The Auriferous Gravels of British Columbia.

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The auriferous gravels of British Columbia, like those of Central California, may be divided into two classes; first, the shallow or modern placers; second, deep or ancient river placers. These terms indicate the characteristic difference that exists between the two classes of placers.

SHALLOW OR MODERN PLACERS.

These placers are superficial deposits of auriferous gravel and alluvium, formed by the modern streams that drain an auriferous region, and are designated as river, bar, bench, gulch, creek or ravine diggings, according to their topographical position.

The placers of the modern rivers of California are practically exhausted. Those of British Columbia are not by any means exhausted.

The shallow placers known as bar, creek and gulch diggings, have been, so far as known, extensively worked since the Fraser River and Cariboo gold excitements about 1857.

The most accessible of the above named placers have been pretty well worked out in the districts I have examined.

But the vast accumulations of auriferous gravel on the benches along the Fraser, Quesnele, Horsefly and other modern streams examined are practically unexplored. These can be worked by hydraulic process wherever water can be secured and all other necessary conditions are reasonably favorable.

The deep placers of the modern streams, that is to say, the auriferous gravels lying below the water level of the modern streams, have been worked to some extent in the vicinity of Barkerville, but immense areas remain to be explored, and will in all probability be profitably worked in the future by aid of modern appliances.

The deep modern placers can be exploited either by shaft, and worked by what is known in California as the drifting process, or by the hydraulic elevator process. In other words a shaft is sunk to bed rock, and the bottom stratum of auriferous gravel is breasted out, hoisted to the surface, washed in ordinary sluices and the gold recovered.

Wherever an abundant supply of water can be obtained and delivered at the mine under sufficient head or pressure, as it is called by California miners, the auriferous gravels lying below drainage can be successfully and profitably worked by the hydraulic elevator. Figure 4 represents a mine in operation by hydraulic elevator process.

THE DEEP PLACERS OF THE ANCIENT RIVERS.

The deep placers of the ancient river system of the tertiary as seen in British Columbia, are similar in character, but so far as I have been able to determine, far more extensive and richer in their gold tenure than those of the most favored districts in Central California, where gravel deposits which contain from three to five cents per cubic yard in gold are considered rich and yield as profit from twenty to fifty per cent. of the gross output when worked by the hydraulic process.

Figure 1 is a sketch showing a geological section of an ancient river channel deposit of auriferous gravel in California, and shows the method of exploitation and working by the hydraulic process.

The top gravel A is usually free, and yields to the force of the hydraulic streams, and is easily worked out through the sluices in tunnels E, F and G.

The blue gravel stratum B is usually indurated to such a degree that it becomes necessary to disintegrate it by bank blasting before the gold can be liberated and recovered. This is accomplished by driving a system of drifts under the bank and exploding large quantities of powder therein – one hundred thousand pounds of powder have often been exploded in one blast at some of the larger hydraulic mines in California. By this means immense quantities of the richer gravels are disintegrated and very profitably worked.

The bottom stratum D is in places indurated to such a degree of hardness that it cannot be worked by hydraulic process without loss of a large percentage of the gold inclosed in the indurated mass which goes to the dump in lumps. When this condition occurs, the bottom or rich stratum on the bedrock is drifted or breasted out, worked in stamp mills in the same manner as quartz, and the gold recovered by amalgamation.

Similar conditions accompany some of the deposits of the ancient rivers of British Columbia as those illustrated in figure 1. Figures 2 and 3 represent geological sections at the Cariboo Hydraulic mines.

Water is abundant in all the districts I have examined, and can be brought on to the deposits in shorter canals and at much less expense than is possible in California.

In California there is invested one hundred millions of dollars in hydraulic mining enterprises, and prior to the inhibition of that industry, on account of damage done by debris to agricultural lands and navigable streams, the annual product in gold amounted to about twelve millions of dollars, about one-half of which resulted in profits.

The auriferous deposits of California remaining unworked are estimated at 2,108,875,000 cubic yards. The gold tenure of these gravels vary from one to thirty cents per cubic yard, and the total gold content estimated at about $500,000,000.00.

I have seen in British Columbia, included in the Yale, Lillooet and Cariboo districts, three times the area of auriferous deposits that are known to exist in the whole of the State of California.

