Ottawa, Ont.

July 9, 1923

REPORT

of the

ORE DRESSING AND METALLURGICAL LABORATORIES

Test No.185

THE CONCENTRATION OF THE COPPER-GOLD VALUES IN THE ORE FROM THE ROSSLAND VELVET MINES, ROSSLAND, B.C. - By R. K. Carnochan

A shipment of ore, 157.5 pounds net, was received at the Ore Dressing and Metallurgical Laboratories, October 17th, 1922, from the Rossland Velvet Mines, Rossland, B.C. The ore contains values in gold, silver, and copper, and tests were desired to determine a suitable method of concentrating these values.

The shipment was divided into three lots, head samples of these lots were taken and found to contain:

	Gold oz/ton	Silver oz/ton	Copper %
Milling Ore	0.26	0.32	2.58
No. 1 Dump ore	0.18	0.26	1.01
Oxidized dump ore	0.26	0.34	1.12

Test No. 1 on no. 1 dump ore: tabling and flotation:

A lot of 2000 grams of no. 1 dump ore, -20 mesh was screened on 80 mesh. This gave:

-20 +80	1310 grams
-80	690 "

The -20+80 was run over a small Wilfley table making a concentrate, middling and tailing. The -80 and the table middling were ground for 15 minutes in a small ball mill with 25 drops of water gas tar, and then floated in a small Ruth machine with 2 drops of P.T.T. #350.

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Test no. 2 on Milling ore; Tabling and flotation:

A lot of 1417 grams of milling ore, -20 mesh was screened on 40 and 80 mesh. This gave:

-20	+40	640 grams
-40	+80	286 "
	-80	491 "

The three sizes were tabled separately making in each case a concentrate and a tailing. The -20+40 table tailing was ground for 5 minutes in a small ball mill with 25 drops of water gas tar, the -40+80 tailing was then added and the ball mill run for 5 minutes more, when the -80 tailing was added and the charge ground again for 5 minutes. The ball mill charge was then floated in a small Ruth machine with 5 drops P.T.T. 350

Test no. 3 on Oxidized dump ore; tabling and flotation

A lot of 1655 grams of oxidized dump ore -40 mesh was screened on 80 mesh. This gave:

-40	+80	690 grams
	-80	965 "

Each of the above sizes was tabled, making a concentrate and a tailing. The -40+80 table tailing was ground for 5 minutes in a small ball mill with 25 drops of water gas tar. The -80 tailing was then added to the mill and the whole charge ground for 5 minutes more. The ball mill charge was then floated in a small Ruth machine with 10 drops of P.T.T. no. 350.

Test no. 4 on no. 1 dump ore; tabling and flotation

This test is similar to test no. 2

-20	-40	692 grams
-40	-80	379 "
	-80	557 "

The flotation concentrate was re-run to clean it up. This gives from flotation a concentrate, a middling, and a tailing.

Test no. 5 on milling ore; flotation:

The ore, -20 mesh, was ground for 30 minutes with 25 drops of water gas tar in a small ball mill and then floated in a small Ruth machine with 3 drops P.T.T. no. 350. The concentrate was re-run to clean up. This gives 3 products from flotation.

Test no. 6 on no. 1 dump ore; flotation. Similar to test no. 5

Test no. 7 on oxidized dump ore; flotation: Similar to test no. 5

Test no. 8 on oxidized dump ore; flotation:

The ore, -20 mesh was ground for 30 minutes in a small ball mill with

0.6 cc heavy hardwood creosote oil (FPL 26) and 0.4 cc of a mixture of 40% coal tar and 60% coal tar creosote. The ball mill charge was then floated in a small Ruth machine, the concentrates being re-run to clean them.

Test no. 9 on oxidixed dump ore: flotation:

The ore, -20 mesh was ground for 30 minutes in a small ball mill with 3 grams soda ash and then floated in a small Ruth machine with 10 drops of TT (Callow alphabetical reagent). The concentrate was re-run to clean it

Test no. 10 on oxidized dump ore; flotation:

This test is the same as test no. 9, except that 3 grams of lime were used in place of the soda ash and 10 drops of XY were used in place of the TT.

