REPORT ON THE ABBOTSFORD CREEK GOLD MINE.

Government Geologist's Office,
Launceston, 22nd December, 1903.

SIR,

In compliance with your instructions, I visited the Abbotsford Creek Gold Mine on the 19th, 20th, and 21st ultimo, and now beg to report thereon.

The history of the mine appears to be as follows:—

Work was commenced in April, 1902, on leased land at Abbotsford, but the reefs tested (Burns and Beauty) were found disappointing, and work was stopped the same year. In July operations were transferred to Messrs. Gibson and Trotter's lease on the Tullochgorum freehold, where a large quartz reef (Morgan reef), said to be auriferous, traverses a steep spur, which comes down from the foot hills of Ben Lomond. Since then a good deal of work has been done on this reef, viz.:—

(1). An upper adit (No. 1) has been driven 195 feet into the hill, and a level driven from it an equal distance on the course of the reef. Two shafts connect with it from surface, and two winzes connect it with the level below (No. 2).

(2) A tunnel (No. 2) has been driven on the course of the reef 700 feet south to north through the hill. A shallow shaft (No. 7) has been sunk from surface to the north end of this tunnel. A deep winze (Barclay's) has been sunk on the reef 180 feet from the floor of the tunnel.

(3) No. 3 adit, 435 feet long, connects with No. 3 level, which has been driven a few fathoms on the reef. This is the lowest level, being 200 feet below No. 2.

(4) Stone has been stoped over No. 1 and No. 2 levels. In the former between the two shafts; in the latter near the north winze, at No. 7 and near No. 2 shaft.

The mine reports for the remaining half of 1902 stated, as the work of opening up the mine progressed, that the stone at various points gave results by mortar test as high as 5, 6, and 7 dwts. gold per ton, and in one instance prospects equal to 10 dwts. Poor non-payable stone was also reported. It was thought that if an average of 6 dwts. could be obtained, the mine would be profitable.

In order to be assured of the bulk value of the stone opened up, 14 tons of quartz samples taken from all parts of the mine (except the surface workings) were sent to the Bairnsdale School of Mines for treatment in December, 1902. These were crushed in six parcels, with the following results:—

No. 1. From Gibson's winze, 5 dwts. 3 grs. per ton.

No. 2. From No. 2 tunnel and rise, 2 dwts. 23 grs. per ton (300 feet of driving).

No. 3. From first 150 feet in No. 2 tunnel, 1 dwt. 6 grs. per ton.

No. 4. From Barclay's winze, 60 feet down, 0 dwts. 22 grs. per ton.

No. 5. From drive No. 1 adit, 0 dwts. 18 grs. per ton.

No. 6. From back of ditto, 0 dwts. 15 grs. per ton.

A 30-head battery was purchased in Victoria in February.

The mine manager's reports of the values of the stone for the half-year ending February 28, 1903, give on the whole slightly lower figures than the current reports previously.

This half-yearly report indicates two descriptions of stone one being worthless quartz, the other gold-bearing stone, valued at from 1 to 6 dwts. per ton.

A. Under the first head, the following are included:—

Drive north from No. 1 tunnel: 86 feet, poor and worthless.

Shaft No. 2: 50 feet, not payable.

Shaft No. 3: 40 feet, low average value.

Shaft No. 7: 30 feet, clean quartz.

North winze: 84 feet, poor.

Barclay's winze: greater part in very poor stone.

B. The gold-bearing stone is estimated in the report as follows:—

Drive north from No. 1 tunnel: 90 feet, payable stone.

Shaft No. 5: average value from top to bottom not exceeding 3½ dwts. per ton.

Gibson's winze: stone throughout yielded between 5 and 6 dwts. of gold per ton.

No. 2 tunnel: 170 feet, stone very erratic in quality, not averaging more than 3 dwts. gold per ton.

Do. 120 feet, stone very poor, from 1 dwt. to 2 dwts. per ton.

Do. 130 feet, should yield from 4 dwts. to 5 dwts. per ton.

