+100	0.53	0.40	Nil	0.03	-	1.33	1.66	-	0.47
+150	8.38	7.08	1.32	0.77	0.17	14.50	18.47	2.08	6.10
+200	14.09	12.85	7.90	5.22	1.92	14.17	15.82	10.25	14.83
-200	77.00	79.69	90.78	93.98	97.91	70.00	64.05	87.67	78.60

Experimental Data:

The cyanidation data pertaining to this investigation has been divided into two parts as follows:

Part I - Cyanidation Tests on "Brownish" Sands
Part II - Cyanidation Tests on "White" Sands

Part I - Cyanidation Tests on Brownish Sands

This data has been divided into two sections as follows:

Section I - Cyanidation Tests on Sample No. 2.

Section II - Cyanidation Tests on Sample "Composite Sample 500 Composite Sample 8 Holes".

Section I - Cyanidation Tests on Sample No. 2

A series of Tests 1, 2, and 3 was run to show the effect of grinding to -100 mesh, -150 mesh and -200 mesh, respectively. Test No. 4 shows the effect of reducing the time of agitation from 52 hours as used in Test No. 3, to 24 hours in Test No. 4. The detailed data and metallurgical results of these tests are presented in Table IV.

WF 541 1M 4-55 HJL CYANIDATION TEST LOG SHEET PRINTED IN U.S.A.

AMERICAN CYANAMID COMPANY
ORE DRESSING LABORATORY

Table No. IV Test No. 1, 2, 3 & 4

CONDITIONS AND RESULTS	Test 1	Test 2	Test 3	Test 4	
GRINDING					
Time, minutes	10	16	21	21	
Percent Solids	67	67	67	67	
Barren Solution Added					
NaCN, %	0.112	0.112	0.112	0.112	
CaO, %	0.020	0.020	0.020	0.020	
Dry CaO Added, Lbs./ton	2.0	2.0	5.0	5.0	
AGITATION					
Time, hours	52	52	52	24	
Percent Solids	33.3	33.3	33.3	33.3	
Barren Solution Added					
NaCN, %	0.112	0.112	0.112	0.112	
CaO, %	0.020	0.020	0.020	0.020	
Pregnant Solution, Off					
NaCN, %	0.085	0.085	0.090	0.098	
CaO, %	0.054	0.054	0.044	0.031	
Au, oz./ton					
Ag, oz./ton					
REAGENT CONSUMPTION					
* NaCN, Lbs./ton	1.05	1.14	1.12	0.63	
CaO, Lbs./ton	15.3	14.9	15.3	11.10	
ASSAYS, Oz./ton					
FEED					
Au	0.054	0.054	0.054	0.054	
Ag	0.43	0.43	0.43	0.43	
TAILINGS					
Au	0.0175	0.0155	0.0145	0.0163	
Ag	0.159	0.142	0.146	0.123	
EXTRACTION, %					
Au	67.59	71.30	73.15	69.81	
Ag	63.02	67.59	66.05	71.40	

* Low alkalinity during 1st 24 hours agitation likely the cause of high cyanide consumptions.

The foregoing data show that:

1. The extractions were slightly improved by finer grinding. However, it is doubtful whether grinding finer than 77 % -200 mesh is justified.

2. Increasing the period of agitation from 24 hours to 52 hours improved the gold extractions.

3. The maximum gold extraction did not exceed 74 %.

It has been our experience that occasionally the results of cyanidation can be improved by maintaining a high alkalinity during cyanidation and/or pre-treatment with lime water prior to the addition of cyanide. The next series of three tests was therefore run to show the effect of maintaining a high alkalinity during cyanidation and also to show the effect of aeration with lime before adding the cyanide.

Test No. 5 shows the effect of increasing the amount of lime from 2.0 lbs./ton (in Test No. 1) to 19.4 lbs./ton (Test No. 5) in the grinding circuit.

Test No. 6 shows the effect of diluting the pulp from the rod mill to 3 to 1, then thickening to 1-1/2 to 1 and agitation for 48 hours. In conducting this test the testing procedure was as follows:

The ore was ground in cyanide and saturated lime solution and transferred to a 5 gallon bottle. Enough barren cyanide solution was then added to give a dilution of 3 to 1 after which the pulp was mixed thoroughly and allowed to settle for about 1 hour. The clear effluent solution was then decanted and the thickened pulp agitated for 48 hours.

Test No. 7 shows the effect of aeration with lime prior to the addition of the cyanide. The testing procedure for conducting this test was as follows:

The ore was ground in water containing lime equivalent to 19.4 lbs./ton CaO. This pulp was then transferred to a large conical-bottomed glass

tube and diluted with water to a 3 to 1 ratio. Air was bubbled through this pulp, which was maintained practically saturated as regards the lime content, for 2 hours. The pulp was allowed to settle and enough clear effluent solution was decanted to give a thickened pulp of about 1-1/2 to 1. Strong cyanide solution was added and the pulp was then agitated for 48 hours.

The detailed data and metallurgical results of these three tests compared with those of Test I are presented in Table V.

AMERICAN CYANAMID COMPANY

ORE DRESSING LABORATORY

Table No. V. Test No. 1-5-6 & 7

CONDITIONS AND RESULTS	Test 1	Test 5	Test 6	Test 7	
GRINDING					
Time, minutes	10	10	10	10	
Percent Solids	67	67	67	67	
Barren Solution Added					
NaCN, %	0.112	0.092	0.092	-	
CaO, %	0.020	0.125	0.125	-	
Dry CaO Added, Lbs./ton	2.0	19.4	19.4	19.4	
AGITATION					
Time, hours	52	48	48	48	
Percent Solids	33.3	33.3	33.3	33.3	
Barren Solution Added					
NaCN, %	0.112	0.092	0.092	-	
CaO, %	0.020	0.125	0.125	-	
Pregnant Solution, Off					
NaCN, %	0.085	0.084	0.086	0.076	
CaO, %	0.054	0.095	0.096	0.093	
Au, oz./ton					
Ag, oz./ton					
Decanted Solution Au oz./ton			0.01005	0.00055	
REAGENT CONSUMPTION					
NaCN, Lbs./ton	1.05	0.38	0.46	0.21	
CaO, Lbs./ton	15.3	35.9	46.0	41.0	
ASSAYS, Oz./ton					
FEED					
Au	0.054	0.054	0.054	0.054	
Ag	0.43	0.43	0.43	0.43	
TAILINGS					
Au	0.0175	0.0183	0.0167	0.0185	
Ag	0.159	0.167	0.120	0.153	
EXTRACTION, %					
Au	67.59	66.12	69.08	65.74	
Ag	63.02	61.17	72.10	64.42	

The foregoing data show that the gold extractions were not improved by the use of high lime circuit nor by the pretreatment of the pulp with lime prior to the addition of the cyanide. However, the cyanide consumption was appreciably decreased when the pulp was first treated with lime.

