

Gravel-Mining Costs in Alaska and Northwest Canada.*

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The data in the following table have been compiled from statistics collected during a recent inspection of the placer fields in Alaska, Yukon Territory and northern British Columbia. Of the statements furnished by operators, only those which are considered reliable have been used. The work attempted had no relation to the sampling or valuing of mining properties, and time did not permit, ex-

tracts of Alaska. The Interior province includes the Atlin district of British Columbia, the Klondike district of Yukon Territory, and the Fortymile, Eagle, Birch Creek, Fairbanks and Rampart districts of Alaska. The Seward Peninsula province includes the Nome, Council and Solomon districts of Alaska. The Nizina district of the South Coast province, and the Port Clarence, Fairhaven, and Kugrok districts

made to a depreciation fund. The fund is equivalent to the cost of plant and maintenance of same during the life of the property, plus six years' simple interest on the investment at five per cent. Each annual payment was divided by the season's output in cubic yards, and the amount thus obtained added to the daily working expenses, to get the total output cost per yard, as far as possible. Prices paid for mining property are taken no account of, as they represent an unknown factor. In cases where expensive plants

Capacity in cubic yards per 24 hours. Cost in Dollars and Cents per Cubic Yard. * * *

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Hydraulic; no pumping of water.	Hydraulic; with use of hydraulic lift.	Open cut; shoveling into sluice-boxes, including stripping top dirt; no pumping.	Open cut; horse-scraping.	Open cut; shoveling; wheeling to bucket; cable-tram to sluice.	Open cut; shoveling into cars; track and incline to sluice.	Open cut; shoveling into buckets or skips; skidding or tramping; and derricking to sluice.	Open cut; shoveling into sluice; tailings by hydraulic lift.	Open cut; steam-shovel excavating; track and incline to sluice.	Open cut; steam-scraping; generally on stripping work or tailings.	Dredging.	Drifting partly frozen or thawed ground requiring timbering.	Drifting and thawing solidly frozen ground; little or no timbering.	Winter drifting and spring sluicing of dumps.	Mining or stripping overburden by ground-slucing.	Hydraulic by means of pumped water.	Booming with self-dumping water-gate.
	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.	Cost.
SOUTH COAST PROVINCE:																	
Number of operations considered.....	6	6	6														
Capacity, cubic yards in 24 hrs. 833.....	350	54															
Thickness of deposit in feet... 30.3.....	25	5.6															
Thickness gravel worked in feet. 30.3.....	25	3.7															
	.20	.31	2.01														
INTERIOR PROVINCE:																	
Number of operations considered.....	13	20		8						6			7			4	
Capacity, cubic yards in 24 hrs. 1049.....	63	105		162	450	233	184	800	92	1062	50		75	50	150	830	250
Thickness of deposit in feet... 37.4.....	8.6	20		17.5	14	15	8	22	15	35	60	26.4	26.4	9	33	7.5	
Thickness gravel worked in feet. 37.4.....	238	3.5	10*	4.5	5	9	6	22	15	35	60	26.4	26.4	9	33	7.5	
	.24	2.39	.60	2.14	2.43	1.75	1.25	1.46	8.7	49	4.25	4.36	4.36	9**	33	6*	
SEWARD PENINSULA PROVINCE:																	
Number of operations considered.....	4	10	5														3
Capacity, cubic yards in 24 hrs. 658.....	145	200			550			1000		700	80	20	83	173	250		
Thickness of deposit in feet... 12.....	6.6	5			15			30		8	20	35	85	4	23		
Thickness gravel worked in feet. 12.....	3.3	5			11			27		8	7	4	4.3	4**	23		
	.89	1.87	.46		.91			.52		.43	4.49	4	3.66	4.61	10	.93	

* "Muck" and top gravel. ** "Muck" or fine silt and ice, from 50% to 75% ice. *** Lost time, prices paid for mining property, and cost of equipment other than mining (railways, wagon-roads, etc.), are not included. Any estimates based on the figures here given should take into account these expenditure otherwise the costs will be too low.

cept in a few cases, of the measuring of the ground.