It is to be noticed that, comparing these reports with the Bairnsdale tests, the figures agree pretty well as far as the

first two lots are concerned, viz.: Gibson's winze and No. 2 tunnel parcels. Lots 5 and 6 from No. 1 level, however, cannot be described as payable stone.

The 130 feet of stone in No. 2 tunnel were opened up after the tests at Bairnsdale, and the improved estimate of value was looked upon with satisfaction. It was believed that the low grade would be compensated for by the cheapness with which the stone could be mined.

The company erected a battery of 20 head, and started crushing in September last. 1500 tons of quartz were put through, from which only 7 ozs. 14⅕ dwts. standard gold, or 8½ ozs. gold and silver, were obtained (equal to 2·72 grains per ton). After this unexpected and disastrous result the mine was closed down.

It was then sought to account for the discrepancies between the Bairnsdale returns and manager's reports on the one hand and the crushing results on the other. Sundry theories have been advanced as possible explanations, such as fraudulent interference with samples, incorrect returns from Bairnsdale, loss of gold by company's battery, &c. These mutually conflicting theories have troubled the minds of shareholders, who naturally desire to know the real state of things.

Geology.—The country through which the reef runs consists of slates and sandstones of Silurian or Ordovician age —the auriferous series of the Mangana-Mathinna-Mount Victoria fields. There is no *a priori* reason why reefs in the Abbotsford belt should not be gold-bearing, and as a matter of fact gold has been found in other reefs on the same mountain spur.

Reef.—This is a strong and masterly one, bearing N. 15° to 20° E., and is a nearly vertical tabular mass of quartz. The dip for the most part is slightly S.E., though occasionally westerly. The width is from 2 to 16 feet, averaging perhaps from 4 to 6 feet. As a rule, the stone is white, brittle, and has a glassy lustre, which is very generally considered an unfavourable sign. Against this, it may be said that some of the gold-bearing quartz of the adjacent Mangana field has the same vitreous lustre. The general absence of mineral, however, is a distinctly unfavourable indication. At the same time, it may be taken as a fact, substantiated by my own samples, that in places the reef does carry small proportions of gold (1 to 4 dwts. per ton, at any rate).

Nevertheless, occurrences of gold in trifling quantities are not sufficient to dispel fears caused by the general aspect of

the stone, and I should require a good deal of positive evidence before I could derive much encouragement from the look of this quartz.

Near the surface the stone is naturally more oxidised, and all through the mine, from No. 1 to No. 3 levels, there are partings in the reef filled with ferruginous matter—a likely vehicle for gold.

The quartz in No. 3 level (the lowest), though barren and still vitreous, has a more kindly look than any other stone which I saw. The reef, however, is not quite so settled as in the upper part of the mine, being more mixed with country-rock. The lode channel, where it was cut by the tunnel, is about 4 feet wide, and filled with quartz and friable country. In the end of the drive north along its course, the face from west to east consists of 6 inches quartz, 10 inches soft dig, 1 foot quartz, 14 inches of iron-stained quartz mixed with country—in all 3 feet 6 inches. There seems to be more quartz on the east side not exposed in the drive. A crosscut behind the face is needed to prove the full width, and it is quite possible that the main part of the reef has not been seen. This level could be driven north considerably over 1000 feet before emerging into daylight on the north side of the hill. It could also be extended south for some distance, but the indications are that the reef is developed more strongly northwards.

The levels have been driven on the western wall of the reef, and I was told that when gold was noticed it was on this wall, except in Barclay's winze, where it was on the east. The mine manager is of the opinion that it occurs in these floors, inclined at a low angle. He has had ample opportunity of noticing any such occurrences, but the result of the crushing shows that they cannot exist to any appreciable extent.

Mining.—The work has been well carried out. The drives are straight, spacious, and adequately secured. The stone has been exposed and opened up well, and it must have been an easy matter to ascertain the value of the quartz as the work progressed.