The pregnant and wash solutions of Tests 5-6 and 7 were combined and submitted for gold assay, to obtain a more accurate check on the actual gold dissolved in the cyanide solution. The results of these assays are presented in Table VI.

Table VI

Assays of Solutions Tests 5, 6 & 7

Test No.	Pregnant + Wash Solution				Residues		**Computed
	Dilution Ratio	Assay Au oz./ton	Total Au dissolved oz./ton	% of Total Au	Assays Au oz./ton	% of Total Au	Feed Au oz./ton
5	4.817	0.00875	0.0421	69.70	0.0183	30.30	0.0604
* 6	1.67	0.01005	0.0167	28.55			
6	4.717	0.0053	0.0250	42.74	0.0168	28.71	0.0585
* 7	1.67	0.00055	0.0009	1.54			
7	4.887	0.00805	0.0392	66.89	0.0185	31.57	0.0586

* Decanted solutions.

** Actual average assay was 0.0540 oz./ton.

It will be noted that 28.55 % of the total gold was removed in the pregnant solution obtained by the decantation of the cyanide solution from the grinding circuit. It is estimated from these results that about 40 % of the total gold dissolved in the cyanide solution during the grinding.

Comparing the extractions as reported in Table IV with that actually computed from the assays of the solutions it will be observed that these results check each other. They have been tabulated to show these comparisons as follows:

	Test No. 5	6	7
Au extractions % (Table V)	66.12	69.08	65.74
" " " (Computed from solution assays Table VI)	69.70	71.29	68.43

Section II - Cyanidation Tests on "Composite Sample 500 Composite Sample 8 Holes"

Two tests were run on this sample of tailings to show the effect of finer grinding. The pregnant and wash solutions were combined and assayed and the feed to cyanidation was computed from the assay of the solutions and residues. The detailed data and metallurgical results of these two tests, Nos. 10 and 11, compared with those obtained when treating the Brownish sands as represented by Sample No. 2, Test No. 5, are presented in Table VII.

AMERICAN CYANAMID COMPANY
ORE DRESSING LABORATORY

Table No. VII Test No. 5-10 & 11

CONDITIONS AND RESULTS	Test 5	Test 10	Test 11		
GRINDING					
Time, minutes	10	10	16		
Percent Solids	67	67	67		
Barren Solution Added					
NaCN, %	0.092	0.089	0.089		
CaO, %	0.125	0.104	0.104		
Dry CaO Added, Lbs./ton	19.4	18.7	18.7		
AGITATION					
Time, hours	48	46	46		
Percent Solids	33.3	33.3	33.3		
Barren Solution Added					
NaCN, %	0.092	0.089	0.089		
CaO, %	0.125	0.104	0.104		
Pregnant Solution, Off					
NaCN, %	0.084	0.076	0.078		
CaO, %	0.095	0.031	0.030		
Au, oz./ton					
Ag, oz./ton					
REAGENT CONSUMPTION					
NaCN, Lbs./ton	0.38	0.53	0.55		
CaO, Lbs./ton	35.9	20.4	20.5		
ASSAYS, Oz./ton					
FEED					
Au	0.054	0.0516*	0.0513*		
Ag	0.43	0.441	0.441		
TAILINGS					
Au	0.0183	0.0171	0.0163		
Ag	0.167	0.191	0.174		
EXTRACTION, %					
Au	66.12	66.80	68.20		
Ag	61.17	56.69	60.54		

* Computed assay of feed from solution and residue assays. Actual average assay of feed was 0.0536 oz./ton Au.

Part II - Cyanidation Tests on "White Sands"

Two series of cyanidation tests were run on samples No. 1 and Composite #600, to show the effect of grinding. Tests numbers 8 and 9 were run on Sample No. 1 and Tests 12 and 13 on the sample Composite #600. The same general testing procedure as described under the heading "Cyanidation Testing Procedure" was used in conducting these tests. The detailed metallurgical results are presented in Table VIII.

AMERICAN CYANAMID COMPANY
ORE DRESSING LABORATORY

Table No. VIII Test No. 8, 9, 12 & 13

CONDITIONS AND RESULTS	Test 8 Sample 1	Test 12 Composite 600	Test 9 Sample 1	Test 13 Composite 600
GRINDING				
Time, minutes	12	12	18	18
Percent Solids	67	67	67	67
Barren Solution Added				
NaCN, %	0.094	0.091	0.094	0.091
CaO, %	0.093	0.109	0.093	0.109
Dry CaO Added, Lbs./ton	19.4	8.85	19.4	8.85
AGITATION				
Time, hours	46	49	46	49
Percent Solids	33.3	33.3	33.3	33.3
Barren Solution Added				
NaCN, %	0.094	0.091	0.094	0.091
CaO, %	0.093	0.109	0.093	0.109
Pregnant Solution, Off				
NaCN, %	0.081	0.074	0.077	0.073
CaO, %	0.073	0.057	0.077	0.034
Au, oz./ton				
Ag, oz./ton				
REAGENT CONSUMPTION				
NaCN, Lbs./ton	0.70	0.59	0.72	0.65
CaO, Lbs./ton	17.42	9.10	17.24	10.8
ASSAYS, Oz./ton				
FEED				
Au	0.059	0.0692	0.059	0.0692
Ag	0.500	0.509	0.500	0.509
TAILINGS				
Au	0.0127	0.0108	0.0115	0.0099
Ag	0.059	0.083	0.078	0.077
EXTRACTION, %				
Au	78.47	84.39	80.51	85.69
Ag	88.20	83.69	84.40	84.87

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Summary:

The results of our cyanidation tests may be briefly summarized as follows:

"Brownish Sands" (Samples No. 2 and Composite 500)

1. The results of a typical cyanide test gave 69.08 % and 70.10 % gold and silver extractions, respectively. The final residues, after regrinding to 77 % -200 mesh and agitating for 48 hours, assayed 0.0167 oz./ton gold and 0.120 oz./ton silver.

2. The additional gold extraction obtained by grinding from 77 % to 98 % -200 mesh does not appear to be sufficient to warrant the finer grinding.

3. The gold and silver extractions were improved by increasing the period of agitation from 24 to 52 hours.

4. The gold and silver extractions were not improved by the use of a high lime circuit during cyanidation.

5. Aeration of the pulp with lime for 2 hours at 3 to 1 dilution, then thickening to 2 to 1, adding cyanide and agitating for 48 hours, did not improve the gold extractions. The cyanide consumption was, however, reduced from 0.46 to 0.21 lb./ton by such a treatment. (See Table V).