Owing to the varying conditions governing the cost of mining in the North, the territory has been divided into three provinces. The South Coast province includes the Juneau, Porcupine and Sunrise dis-

* The figures given above are extracted from a forthcoming report on the 'Costs and Methods of Gravel and Placer Mining in Alaska,' and here published by permission of the Director of the United States Geological Survey. The data furnish as near approximations as the nature of the work permits. The cost of all supplies, rates of transportation, cost of labor, and description of water, timber and fuel resources in all important parts of the territory, as well as full descriptions of all the methods of mining employed, will be given in the final report.

of the Seward Peninsula, none of which were visited, are separately considered.

In preparing the sheet, the working costs of 118 different operations were first tabulated with reference to the method employed and to situation. A second table was then prepared, in which the working cost was augmented by an amount per cubic yard based on allowance for depreciation of plant. A general figure of six years was taken as the average life of an individual property, and, except in the case of winter drifting operations, 120 days as the working season. It was then assumed that five annual payments are

have been installed the amortization was separately figured for each case. In cases of shoveling-in and small mechanical plants, the installation and maintenance cost was taken at an average amount for a group of operations in each district. Where the operation implies an additional stripping of overburden, which is always separately charged, the cost was distributed and added to the gravel extraction cost.

From the second table, where the costs were reduced to one figure for each district, a third table (the above), was prepared, giving as nearly as possible the average cost for each of the seventeen

separate methods considered in one or more of the three provinces. Where the operations from which the averages are derived exceed two in number, the fact is so indicated in the table.

The attempt has been made to reject figures which were evidently not representative. The final figure arrived at is not, however, always satisfactory. For example, under No. 5 (the method of working open-cut by shoveling into wheelbarrows, wheeling to bucket, hoisting and conveying to sluice by self-dumping carrier or cable), \$2.14 is representative for the Klondike, where seepage water is generally pumped from the pit, and many operators pump the water for sluicing. On the other hand, a plant in the Birch Creek district of Alaska, mining only 22 cu. yd. per day, and handling the water by a drain, operated at a cost of \$1.50 per cubic yard. In No. 13 (drifting solidly frozen ground, steam or hot-water thawing, hoisting and conveying with the use of the self-pumping bucket), the cost in the Klondike is \$1.95; while the higher figure given is arrived at by combining the expensive American camps of Fortymile and Fairbanks, where the cost is \$4.63 and \$3.56 respectively.

The high cost of hydraulicking with use of hydraulic lift, in the Seward Peninsula, is caused by the difficulty of moving the gravel to the bed-rock sluice,¹ and the expense of the ditches and installations. Hydraulicking by means of water under natural head without the use of the hydraulic lift, or some other means of elevating the material, was not seen in the Seward Peninsula. It is known that a hydraulic plant is in successful operation at Bluff, 50 miles to the east of Nome, but no data are available. In the interior, only bench gravels are hydraulicked. Steeper grades for sluices can be obtained, and the gravel is more easily moved. The high duty of the miners' inch in the Klondike is a large factor in bringing down the cost of No. 1 and No. 16. It should be distinctly understood, if hydraulicking costs in the interior appear attractively low, that the water supply is exceedingly variable, and that no reliable estimate can be made beforehand of the output of a given season's operations. Furthermore, while much of the bench gravel was originally rich, the pay-streaks have been largely drifted out, and the gold is not disseminated through the upper portion of the gravel to the extent that it is in California. With regard to the pumping of water for hydraulicking, the practice cannot be too strongly condemned. He is a bold man who attempts it, and a singularly fortunate one who makes a financial success of it.

Mr. Stephen Birch, operating in the Nizina district of Alaska, has courteously furnished, for this report, a summary of the costs of working placer ground on

¹This difficulty is due, not only to the exceedingly gentle grades of the streams, but also to the shingly character of the material handled.

Dan creek. These figures are given herewith, as they imply a total charge of invested capital, in addition to working costs against one season's operations.

By ground sluicing through 20-in. flume, 6,803 cu. yd., \$8,781.44, or \$1.14 per cubic yard.

By use of 8-in. cotton pressure hose and nozzle, through 20-in. flume, 1,600 cu. yd., \$1,457.00, or \$0.91 per cubic yard.

Use of pick and shovel only, through 10-in. sluice-box, 2,320 cu. yd., \$5,100, or \$1.87 per cubic yard.

273-ft. tunnel, 6 by 6 ft., timbered, \$1,017.00 or \$3.72 per running foot. Or 407 cu. yd. of gravel removed, which cost \$2.50 per cubic yard.