Test no. 11 on oxidized dump ore; flotation:

This test is the same as test no. 9 except that lime was used in place of soda ash, and thio-fizzan in place of TT.

Test no. 12 on oxidized dump ore; flotation:

This test is the same as test no. 9 except that lime was used in place of soda ash.

Test no. 13 on Oxidized dump ore; flotation:

This test is the same as test no. 9 except that XY was used in place of TT

Test no. 14 on oxidized dump ore; flotation:

This test is the same as test no. 9 except that thiofizzan was used in place of TT.

Test no. 15 on milling ore; flotation:

This test is similar to test no. 9. Three grams of lime were used in grinding the ore, and 5 drops of TT were used to float.

Test no. 16 on no. 1 dump ore: flotation:

This test is similar to test no. 9. Three grams of lime were used in grinding the ore and 5 drops of TT used to float.

Product	Weight grams	Au.oz	Ag.oz	Cu %	Au gm x oz	Ag gm x oz	Cu grams	Au % value	Ag % value	Cu % value
Test No. 1 on #1 dump ore - tabling & flotation										
Table conc.	169	1.02	0.86	3.92	172.4	145.3	6.62)	64.9	51.1	73.6
Flot. "	67	1.24	1.38	12.17	83.1	92.5	8.15)			
Table tail	684	0.06	0.08	0.33	41.0	54.7	2.26			
Flot "	1070	0.09	0.16	0.28	96.3	171.2	3.00			
Loss	10	0.09	0.16	0.28	0.9	1.6	0.03			
Heads	2000	0.18	0.26	1.01	393.7 360.0	465.3 520.0	20.06 20.20			
Test No. 2 on Milling Ore - Tabling and Flotation										
Tab conc +40	83	0.96	0.94	7.30	79.7	78.0	6.06)	84.5	79.5	91.0
" " +80	57	0.98	0.74	8.65	55.9	42.2	4.93)			
" " -80	72	0.84	0.88	10.12	60.5	63.4	7.29)			
Flot conc	69	0.74	1.18	16.79	51.1	81.4	11.59)			
" tail	1015	0.04	0.06	0.26	40.6	60.9	2.64			
Loss	121	0.04	0.06	0.26	4.8	7.3	0.31			
Heads	1417	0.26	0.32	2.58	282.6 368.4	333.2 453.4	32.82 36.56			
Test No. 3 on oxidized dump ore - Tabling and flotation										
Tab conc +80	173	0.66	0.38	3.37	114.2	65.7	5.83)	74.7	55.2	91.0
" " -80	165	0.80	0.46	3.20	132.0	75.9	5.28)			
Flot conc	65	0.76	1.14	8.15	49.4	74.1	5.30)			
" tail	1070	0.08	0.14	0.13	85.6	149.8	1.39			
Loss	182	0.08	0.14	0.13	14.6	25.5	0.24			
Heads	1655	0.26	0.34	1.12	395.8 430.3	391.0 562.7	18.04 18.54			
Test No. 4 on No. 1 dump ore - tabling and flotation										
Table con+40	127	0.68	0.48	2.87	86.4	61.0	3.64)	78.8	68.9	88.1
" " +80	62	1.08	0.70	3.67	67.0	43.4	2.27)			
" " -80	70	0.78	0.56	3.25	54.6	39.2	2.27)			
Flot conc	62	0.73	0.95	7.62	45.3	58.9	4.72)			
" mids	145	0.47	0.63	0.40	68.1	91.3	0.58			
" tail	1027	tr	tr	0.10	0.0	0.0	1.03			
Loss	135	tr	tr	0.10	0.0	0.0	0.13			
Heads	1628	0.18	0.26	1.01	321.4 293.2	293.8 423.3	14.64 16.47			
Test No. 5 on Milling Ore - flotation										
Flot. conc.	115	0.98	0.80	16.78	112.7	92.0	19.30	57.7	54.6	77.2
" mids	153	0.30	0.26	1.91	45.9	39.8	2.92	23.5	23.6	11.7
" tailg	734	0.05	0.05	0.38	36.7	36.7	2.79	18.8	21.8	11.1
Heads	1002	0.26	0.32	2.58	195.3 260.5	168.5 320.6	25.01 25.85	100.0	100.0	100.0
Test No. 6 on No. 1 Dump ore - flotation										
Flot. conc.	76	1.32	0.88	10.23	100.3	66.9	7.77	61.0	52.4	68.7
Flot. mids	173	0.24	0.22	0.86	41.5	38.1	1.49	25.2	29.8	13.2
" tailg	758	0.03	0.03	0.27	22.7	22.7	2.05	13.8	17.8	18.1
Heads	1007	0.18	0.26	1.01	164.5 181.3	127.7 261.8	11.31 10.17	100.0	100.0	100.0
Test No. 7 on Oxidized dump ore - flotation										
Flot. conc.	44	1.10	1.14	11.99	48.4	50.2	5.28	17.4	13.9	46.8
" mids	178	0.60	0.62	2.64	106.8	110.4	4.70	38.4	30.7	41.6
" tailg	768	0.16	0.26	0.17	122.9	199.7	1.31	44.2	55.4	11.6
Heads	990	0.26	0.34	1.12	278.1 257.4	360.3 336.6	11.29 11.09	100.0	100.0	100