"White Sands" Samples No. 1 and Composite #600)

1. Grinding this type of material to 78 % -200 mesh, and cyaniding for 49 hours gave 85.69 % and 84.87 % gold and silver extractions, respectively. The NaCN consumption was 0.65 lb./ton and the lime 10.8 lbs./ton. The final residue assayed 0.0099 and 0.077 oz./ton gold and silver respectively.

Remarks and Observations:

1. The head samples of these tailings were "spotty" in gold values and special precautions were used in assaying in order to minimize the errors introduced by such a condition.

(Continued)

(Continued)

2. These tailing samples appeared to be sensitive to the amount of lime added. The use of too small an amount of lime increased the cyanide consumption, even though the solutions had not entirely lost their alkalinity. The consumption of lime appears to be somewhat proportionate to the amount added i.e., the more lime added the higher consumption. The optimum amounts of lime for the Brownish sands appears to be about 20 lbs./ton of CaO and that for the White Sands about 10 lbs./ton.

3. The settling rate of the Brownish Sands and White Sands in cyanide and lime solutions was fairly rapid. No difficulties were encountered in obtaining clear effluent solutions.

AMERICAN CYANAMID COMPANY

Arvid E. Anderson

Arvid E. Anderson
Ore Dressing Laboratory

FJM

September 24, 1935

COLLEGE OF MINES AND METALLURGY
(A BRANCH OF THE UNIVERSITY OF TEXAS)
EL PASO, TEXAS

DEPARTMENT OF MINING AND METALLURGY
JOHN F. GRAHAM
EUGENE M. THOMAS

REPORT

on

CYANIDE TESTS

of

CONGRESS DUMP.

CONGRESS JCT., ARIZ.

made by

JOHN F. GRAHAM

PROF. OF MINING AND METALLURGY,

TEXAS COLLEGE OF MINES AND METALLURGY.

EL PASO, TEXAS JULY 31, 1935

Cyanide Tests on Congress Dump

Preliminary Tests

June 21, 1935 Mr. W. A. Leddell brought in three samples from the Congress Dump upon which were to be made tests preliminary to the receipt of regular dump samples.

Sample #1, Composite of 27' hole	Au = .07 oz.
Sample #2, White sand	Au = .07 oz.
Sample #3, Upper Red Dump	Au = .07 oz.

Washing Tests

Washing tests were made on samples #1 and #2. After quartering out a sample, it was divided, one half going to the assayer direct; the other half being well washed before being assayed.

Sample #1, Unwashed	Au = .045 oz.
Sample #1, Washed	Au = .04 oz.
Sample #2, Unwashed	Au = .06 oz.
Sample #2, Washed	Au = .08 oz.

These tests, while not in accord with the head samples, nevertheless do not give any indication that the sands contain any appreciable amount of soluble gold. The fact that the sub-soil under the dump is almost if not as rich as the dump itself would indicate that the dump has been well washed by the rains of the years gone by.

Flotation

A flotation test was made on sample #2.

12 grams	concentrate	assaying 1.76 oz.	Au, Recovery	= 59.0%
490 "	tails	" .03 "	" "	= 41.0%

A test made on the final white sand sample gave a tailing value of .02 oz. Ratio of concentration: 25 to 1.

Another test made on the brown sands sample gave a tailing value of .02 oz. Ratio of concentration: 50 to 1.

Inasmuch as better results can be obtained by cyanidation, no further work was done by flotation.

Cyanidation

A 48 hour agitation test was run of the white sands "as is", without grinding, using .274% KCN solution, and a 2 to 1 solution. This gave a .02 oz. gold tail. No re-

cord was made on the silver content.

At this time the two regular samples were received and all work on the preliminary samples was stopped.

Cyanide Tests
on
White Sands,
Congress Dump.

Sample #100

Assays of alternate quarters of a sample from this ore assayed

#100	Au = .07	Ag = .45
#100a	Au = .07	Ag = .49

Sizing Test

Material	% of Total	Agitation Hours	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
-100, + 150	39.2	72	.03	.008	.17	.07	73.3	59.0
-150, + 200	37.2	72	.065	.006	.34	.05	90.8	85.4
- 200	23.6	72	.12	.005	.68	.06	95.1	91.3
						Average =	89.8	83.0
		using .27% KCN solution, ratio 2 to 1						
all -200	100	72	.07	.008	.42	.10	88.6	76.3
		using .27% KCN solution, ratio 2 to 1						
all -200	100	72	.07	.006	.42	.10	91.4	76.3
		using .11% KCN solution, ratio 2 to 1						

Time of Agitation Test

Head Assay: Au = .07 Ag = .41

Test No.	Grind	Hours Agitated	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
107	-100	24	.40	.07	.005	.41	.08	93.0	83.0
108	-100	36	.44	.07	.005	.41	.08	93.0	83.0
109	-100	48	.52	.07	.004	.41	.04	94.3	91.5
110	-100	60	.60	.07	.004	.41	.04	94.3	91.5

Using .27% KCN solution, ratio 2 to 1.

Sizing Test

Using .28% KCN solution, ratio 2 to 1.

Time of agitation, 45 hours.

Test No.	Grind	% of Total	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
113	+35	14.4	.07	.05	.45	.22	28.6	51.2
114	-35+48	12.2	.06	.03	.48	.19	50.0	60.5
115	-48+65	15.7	.03	.02	.45	.16	33.3	64.5
116	-65+100	15.7	.03	.018	.37	.12	40.0	67.6
117	-100+150	11.6	.03	.012	.27	.09	60.0	66.7
118	-150+200	12.2	.05	.008	.35	.07	85.0	80.0
119	-200	18.1	.11	.006	.79	.05	94.7	93.7

Strength of Solution Test

All ground -100 mesh, agitated 48 hours.

Ratio of solution: 2 to 1.

Test No.	Sol. % KCN	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
120	.10	.56	.07	.004	.47	.04	94.3	91.5
121	.065	.44	.07	.004	.47	.05	94.3	89.3
122	.045	.52	.07	.005	.47	.05	92.8	89.3
123	.035	.40	.07	.006	.47	.05	91.5	89.3
124	.027	.52	.07	.01	.47	.07	85.7	85.1

Summary, White Sand

This ore needs a few more tests to bring out further limits. For instance, while .05% KCN solution is correct for a 48 hour agitation with all ground to -100 mesh, it is very apparent that 48 hours is too long to agitate. Opposite this fact we have that of good dissolution using.27% KCN sol for 24 hours. The determination of the exact relation between time and strength of solution should be determined but was not be-

cause it became evident that this ore would give no trouble in cyaniding and I was requested to prepare a composite of the two samples and test that.