The British Columbia gravels that I have examined, and that may be considered available for hydraulic working, yielded results varying from one cent to $1.50 per cubic yard, and as a whole average richer than any I have seen in California.

In some properties examined, I sampled streaks, some of which were on bedrock and others 150 feet above the bedrock, that yielded prospects varying from $2 to $36 per cubic yard. We have no such rich deposits in California.

The exploitation and equipment of hydraulic mines is expensive, and large sums of money are required to provide water supply and hydraulic plant, to get the mines opened and placed on a paying basis.

For this reason great care should be exercised by those intending to engage in such enterprises. Competent engineers should be employed to investigate the source of water supply, determine the available gradient for sluices, dump for debris and the gold tenure of the gravel. The absence or insufficiency of either of the first three of these conditions means the failure of the enterprise to prove remunerative.

A company of gentlemen in Montreal have undertaken the equipment of two large hydraulic mines in Cariboo, the Horse Fly Hydraulic Mine and the Cariboo Hydraulic Mine, which will soon be on a basis for profitable production.

I do not hesitate to predict that the day is not far distant when the gold output from the auriferous placers of British Columbia will not only surprise Canadians, but will astonish the civilized world.

I will refer briefly to some of the principles involved in the working of hydraulic mines, and to the origin of the hydraulic process in California.

The exhaustion of the shallow placers led to the discovery of the deeper deposits of the ancient river system. The shallow placers were, of course, rich like those of Cariboo, and, as they were exhausted, the miners attacked the deeper deposits to work their shallow edges. Only a small supply of water was required, and the great richness of the bed rock stratum and concentrated edges or rims made the work profitable to individual labor, with the easily obtained and limited supply of water; but as the depth of the superincumbent mass of poorer top gravel increased, the results decreased and the individual miner was forced to abandon his effort and depart for shallower and richer fields.

This was the condition of California in 1857. This is the condition of the auriferous regions of British Columbia to-day—the shallow placers exhausted—the deep placers unexplored. Vast areas of the best auriferous earth in the world awaiting the energy of the prospector to explore and locate, and the courage of capital to develop and place on a basis for gold production.

The gravel banks or deposits of debris and alluvium of the ancient rivers are the most favorable form of deposit for the operation of hydraulic mining, owing to the even distribution of the gold throughout the mass of gravel and the great depth of material.

As the early or pioneer miners exhausted the rich shallow placers in the ravines and gulches, they turned their attention to the deposits of the ancient rivers, working off their thin edges with the limited supply of water, but sooner or later abandoned the attempt, as the amount of the material which they could remove in a day with a small quantity of water, without pressure, would not pay; they had, however, discovered two important facts, viz: That their want of success was mainly due to the want of a large supply of water delivered under pressure to enable them to remove

Table Showing Results of Working a few Well Managed Mines in California.

Name of Mine	Locality.	Quantity water used in miners inches.	Height of Bank in feet.	Head or pressure of water in feet.	Grade of sluices in inches to 12 feet.	Cubic yds. of gravel moved per inch of water used in 24 hrs.	Average yield in cts. and fraction of cents per cubic yard.	Age yield in cents & fraction of cents per inch of water used in 24 hours.	Cost of min'g. per cubic yard in cents and fraction of cents.		Total cost of moving per cubic yard in cts. and fractions of cents	Net profit per cubic yard in cents and fraction of cents.	Net profits in cents and fraction of cents per miners inch of water used in 24 hrs.	Remarks.
									Water	Labor &c				
French Hill	Stanislaus Co.	2150	30	70	3½	1 1/100	12	13	1/8	5 1/10	5 1/8	6 1/10	6 1/10	This Company owns water which costs about 1 cent per inch
North Bloomfield.....	Nevada Co.	3000	260	300	6½	4 17/100	6 1/8	27 1/8	1 7/100	2 14/100	3 11/100	3 41/100	24 31/100	This Company owns water which cost 3 cents per inch.
Independence Hill....	Placer Co.	500	150	375	12	24	3	72	1 1/100	1 9/100	1 1/8	1 1/8	36	Both these companies purchase water at 10 cents per miners inch per 24 hours.
Big Bonanza.....	Placer Co.	1500	Top Gravel 250	300	8	14	5	70	1 1/100	1 13/100	2 1/8	2 1/8	35	