Product	Weight grams	Au.oz	Ag.oz	Cu %	Au. gm x oz	Ag. gm x oz	Cu grams	Au % value	Ag % value	Cu % value
Test No. 8 on Oxidized dump - flotation										
Flot. conc.	150			5.95			8.92			79.2
" mids	188			0.69			1.30			11.5
" tails	655			0.16			1.05			9.3
							11.27			
Heads	993			1.12			11.12			100.0
Test No. 9 on Oxidized dump - flotation										
Flot. conc.	77			9.38			7.22			66.9
" mids	134			1.32			1.77			16.4
" tails	781			0.23			1.80			16.7
							10.79			
Heads	992			1.12			11.11			100.0
Test No. 10 on Oxidized dump - flotation										
Flot. conc.	135			6.80			9.18			80.4
" mids	118			0.63			0.74			6.5
" tails	744			0.20			1.49			13.1
							11.41			
Heads	997			1.12			11.17			100.0
Test No. 11 on Oxidized dump - flotation										
Flot. conc.	165			5.57			9.19			82.6
" mids	146.5			0.76			1.11			10.0
" tails	695			0.12			0.83			7.4
Test No. 12 on Oxidized dump - flotation										
Flot. conc.	126	0.73	0.93	7.75	92.0	117.2	9.76	37.2	38.7	79.2
" mids	131	0.33	0.45	0.88	43.2	58.9	1.15	17.5	19.4	9.3
" tails	746.5	0.15	0.17	0.19	112.0	126.9	1.42	45.3	41.9	11.5
					247.2	303.0	12.33			
Heads	1003.5	0.26	0.34	1.12	260.9	341.2	11.24	100.0	100.0	100.0
Test No. 13 on Oxidized dump - flotation										
Flot. conc.	38			14.31			5.44			46.4
" mids	175.5			2.78			4.88			41.7
" tails	775			0.18			1.39			11.9
							11.71			
Heads	988.5			1.12			11.07			100.0
Test No. 14 on Oxidized dump - flotation										
Flot. conc.	171.5			5.66			9.71			82.2
" mids	118			1.05			1.24			10.5
" tails	713			0.12			0.86			7.3
							11.81			
Heads	1002.5			1.12			11.23			100.0
Test No. 15 on Milling ore - flotation										
Flot. conc.	82.2	1.34	2.12	26.50	110.1	174.3	21.78	46.8	54.3	88.0
" mids	77.1	0.63	0.69	2.23	48.6	53.2	1.72	20.7	16.6	6.9
" tails	849.7	0.09	0.11	0.15	76.5	93.5	1.27	32.5	29.1	5.1
					235.2	321.0	24.77			
Heads	1009.0	0.26	0.32	2.58	262.3	322.9	26.03	100.0	100.0	100.0
Test No. 16 on No. 1 Dump - flotation										
Flot. conc.	40.3	2.09	2.31	17.94	84.2	93.1	7123	44.8	46.0	77.4
" mids	78.8	0.75	0.71	1.43	59.1	55.9	1.13	31.5	27.6	12.1
" tails	889.3	0.05	0.06	0.11	44.5	53.4	0.98	23.7	26.4	10.5
					187.8	202.4	9.34			
Heads	1008.4	0.18	0.26	1.01	181.5	262.2	10.18	100.0	100.0	100.0