Tabulation of Cyanide Tests on White Sands

Test No.	Grind	Sol % KCN	Hours Agitated	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
100					.07		.47			
101	-100+150	.27	72	.28	.03	.008	.17	.07	73.3	59.0
102	-150+200	.27	72	.48	.065	.006	.34	.05	90.8	85.4
103*	-200	.27	72	1.32	.12	.005	.68	.06	95.1	91.3
104	-200	.27	72	.84	.07	.008	.42	.10	88.6	76.3
105	-200	.11	72	.76	.07	.006	.42	.10	91.4	76.3
107	-100	.27	24	.40	.07	.005	.47	.08	93.0	83.0
108	-100	.27	36	.44	.07	.005	.47	.08	93.0	83.0
109	-100	.27	48	.52	.07	.004	.47	.04	94.3	91.5
[illegible]0	-100	.27	60	.60	.07	.004	.47	.04	94.3	91.5
[illegible]3	+35	.28	45	.68	.07	.05	.45	.22	28.6	51.2
114	-35+48	.28	45	.60	.06	.03	.48	.19	50.0	60.5
115	-48+65	.28	45	.48	.03	.02	.45	.16	33.3	64.5
116	-65+100	.28	45	.36	.03	.018	.37	.12	40.0	67.6
117	-100+150	.28	45	.40	.03	.012	.27	.09	60.0	66.7
118	-150+200	.28	45	1.16	.05	.008	.35	.07	85.0	80.0
119*	-200	.28	45	2.04	.11	.006	.79	.05	94.7	93.7
120	-100	.10	48	.56	.07	.004	.47	.04	94.3	91.5
121	-100	.065	48	.44	.07	.004	.47	.05	94.3	89.3
122	-100	.045	48	.52	.07	.005	.47	.05	92.8	89.3
123	-100	.035	48	.40	.07	.006	.47	.05	91.5	89.3
124	-100	.027	48	.52	.07	.01	.47	.07	85.7	85.1

* Tests are -200 products from sizing tests. All other -200 tests are all ground thru 200.

Cyanide Test on Composite sample, Congress Dump

A sample was prepared by thoroughly mixing 22 parts white sand with 78 parts brown sand.

The sample was divided and opposite quarters assayed.

#300	Composite sample	Au = .06	Ag = .39
#300a	" "	Au = .06	Ag = .34

78 parts sample	#200,	assaying .045	Au = .0351	
22 " "	#100,	" .07	Au = .0154	
		100 parts =	.0505	= .0505 oz. Au.

Since the result to be expected from computation is lower than that obtained by sampling, I felt it best to use as the head assay Au = .055 Ag = .37

Washing

100 grams of the ore was washed and then assayed, assaying .068 oz. gold. Evidently washing removed no gold.

Screen Analysis of Composite Ore

+35	= 13.0%
-35+48	= 7.9
-48+65	= 13.0
-65+100	= 10.7
-100+150	= 7.5
-150+200	= 8.3
-200	= 39.6
	100.0%

Time of Agitation Test

All -100 mesh, agitated with 2 to 1 solution except test #311, which was agitated with 1 to 1 solution. Strength of solution .10% KCN.

Test No.	Hours Agitated	Gold		Silver		Recovery	
		Heads	Tails	Heads	Tails	Au	Ag
309	24	.055	.01	.37	.13	81.8	65.0
310	39	.055	.008	.37	.09	85.5	75.7
311	39	.055	.008	.37	.05	85.5	86.5
313	42	.055	.012	.37	.14	78.2	62.0
312	48	.055	.006	.37	.04	89.1	89.2

Strength of Solution Test

All -100 mesh, 2 to 1 solution, agitated 42 hours.

Test No.	% KCN	Gold		Silver		Recovery	
		Heads	Tails	Heads	Tails	Au	Ag
313	.02	.055	.012	.37	.14	78.2	62.0
314	.03	.055	.01	.37	.11	81.8	70.3
315	.037	.055	.006	.37	.09	89.1	75.6
316	.046	.055	.005	.37	.09	90.9	75.6
317	.067	.055	.004	.37	.07	92.8	81.0

Washing

A further washing test was made on -100 mesh material, using opposite halves of the sample.

Unwashed Au = .07 oz. Ag = .39 oz.
Washed Au = .065 oz. Ag = .32 oz.

Dissolution in the ball mill

Two samples were ground in solution in the ball mill, and then washed and assayed.

#318 Au = .03 oz. Ag = .18 oz.
#327 Au = .03 oz. Ag = .21 oz.

This would indicate that in grinding

54.5% of the gold dissolved
54.1% " " silver "

Time of Agitation and Ratio of Dilution Tests

All solution strengths are .10% KCN

Test No.	Grind	Dilution	Hours Agitated	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
323	-100	2-1	24	.055	.01	.37	.07	81.8	81.2
321	-100	2-1	36	.055	.02	.37	.08	63.7	78.5
322	-100	1-1	36	.055	.015	.37	.08	72.8	78.5
324	-150	2-1	42	.055	.02	.37	.07	63.7	81.2
325	-150	1-1	42	.055	.005	.37	.05	90.9	86.5
326	-150	2-1	48	.055	.005	.37	.08	90.9	78.5
333 82%	-200	2-1	48	.055	.008	.37	.11	85.5	70.3
331 91%	-200	2-1	48	.055	.006	.37	.10	89.1	73.0

This indicates that the time of agitation should be 48 hours, that the sands should be ground to -150 mesh, that a dilution ratio of 1 to 1 is sufficient, and that the cyanide consumption will be .6 lb.

The gold extraction will be close to 90%, the silver about 75%.

It is well to note here that gold assays given in the third decimal place are only estimates and it is foolish to figure gold extractions too closely when based upon such results. A reading of Au = .008 means that it was somewhere between .005 oz. and .01 oz. and that .008 was the best judgement of the weigher at that time.

Lime Test

Tests were made using various amounts of lime per ton of ore.

The pH measure of the ore gave an alkalinity of greater than 8 when 7 is taken as neutral and lower than 7 as acid. Despite this fact the ore requires considerable lime to establish a definite alkalinity of solution. Presumably the lime is consumed by absorption on the surface of the ore.