Crushing.—Crushing started on the 18th September, and unfortunately the mine manager met with an accident the next day, which resulted in his absence from the mine for three weeks. During this time the battery manager returned to Victoria, leaving the battery for some days to be run by the men on shift until the arrival of a new manager from the mainland. The mine manager was only able to return to his duties the last fortnight of the crushing. This

absence is to be deplored, as all through the crushing it must have been seen that worthless stone was being treated. There was some leakage of sand and mercury at the head of the plates, as is seen on examining underneath them, and a good deal of mercury is also to be found in the sand outside the battery below the shoot. Some of this escaped mercury, on being tested by the Government Analyst, was found to be alloyed with gold. Apart from any loss of gold incidental to the starting of a battery, there appears to have been some loss which can fairly be called preventible. But I am of opinion that the battery loss, whatever it amounted to, and though it might have had an important bearing on the returns if the stone had been payable, need not be taken into account in this case as at all affecting any ultimate decision as to the value of the reef.

Bairnsdale Trial.—It is no easy task to find a reasonable explanation of the wide differences between the Bairnsdale results and the mine manager's reports on the one hand and the result of the crushing on the other.

To show how far the Bairnsdale trials are supported by the mine manager's tests, as the latter are given in his half-yearly report to 28th February last, I place the two side by side in the following table:—

	Bairnsdale.		Mine Manager's Report.
	Gold per ton.		Gold per ton.
	dwts.	grs.	
Lot No. 1—Gibson's winze	5	3	Between 5 and 6 dwts.
Lot No. 2—No. 2 tunnel and rise, 300 ft. of driving	2	23	170 ft. of stone not averaging more than 3 dwts. 120 ft. of stone from 1 to 2 dwts.
Lot No. 3—From first 150 ft. in No. 2 tunnel	1	6	130 ft. not payable, but improving
Lot No. 4—Barclay's winze, 60 ft. down	0	22	Greater part in very poor stone
Lot No. 5—160 ft. of driving from No. 1 tunnel	0	18	Payable stone for 90 ft., poor quality for 50 ft., worthless for 36 ft.
Lot No. 6—Back of drive N., and S. from No. 1 tunnel	1	14	Not published in the report.

Mr. Donald Clark, Director of the Bairnsdale School of Mines, reported that the battery was cleaned up each time

in order to keep each lot separate and distinct. An experiment of concentrating was tried, but there were no metallic minerals caught, and the concentrates were almost barren; also the sand escaping only gave traces of gold. He says the stone itself was friable, though hard, and fairly easily crushed; the quartz in parcel 1 was slightly more gossany in appearance than the others, which were almost absolutely white. He adds that on account of the low grade the greatest pains were taken with the parcels, "and as a test the results are absolute."

It is noteworthy that the return of gold from the six parcels diminishes successively from the first to the sixth. One cannot help speculating on the possibility of the first return owing its richness to gold belonging to previous crushings. The difficulty of ensuring that the quantity of gold retained by the copper plates shall be the same at the beginning and end of a run is well known.

In order to ascertain the conditions under which the Bairnsdale tests were made, I communicated with Mr. Clark, who very kindly replied to me as follows:—

"I wish to say that so far as it is possible to treat samples separately, everything was done. Before starting, every liner was taken out, and the mortar-box (a 5 head) thoroughly cleaned. The plates were carefully worked over with a rubber, no hard instruments being allowed on them. The first lot of stone that went through contained more ironstone than the last ones, which were almost pure quartz. The mercury used was retorted each time, and it was from it that the gold was obtained. I recognised the difficulty you mention at the time of the crushing, but do not think it interfered more than at the rate of a few grains per ton. . . . I am inclined to think in this case that whatever gold there was was contained in the ironstone veinlets or cavities formed probably from the decomposition of pyritic material."

After all this information the question recurs: How is it that the crushing results came so woefully short of the Bairnsdale figures, even when the latter were confirmed by the mine manager's reports, and the average of No. 2 tunnel improved by additional 130 feet of stone, valued at from 4 to 5 dwts. per ton?