SCREEN TESTS

Test No. 2, flotation tailing	+35 mesh	0.4 %
	+48	2.4 %
	+65	15.8 %
	+100	27.0 %
	+150	9.7 %
	-150	44.7 %
Test No. 3, flotation tailing	+65 mesh	1.2 %
	+100	5.9 %
	+150	15.1 %
	-150	77.8 %
Test No. 4, flotation tailing	+65 mesh	10.0 %
	+100	25.6 %
	+150	13.6 %
	-150	50.8 %
Test No. 5, flotation tailing	+65 mesh	0.6 %
	+100	8.8 %
	+150	17.3 %
	+200	18.3 %
	-200	55.0 %
Test No. 6, flotation tailing	+65 mesh	0.1 %
	+100	3.2 %
	+150	10.0 %
	+200	23.1 %
	-200	63.6 %
Test No. 7, flotation tailing	+65 mesh	0.1 %
	+100	6.3 %
	+150	10.9 %
	+200	22.7 %
	-200	60.0 %

S U M M A R Y

Milling ore: The results obtained on the milling ore are as follow:

		Au oz/ton	Ag oz/ton	Cu %	% of values Au	Ag	Cu
Test no. 2, tabling & Flot. -	total conc	0.88	0.94	10.63	84.5	79.5	91.0
Test no. 5, Oil flotation -	concentrate	0.98	0.80	16.78	57.7	54.6	77.2
	middling	0.30	0.26	1.91	23.5	23.6	11.7
Test no. 15 Flotation with Alphabetical reagents	concentrate	1.34	2.12	26.50	46.8	54.3	88.0
	middling	0.63	0.69	2.23	20.7	16.6	6.9

No. 1 Dump Ore: The results obtained on no. 1 dump ore, are:

		Au oz/ton	Ag oz/ton	Cu %	% of values Au	Ag	Cu
Test no.4, tabling & flot.	Total conc	0.79	0.63	4.02	78.8	68.9	88.1
	midd	0.47	0.63	0.40	21.2	31.1	4.0
Test no.6, oil flotation	Conc.	1.32	0.88	10.23	61.0	52.4	68.7
	midd.	0.24	0.22	0.86	25.2	29.8	13.2
Test no.16, Flotation with Alphabetical reagents	Conc.	2.09	2.31	17.94	44.8	46.0	77.4
	Midd.	0.75	0.71	1.43	31.5	27.6	12.1

Oxidized Dump Ore: The results on Oxidized Dump Ore are:

		Au ox/ton	Ag oz/ton	Cu %	% of values Au	Ag	Cu
Test no.3, tabling & Flot.	Total conc	0.73	0.54	4.07	74.7	55.2	91.6
Test no.7, Flotation	Conc.	1.10	1.14	11.99	17.4	13.9	46.8
	Midd.	0.60	0.62	2.64	38.4	30.7	41.6
Test no.8, Oil flotation	Conc.			5.95			79.2
	Midd.			0.69			11.5
Test no.12 Flotation with Alphabetical reagents	Conc.	0.73	0.93	7.75	37.2	38.7	79.2
	Midd.	0.33	0.45	0.88	17.5	19.4	9.3

CONCLUSIONS

1. Tabling and flotation gives higher recoveries and lower grade products than flotation alone.
2. Flotation with Alphabetical reagents gives better products and a higher copper recovery than oil flotation, but the oil flotation gives better gold and silver recoveries.
3. Cyaniding at -200 mesh for 24 hours reduced the tailings from tests 2 and 3 to a trace in gold and silver.
4. The best method of treating this ore can only be decided by a careful consideration of freight rates and smelter charges.