With 5# CaO per ton of ore % CaO in the solution = .003
" 10# " " " " " " " " " " " " = .013
" 15# " " " " " " " " " " " " = .025
" 20# " " " " " " " " " " " " = .045

Since it is advisable to always have a lime content of .05% in the solution, the above test indicates that 20# of lime per ton of ore is required. It is true that the lime will build up in the solution and so the amount introduced after operating conditions become settled can be decreased. Two tests were successfully made using 10# CaO, but five tests were lost because 10# didn't give sufficient alkalinity. So all tests were made using 20# CaO.

Note:

This series was begun upon receipt of a telegram of July 5th giving the proportions to be used, and was completed July 15th.

Tabulation of Cyanide Tests

Test No.	Grind	Solution % KCN	Hours Agitated	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
300					.06		.37			
301	+48	.10	46	.12	.07	.03	.39	.27	57.2	30.8
302	-48+65	.10	46	.28	.05	.02	.31	.22	60.0	29.0
303	-65+100	.10	46	.24	.04	.018	.28	.20	55.0	28.5
304	-100+150	.10	46	.24	.03	.016	.21	.16	46.7	23.8
305	-150+200	.10	46	.52	.06	.014	.34	.15	73.3	55.9
306	-200	.10	38	.88	.062	.01	.60	.29	83.9	51.7
309	-100	.10	24	.36	.055	.01	.37	.13	81.8	65.0
310	-100	.10	36	.32	.055	.008	.37	.09	85.5	75.7
312	-100	.10	48	.36	.055	.006	.37	.04	89.1	89.2
313	-100	.02	42	.32	.055	.012	.37	.14	78.2	62.0
314	-100	.03	42	.28	.055	.01	.37	.11	81.8	70.3
315	-100	.037	42	.36	.055	.006	.37	.09	89.1	75.6
316	-100	.046	42	.36	.055	.005	.37	.09	90.9	75.6
317	-100	.067	42	.28	.055	.004	.37	.07	92.8	81.0
318	+100	.10	.1	3.80	.055	.05	.33	.18	9.0	45.0
321	-100	.10	36	.52	.055	.02	.37	.08	63.7	78.5
323	-150	.10	24	.48	.055	.01	.37	.07	81.8	81.2
324	-150	.095	42	.40	.055	.02	.37	.07	63.7	81.2
326	-150	.095	48	.64	.055	.005	.37	.08	90.9	78.5
333	4 min.	.095	48	.54	.055	.008	.37	.11	85.5	70.3
331	6 min.	.095	48	.63	.055	.006	.37	.10	89.1	73.0

All above test agitated with a 2 to 1 solution ratio.

All tests below agitated with a 1 to 1 solution ratio.

322	-100	.10	36	.52	.055	.015	.37	.08	72.8	78.5
325	-150	.10	42	.64	.055	.005	.37	.05	90.9	86.5
311	-100	.10	39	.84	.055	.008	.37	.05	85.5	86.5

#300 series of tests on composite #1

Cyanide Test on Brown Sands

July 12th instructions were received to continue the tests on the brown sands only, using a 1½ to 1 ratio of dilution, grinding to -100 mesh and -150 mesh and report results.

In handling this sample a change was made in the procedure of the individual test. In all previous work the ore was ground dry to pass the desired screen and then bottle agitated. This method is liable to give an excess of fines and of course is not the method used in the mill. It is standard practice in testing and is comparatively easy to handle.

From this time on all samples were ground in solution, washed with solution as in the classifier, decanted to the desired thickness as in the thickener, and then agitated in bottles the required time. Cyanide and lime were measured before grinding, after decantation, and after agitation. This method requires considerably more work but approaches closely mill conditions.

By this method no longer could screens be used to control the fineness but the rod mill used for grinding had to be calibrated from the standpoint of time. Following is the quality of grinding referred to when mention is made of "minutes of grinding".

	2 min.	2½ min.	3 min.	4 min.	5 min.	6 min.
+100	9	3½	2	1	1	½
+150	18	15	9	3	½	½
+200	14	19½	20	18	11½	8
-200	59	62	69	78	87	91
	100	100	100	100	100	100
Ave. of	4 tests	4 tests	6 tests	5 tests	1 test	1 test

Three samples were cut and assays made on the original sack of brown ore.

#200	Au = .05	Ag = .39
#200a	Au = .04	Ag = .34
#200b	Au = .05	

The head value used in this series of tests was

Au = .045 Ag = .37

Sizing Test

+100 mesh = 4%
+150 " = 11%
+200 " = 7
-200 " = 37
100

Preliminary test

While testing the White Sand, I had started a sizing test on this ore and also what I call an "ideal" test. When orders came to stop testing I did finish the tests I had started on the

white sand and also the "ideal" test on the brown sand, but discarded all the others. The "ideal" test was ground all -200 mesh, agitated for 72 hours with .11% KCN solution, 2 to 1 ratio.

Test No.	Gold		Silver		Recovery	
	Heads	Tails	Heads	Tails	Au	Ag
206	.045	.003	.37	.03	93.4	91.8

A complete tabulation of all tests is given on a later page but some conclusions may be brought out here.

Time of Agitation

In no combination tried did the tailing value drop below .01 oz. gold until agitation had taken place for 48 hours. Therefor 48 hours will have to be the agitation period.

Checks Dm. Cyanamid

Fineness of Grinding

In all cases tried of different fineness of grinding the tailing value dropped below .01 oz. gold. The fineness of grinding finally adopted will be selected because of economic reasons. A 5% increase in gold extraction will realize 8¢ additional. Whether such a gain in extraction is an actual gain financially must be decided.

Fineness of Grinding Tests

Agitated 48 hours in .1% KCN solution, 1½ to 1 ratio of solution.

Test No.	Grind	Gold		Silver		Recovery	
		Heads	Tails	Heads	Tails	Au	Ag
221	2 min.	.045	.009	.37	.12	80.1	67.6
215	2½ "	.045	.007	.37	.11	84.5	70.3
225	3 "	.045	.007	.37	.12	84.5	67.6
226	4 "	.045	.005	.37	.12	88.9	67.6

####

At this time I undertook to make a final series of tests checking the above results. From certain evidence I had obtained I believed that the tests could be run with 10# CaO and come through with protective alkalinity, and I so ran them. The resultant alkalinity was so near nothing that the tests were a failure giving exceedingly poor extraction. I was now out of ore and Mr. Sherman expressed me 25# reaching me July 24th. I put on 7 tests July 25th which came off July 27th and the results are given below.

Two assays of this new ore gave

#1	Au = .04	Ag = .41
#2	Au = .05	Ag = .63
Average	.045	.52

This ore proved not to be at all like the previous brown ore but I did not discover this until the tests were completed.

First, the new ore has an exceedingly low, by comparison with the first brown ore, settling rate.