Before attempting to reply to this, I will give the assay results of my samples. With the assistance of Mr. F. S. Grove, and without any of the company's employées being present, I sampled the reef in the levels in 10 to 12 feet sections, and in the stopes every 6 feet. These samples have

been assayed by Mr. W. F. Ward, the Government Analyst, who furnishes me with the following figures:—

	Samples.	Gold.
A	No. 1 level, drive north for 120 ft	Doubtful trace
B	Stope over drive north, No. 1 level	Trace
C	No. 1 tunnel, for 96 ft. past intersection of the reef	Doubtful trace
D	No. 2 tunnel, for 120 ft. from No. 7 shaft to wide part of tunnel	Trace
E	No. 2 tunnel, for 120 ft. south from D	Doubtful trace
F	No. 2 tunnel, for 120 ft. south from E	Trace
G	No. 2 tunnel, for 160 ft. south from F	Trace
H	No. 2 tunnel, for 150 ft. to entrance	Doubtful trace
I	Stope over No. 2 tunnel	Trace
K	No. 3 level, north end	Doubtful trace
L	No. 3 level, all along drive N.	Doubtful trace
M	Surface outcrop below No. 3 shaft, on south side of hill	4 dwts. 12 grs.
N	Surface cut or stope between No 3 and No. 5 shafts	1 dwt. 12 grs.
O	No. 7 surface stope, south of No. 7 shaft, on north side of hill	1 dwt. 12 grs.

Looking at these assays, I have no hesitation in saying that, though the samplings may have missed occasional occurrences of gold, the reef opened up in the levels is practically valueless.

It must be admitted, however, that at and near the surface it did carry some gold. Possibly a few small patches were struck in different parts of the mine.

After obtaining an assay return of over 4½ dwts. per ton from outcrop samples, I am quite prepared to accept the Bairnsdale figures as results from the mine stone, but I must add that they do not represent the average value of the reef as opened up. The quantity of stone stoped after the Bairnsdale tests were made makes it impossible to compare these rigidly with the crushing results. Some of the Bairnsdale samples were taken from outside heaps, and the difficulty of getting average quality samples in that way is well known.

As for the mine manager's reports, which I take to have been made in good faith, as he enjoys a good reputation for integrity, I can only conceive of two possible explanations. Either (1) his samples were taken irregularly, and he merely averaged the results numerically, obtaining incorrect mean values for the reef; or (2) if his samples had been more

closely controlled from the time when they were taken to the time when they were washed, different and poorer results would have been obtained. The choice seems to lie between these two alternatives (either or both). Without more complete data than are now available I am unable to say anything more definite.

This unhappy history leads me to reiterate the importance of mine sampling. Mineowners in Tasmania are only just beginning to wake up to it. Hitherto a few samples taken from the pay ore, and more or less at random at that, have sufficed to satisfy those who put their money into undeveloped mines. But these days are passing away. It cannot be too widely realised that the ascertaining of the value of a mine by means of correct and complete sampling, although it costs money, is the way to save money in the long run. Scientific sampling produces even more reliable results than the trial tests of small battery parcels, for in the former there is more averaging, diminishing the total chances of error, while in the latter all is reduced to one or two factors.

Outlook for future work.—With the results of the crushing, I do not see any encouragement whatever for continuing work on the part of the reef already opened up. Any future work must be purely prospecting, in the hope of discovering stone of an improved quality. There seems to be an irregular shoot of gold-bearing stone, such as it is, descending from somewhere near No. 3 shaft, and in the block of reef in which Barclay's winze is situate. This is not payable. It is impossible to say whether it will improve or not at a greater depth, but the way in which the gold favours the oxidised stone is against any immediate improvement. If it is desired to prove this, the way of doing it is obviously to connect No. 3 drive with Barclay's winze, and then sink further. I am told that the gold was always found to pitch south, and if this is the case, it will not be necessary to drive further north than Barclay's winze before beginning to sink.

I have the honour to be,
Sir,
Your obedient Servant,

W. H. TWELVETREES,
Government Geologist.

W. H. WALLACE, ESQ.,
Secretary for Mines, Hobart.

JOHN VAIL,
GOVERNMENT PRINTER, TASMANIA.