Mr. Birch adds: "While the cost may seem high, it is because of the fact that it includes the tools and material now on hand, which were necessary to remove this gravel. Now, if this work is continued for a number of years, the depreciation of the tools, etc., could be charged proportionately. These prices may not be a criterion for future operations in that country, but were our first cost of operation, and any strangers going into that section of country would be apt to run up their costs to these figures."

The cost of shoveling into sluice-boxes in the remote parts of the Seward Peninsula reaches to \$5 per cu. yd., and even higher. Some drifting operations have been carried on in the Kugrok and Fairhaven districts, on which figures are not at hand.

Dredging estimates furnished by reliable interior operators, place the cost at 80c. per cu. yd., where gravel must be thawed by points ahead of the dredge. In the Seward Peninsula it is estimated that if the property is sufficiently large for a ten-year life to be allowed, a dredge can be operated at the cost of 30c. per yard. The field for dredges in placer mining in Alaska, is extremely limited. In the Seward Peninsula it is not impossible that some of the wide, shallow creek deposits will be worked successfully by means of the steam scraper. The cost of an experimental operation on Ophir creek was said to be under 20c. per yard.

The costs of operating by two mechanical systems, in the Seward Peninsula (involving the labor of men in shoveling into cars and tramping, in the one case to the bottom of an incline, and in the other to a bed-rock sluice leading to hydraulic elevator throat), are unfortunately not available for publication. The derricking system, No. 7, however, both in the interior and the Seward Peninsula, appears to be superior in point of cost to either of the above mentioned, for the working of the average Alaska open-cuts.

Frozen ground cannot be attacked with success by the steam-shovel. Even where it digs the gravel successfully, if men follow it to clean bed-rock by hand, the cost of operating is sometimes doubled. The

steam-shovel has, however, a field in northern placer mining.

Regarding mechanical operations in general, the important principle should be emphasized that the main expense is getting the material into the receptacle which conveys it to the sluice or washing plant. Tramping, even for a long distance and to a considerable elevation, adds a very small proportionate amount to the total cost of working. The establishment of a permanent washing plant, economically situated, as regards water supply and dump, should be considered by every Alaskan miner who proposes working the shallow creek deposits which characterize that country. The isolation of the washing operations, together with the adoption of the most economical system of tramping possible, will go far toward attaining the ends of adequate grade and room for tailing, which are the *sine qua non* accompaniments of successful gravel mining.

Foreign Iron and Steel Trade.

The value of the iron and steel exported from the United States during the full year 1904 is estimated by the Bureau of Statistics at \$128,553,613. As compared with \$99,135,865 for 1903, this shows an increase of \$29,417,748 over the previous year. These figures cover not only raw materials, except ore, but also rolled products, engines, machinery and tools.

The amounts, in long tons, of the leading items for the two years stand as follows:

	1903.	1904.	Changes.
Pig iron	20,379	79,025	I. 28,646
Bars	59,543	75,549	I. 16,006
Rails	31,137	416,250	I. 385,113
Structural steel	30,641	55,514	I. 24,873
Wire	108,521	118,581	I. 10,060
Nails and spikes	42,644	45,108	I. 2,464

The tremendous increase in the exports of steel rails, will be noticed. The heaviest shipments, 216,801 tons, went to Canada; Japan and Asia received 101,738 tons; South America, 28,347 tons and Mexico, 23,871 tons. Shipments to all of Europe amounted to only 17,581 tons.

Imports of iron and steel, and their manufactured products during 1904 were valued at \$21,621,970, showing a decrease of \$19,633,894 from their valuation in 1903. The principal items, in long tons:

	1903.	1904.	Changes.
Pig iron	599,574	59,500	D. 520,074
Billets, blooms, etc.	261,570	10,801	D. 250,769
Scrap iron and steel	82,921	13,461	D. 68,460
Bars	43,393	20,912	D. 22,481
Rails	95,555	37,776	D. 57,779
Wire rods	20,836	15,313	D. 15,523
Tin-plates	47,360	70,652	I. 22,292

The movement of iron ore between this and other countries during the same period is shown by the following:

	1903.	1904.	Changes.
Exports	80,611	213,865	I. 133,254
Imports	980,440	487,613	D. 492,827

Excess of imports over exports 899,829 273,748 D. 626,081

Imports came mainly from Cuba. Exports consist principally of Michigan ores that are shipped to Midland and Hamilton, Ontario.