Second, the new ore has a high cyanide consumption, being from .8# to 1.25# per ton of ore.

Third, the ore is much finer than the first ore. A screen analysis gave:

+100 =	36%
+150 =	9
+200 =	5
-200 =	50
	100

Four minute grinding produced:

+100 =	1%
+150 =	1
+200 =	10
-200 =	88
	100

Fourth, 20# CaO was not enough for this ore. The end alkalinity at the finish of the agitation was visible but nowhere near enough for safety.

Fifth, The ore carried pyrite, the first I have encountered in these tests.

I feel, however, that this series of tests does show that with the same ore as previously handled the tail value would have been below .01 oz. gold since most of these tests were .01 oz.

It becomes a question of how much of this class of ore you will have.

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Seven tests were run and the results are tabulated below.

All tests were ground 4 minutes and agitated 48 hours.

Test No.	Sol ratio	Sol % KCN	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
237	1½ to 1	.098	1.7	.045	.01	.52	.15	77.8	71.1
238	1½ to 1	.098	1.14	.045	.005	.52	.13	89.0	75.0
239	1½ to 1	.098	.78	.045	.01	.52	.14	77.8	73.0
240	1 to 1	.098	1.08	.045	.01	.52	.15	77.8	71.1
241	2 to 1	.098	.80	.045	.015	.52	.16	66.5	69.2
242	1½ to 1	.054	.48	.045	.01	.52	.15	77.8	71.1
243	1½ to 1	.070	.60	.045	.014	.52	.15	68.7	71.1

Cyanide Tests on Original Brown Ore

Congress Dump

Test No.	Grind	Solution % KCN	Hours Agitated	lbs. KCN used	Gold Heads	Gold Tails	Silver Heads	Silver Tails	Recovery Au	Recovery Ag
200					.05		.39			
200a					.04		.34			
200b					.05					
206	-200	.27	72		.045	.003	.37	.03	93.4	91.8
				.42						
210	3 min.	.095	14	.54	.045	.03	.37	.18	33.3	59.3
218	"	.095	24	.42	.045	.01	.37	.14	77.9	62.1
211	"	.095	30	.63	.045	.03	.37	.10	33.3	73.0
217	"	.095	36	.45	.045	.01	.37	.14	77.9	62.1
223	"	.095	36	.54	.045	.03	.37	.17	33.3	54.2
225	"	.095	48		.045	.007	.37	.12	84.5	67.6
				.33						
220	2 min.	.095	24	.54	.045		.37			
219	"	.095	30	.30	.045		.37			
222	"	.095	36	.72	.045	.025	.37	.17	44.5	54.2
221	"	.095	48		.045	.009	.37	.12	80.1	67.6
				.60						
212	2½ min.	.095	24	.48	.045	.015	.37	.06	66.7	83.8
213	"	.095	30	.63	.045	.01	.37	.07	77.9	81.0
214	"	.095	36	.63	.045	.01	.37	.13	77.9	64.9
215	"	.095	48		.045	.007	.37	.11	84.5	70.3
				.45						
224	4 min.	.095	36	.63	.045	.02	.37	.17	55.6	54.1
226	"	.095	48		.045	.005	.37	.12	88.9	67.6

Aug. 5, 1935

Mr. Gerald Sherman,
New York City, N. Y.

Dear Mr. Sherman:

Re Congress Dump

Variations in procedure between American Cyanamid Co. and Graham:

1. Graham adds lime all at beginning and Am. Cyanamid by stages.

   Total consumption of CaO is about the same in each case, 15#, because Graham has a residual value of lime which will stay in the circuit.

   I have no explanation as to why a difference in place or time of adding lime should make any difference except that I find that when my protective alkalinity at the end of the grinding period was below .05% per ton of solution, extraction went to pieces.

2. Graham agitates a 1½ to 1 solution, the Am. Cyanamid a 2 to 1 solution, the difference being all in favor of the Am. Cyanamid.

3. The Am. Cyanamid agitates in open mouth bottles, Graham in closed bottles.

   The greater aeration of the open mouth bottle is in favor of the Am. Cyanamid Co.

   The greater, more violent agitation of the end over end agitation is in favor of Graham.

Other than the above all conditions are apparently alike in the two tests except - and I would not suggest it were we not trying to find some reason where apparently no reason exists -

Am. Cyanamid	Heads = .054 oz. Au, .43 oz. Ag
Graham	Heads = .045 oz. Au, .37 oz. Ag

The above discrepancy ought to be all on the side of the Am. Cyanamid Co. in figuring extraction.

Since it is not, then it is possible that the New York assayer is consistently high in all results, both heads and tails, or the El Paso assayer consistently low.

The El Paso assayer feels that his work in general is being constantly checked by the umpire work he does for the smelters.

How does any assayer turn out a gold result in the fourth decimal place? .0175 gold. I have always doubted the accuracy of the third place, except as a guess.

Saturday morning I put on three samples of composite of three sacks received from Congress on Thursday. They came off today and were assayed and results turned in tonight.

Heads Au = .042
Ag = .14

Test	#401	Au = .015	Ag = .17
"	#402	" .015	" .16
"	#403	" .014	" .15

The above results are disappointing, but this sample also was decidedly different from the first brown ore, in (1) lime consumption using 40# (2) in KCN consumption, using about 1# (3) in settling rate, being considerably slower, although still classed as a quick settling ore.

In my report, every forty-eight hour test on Original Brown Ore gave less than .01 oz. gold.

#221	2 min. grind	.009 oz gold tailing
#215	2½ min. grind	.007 " " "
#225	3 " "	.007 " " "
#226	4 " "	.005 " " "

My only trouble on this ore came when I tried to cut down on the lime.

In the morning I shall put on a couple more bottles of the latest brown ore, a couple of bottles of a composite of the latest brown ore and white sand, and a couple of repeats of composite #300. These will come off Thursday morning and be assayed by Thursday night.

Repeats on composite #300 will check my former work, although 12 tests on this composite showed .01 oz. of gold or less.

Tests on a new composite will show whether beneficient effects may be due to white sands.

Repeat on the latest brown ore will simply check the former work, listed at the head of this letter.

Regardless of the American Cyanamid results, there can be no doubt that my samples #100, #200, and composite #300 consistently gave low tails with 48 hour agitation. Not once did they fail. I might easily get a tailing too high but it would be hard to always get too low.

It is to be regretted that my origonal brown ore ore sample was consumed before the test was finished, but on the other hand, if the dump has refractory spots you should know it. Have you no idea where the original brown ore came from?

John F. Graham

CONGRESS MILL TAILINGS

SUMMARY OF CYANIDE MILL TESTS

White Tailings

Sample #1

Graham

Gold 0.07 ozs. per ton Silver 0.47 ozs. per ton

Sizing Test

Test	Size Mesh	Percentage of Weight	Gold	Silver
113	+35	14.4%	0.07 ozs.	0.45 ozs.
114	-35+48	12.2%	0.06	0.48
115	-48+65	15.7%	0.03	0.45
116	-65+100	15.7%	0.03	0.37
117	-100+150	11.6%	0.03	0.27
118	-150+200	12.2%	0.05	0.35
119	-200	18.1%	0.11	0.79

Tests on Complete Sample

Test	Size	% K C N Solution	Hours Agitation	Cyan. Consumption	Heads	Tails	Gold Extract.	Silver Extract.
120	-100	0.10	48	0.56#	0.07 ozs	0.004 ozs	94.3%	91.5%
121		0.065	48	0.44#		0.004	94.3	89.3
122		0.045	48	0.52#		0.005	92.8	89.3
123		0.035	48	0.40#		0.006	91.5	89.3
124		0.027	48	0.52#		0.010	85.7	85.1

American Cyanamid Company

Gold 0.059 ozs. per ton. Silver 0.50 ozs. per ton.

Ratio of sizes presumably according to Graham's sizing test above.

Grinding Test

	Test #8		Test #9
	12 Minutes		18 Minutes
+100 Mesh	1.33%	+100 Mesh	0.0
+150 "	14.5 %	+150 "	2.08%
+200 "	14.17%	+200 "	10.25%
-200 "	70.0 %	-200 "	87.67%

Results of grinding should be consistent as between other tests by American Cyanamid on White Tailings, but have no relation to Graham's data on time and fineness of grinding.

Test	Size	Hours Agitation	Cyanide Consumpt.	Lime Consumpt.	Heads	Tails	Gold Extract.	Silver Extract.
#8	As above	46	0.7#	17.4#	0.059 ozs	0.0127	78.47%	88.2%
#9	As above	46	0.72#	14.2#	0.059	0.0115	80.51%	84.4%

Using head assay of 0.07 ozs. Gold per ton, as in Graham's sample, and same tails the Gold Extraction would be: -

#8 81.9 %

#9 83.6 %

Lime charged 20# per ton

NaCN 0.094%

Dilution 2 : 1

Sample #2

Graham

Gold 0.083 ozs. per ton. Silver 0.50 ozs. per ton.

Fineness of grinding

Tests	Grind	+100 Mesh	+150	+200	-200
#601) 602) 603)	5 min.	3%	5%	24%	68%
#604	7 min.	2%	0½%	10%	87½%
#605	9 min.	4%	0	1½%	94½%

Test	Grind	Hours Agitation	Heads	Tails	Gold Extraction	Silver Extraction
#601	5 min.	48	0.083	0.008	90.4%	94.0%
602	5 min.	48		0.008	90.4%	94.0%
603	5 min.	64		0.01	88.0%	94.0%
604	7 min.	48		0.012	85.5%	94.0%
605	9 min.	48		0.009	89.1%	96.0%

American Cyanamid Company (Harder Material)

Gold 0.0692 ozs. Silver 0.509 ozs.

Test	Grind	+100 Mesh	+150	+200	-200
#12	12 min.	0.66%	18.47%	15.82	64.05% (?) 99.
#13	18 min.	0.47%	6.10	14.83	78.60%

Size	Hours Agitation	Cyanide Consumption	Lime Consumption	Heads	Tails	Gold Extract.	Silver Extract.
#12 12 min.	49	0.59#	9.1#	0.0692 oz	0.0108	84.39%	83.69%
#13 18 min.	49	0.65#	10.8#	0.0692	0.0099	85.69%	84.87%

With same tails &) (0.07 ozs.
or) (0.08 ozs. Heads the extraction would be:

#12	Heads	0.07	Extraction	84.6%
		0.08		86.5%
#13	Heads	0.07	Extraction	85.8%
		0.08		87.6%

R. A. Perez Company

Gold 0.08 ozs. per ton Silver 0.50 ozs.

Test	Size	Hours Agitation	Cyanide Consumpt.	Lime Consumpt.	Heads	Tails	Gold Extract.	Silver Extract.
#1	85% -200 M.	48	0.75#	10# (?)	0.08 ozs	0.01	86.0%	77.5%
#2	85% -200 M.	48	0.53#		0.08	0.01	87.5%	76.0%

#1 Agitated in closed bottle

#2 " in open bottle

Difference in extraction apparently due to unaccounted for loss in Gold. Did tailings weigh out exactly 0.01 ozs. Gold?

#1 Test	Gold Heads		0.08 ozs.
	Solution	0.06 ozs.	
	Tails	0.01	0.07

Were Tails 0.02 ozs. or Solution 0.07 ozs. or 3 split between them, or were Heads 0.07 ozs.

#2 Test	Gold Heads		0.08 ozs.
	Solution	0.0695 ozs.	
	Tails	0.01	0.0795

In the above tests on White Tailings there is a wide range in the Head assays which indicate the effect of particles of fine Gold.

Sample #1

	HEADS Gold	HEADS Silver	TAILS Gold
Graham	0.07 ozs.	0.47 ozs.	0.004 ozs. .004 .005 .006 .010
American Cyanamid	0.059 ozs.	0.50 ozs.	0.0127 ozs. 0.0115

Sample #2

	HEADS Gold	HEADS Silver	TAILS Gold
Graham	0.083 ozs.	0.50 ozs.	0.008 ozs. 0.008 0.01 0.012 0.009
American Cyanamid	(0.062 ozs. (0.0765	0.509 ozs.	0.0108 0.0099
R. A. Perez	0.08 ozs.	0.50	0.02 0.0105

In Perez Tails, it is assumed that unaccounted for Gold appears in the Tails.

Brown Tailings (Roasted)

Sample #1

Graham

Gold 0.045 ozs. per ton Silver 0.37 ozs.

Grinding Test

	2 Min.	2½ Min.	3 Min.	4 Min.	5 Min.	6 Min.
+100	9%	3½%	2%	1%	1%	½%
+150	18%	15 %	9%	3%	½%	½%
+200	14%	19½%	20%	18%	11½%	8 %
-200	59%	62%	69%	78%	87%	91 %

Preliminary "Ideal" Test. All through 200 Mesh.

Agitated 72 hours 0.11% KCN Ratio 2 : 1

Test	GOLD Heads	GOLD Tails	SILVER Heads	SILVER Tails	EXTRACTION Gold	EXTRACTION Silver
#206	0.045 ozs	0.003 ozs	0.37 ozs	0.03 ozs	93.4%	91.8%

General Test

Test	Size	K C N Solution	Hours Agitation	Gold Heads	Gold Tails	Gold Extract.	Silver Extract.
#221	2 Min. Grind	0.10%	48	0.045	0.009	80.1%	67.6%
#215	2½	0.10	48	.045	0.007	84.5	70.3
#225	3	0.10	48	.045	0.007	84.5	67.6
#226	4	0.10	48	.045	0.005	88.9	67.6

American Cyanamid Company

Gold 0.054 ozs. Silver 0.43 ozs.

Grinding Test

10 Minutes

Tests	+100	+150	+200	-200
#1-5-6-7	0.53%	8.38%	14.09%	77.0%
#10	0.40%	7.08%	12.85%	79.69%

16 Minutes

Tests	+100	+150	+200	-200
#2	0	1.32%	7.90%	90.78%
#11	0.03%	0.77	5.22	93.98%

21 Minutes

#11	0	0.17%	1.92%	97.91%

Cyanide Tests

Test	Size Grind	K C N Solution	Hours Agitation	Heads	Tails	Gold Extract.	Silver Extract.
#1	10 Min.	0.112%	52	0.054	0.0175	67.6%	63.0%
#2	16	0.112	52	.054	0.0155	71.3	67.6
		0.112	52	.054	0.0145	73.15	66.05

By interpolation it appears that by grinding to 80% -200 Mesh an extraction of 68.2% would be obtained.

Lime in solution 0.02% dry 2# per ton.

Further tests were made on Sample #1 with changes as follows: -

#5 19.4# of lime per ton used fed into mill

#6 Reagents as in #5 Test, but tailings were decanted, recovering 0.0167 ozs. Gold. Solution then brought up to strength getting 0.025 ozs. more.

#7 Tailings ground with lime without cyanide and agitated (2 hours?). Some of lime solution decanted, cyanide added and agitated. Lime solution contained 0.0009 ounces of Gold in water soluble form.

Fineness - Ground 10 Minutes 77% -200 ?

Mesh Agitation 52 hours

Test	Size Ground *	Hours Agitation	NaCN Consumpt.	Lime Consumpt.	Heads	Tails	Gold Extract.	Silver Extract.
#5	10 Min.	52	0.38#	35.9	0.059	0.0183	66.12	61.17%
#6	10 Min.	52	0.46#	46.-	0.059	0.0167	69.08	72.1 %
#7	10 Min.	52	0.21#	41.-	0.059	0.0185	65.74	64.4 %

* 77% Minus 200 Mesh

It may be inferred from this test that lime charged in the mill in large quantities reduces cyanide consumption but has little effect on the extraction.

Sample #2

This sample contained tailings from fewer drill holes, and a considerable proportion came from near the bottom of the pile adjacent to the original granite soil.

Graham

Gold 0.045 ozs. Silver 0.52 ozs.

Test	Size Ground *	Hours Agitation	Solution Ratio	K C N Solution	Cyanide Consumed	Heads	Tails	Gold Extract.	Silver Extract.
#237	4 Min.	48	1½ : 1	0.098%	1.7#	0.045	0.01	77.8%	71.1%
238	4	48	1½ : 1		1.14#		0.005	89.0%	75.0
239	4		1½ : 1		0.78#		0.01	77.8%	73.0
240	4		1 : 1		1.08		0.01	77.8%	71.1
241	4		2 : 1	0.098	0.80		0.015	66.5%	69.2
242	4		1½ : 1	0.054	0.48		0.01	77.8%	71.1
243	4	48	1½ : 1	0.070	0.60	0.045	0.014	68.7%	71.1%

* 10 Minutes grinding represents approximately: -

+100 Mesh	0.5%
+150 Mesh	7.75%
+200 Mesh	13.5 %
-200 Mesh	77.8 %

See grinding in Tests #1 - 5 - 6 - 7 and 10

Sample #3

Graham

Gold 0.05 ozs. per ton Silver 0.40 ozs. per ton

Test	SIZE +100	+150	+200	-200	Hours Agitation	Heads	Tails	Gold Extract.	Silver Extract.
#503	2%	2	13%	83%	48	0.05	0.015	70%	67.5%
504	3%	2	17	78%	48		0.017	66%	62.5%
505	3%	2	9	86%	60		0.017	66%	
506	3%	0	4	93%	48		0.015	70%	65.-%
507	1%	1	1	97%	48	0.05	0.014	72%	65.-%
Grinding in Minutes					4	4	4	6	8
Sample					#503	#504	#505	#506	#507

American Cyanamid Company

Gold 0.05145 ozs. per ton Silver 0.441 ozs. per ton

Test	MESH +100	+150	+200	-200	Hours Agitation	Cyanide Consumpt.	Lime Consumpt.	Heads	Tails	Gold Extract.	Silver Extract.
#10	0.4%	7.1%	12.8%	79.7%	46	0.53#	20.4#	0.0516	0.0171	66.8%	56.7%
#__	0.03	0.77	5.22	94.0	46	0.55#	20.5#	0.0513	0.0163	68.2%	60.5%

R. A. Perez & Company

Gold 0.045 ozs. per ton Silver 0.40 ozs. per ton

Sample ground to 85% Minus 200 Mesh

Agitation 48 hours

Test	Cyanide Solution	Lime Per Ton	K C N Consumpt.	Lime Consumpt.	Heads	Solution	Tails	Gold Extract.	Silver Extract.
#1	0.112%	10#	0.5#	9.5#	0.045	0.031	0.01	75.6%	55.8%
2	0.112	10#	0.5#	9.5#		0.022	0.02	52.4%	31.8%
3	0.112	20# per ton Sol.	0.68#			0.035	0.01	77.7%	60.4%
4	0.105%	20# per ton Sol.	1.0#	15.0#		0.035	0.01	77.7%	59.3%
5	0.105%	20# per ton Sol.	1.0#		0.045	0.0375	0.01	78.9%	52.8%

	Agitation	Lime	Solution R
#1	Closed Bottle)	10# per ton ore	2 : 1
#2	Open ")		2 : 1
#3	Closed Bottle)	20# per ton	1½: 1
#4	Air Agitation)	Solution	2 : 1
#5	)		½: 1

There are no notes on fineness of grinding except that 85% passed a 200 mesh screen. In Test #5 it is noted that the sample was ground for 30 minutes.

The time of grinding is only comparative for the White and Brown Tailings at the same laboratory.

Perez & Company apparently required 30 minutes to make 85% pass 200 mesh. Graham's 5 minute grind put 87% through the same screen.

October 22, 1935