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TAMIL NADU ARCHIVES

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DEVALAH, 18TH February 1879.

From

R. BROUGH SMYTH, Esq.,

Mining Engineer.

To

J. H. GARSTIN, Esq.,

*Acting Secretary to Government,
Revenue Department.*

SIR,

REFERRING to the paper, dated 10th January 1879, No. 42, wherein I am instructed by the Government to ascertain how it is that notwithstanding the presence of considerable quantities of gold in the reefs at the Alpha Mine and to the extent reported by me the operations have not proved successful, and especially whether this want of success has arisen from any peculiar difficulties in separating the gold from the matrix at this particular spot, or from the cost of labor or fuel or from other reasons within or beyond the control of the mine proprietors, I now do myself the honor to submit the following report for the consideration of His Grace the Governor in Council.

Preliminary.

Immediately on receipt of the instructions above referred to, and as directed by the Government, I communicated with the Directors of the Alpha Company and sought permission to make a careful examination of the mine, and at the same time I asked a number of questions respecting the operations of the Company.

Subsequently I wrote to the Secretaries and Treasurers in Madras requesting them to furnish such information respecting the work done in the past as they could supply.

The Directors very promptly furnished papers relating to the expenditure of moneys, the quantities of quartz raised and the results, and they replied to some of the questions asked by me; and I would wish to record my appreciation of the assistance afforded by them, by Messrs. Parry and Company and by Mr. G. E. Withers who at one time had the management of the works under what is known as "The Prince of Wales Quartz Reef Gold Prospecting Company," a Company which held and worked the Alpha Mine on tribute for a brief period.

Though necessarily from the nature of the duties which I have had to discharge since I came to this district, I was well acquainted with the mine and the machinery of the Alpha Company, I have since the receipt of instructions made a further careful examination of the land held by them, the reefs, and the works erected for the purpose of reducing the auriferous quartz.

The area granted to the Alpha Company.

I have not been able to obtain a plan or a sufficient description of the boundaries of the area granted to the Alpha Company. The extent is said to be fifteen acres, but on the map of the Ouchterlony Valley and three Amshor South-East Wynad the area marked "Alpha Company" exceeds one hundred acres.

The lines of demarcation as pointed out to me on the ground seem to embrace a larger area than fifteen acres.

The boundaries are thus described in the prospectus of the Company:— A block of fifteen acres bounded on the west and south by two large streams, and on the east and north by four demarcation stones.

As my report deals principally with only so much of the main reef as is known to be within the area granted to the Company, the question of boundaries need not be further referred to.

The Quartz Veins.

The principal quartz vein intersecting the land is that known as the "Skull Reef." It appears at the surface at various points between "Wright's Level" and the northern boundary of the Company's area, and is traceable further northward for a great distance. Wright's Level is on the eastern slope of the range that forms the western rim of the basin drained by the Carcoor Poya, and is distant thirty chains from the Alpha mill.

The country is intersected by streams trending to the Carcoor Poya, and there are low and high hills, some very steep, but nearly all with smooth contours.

At Wright's Level the vein is from four to five feet in thickness near the surface, and seven feet six inches at a depth of thirty feet. Its strike for a distance of more than one chain is nearly north and south and the dip is east at an angle of 30° to 40°.

The quartz in some parts of the vein is laminated, the laminae being from two to four inches and more in thickness, and they are nearly parallel to the line of strike. These are crossed by other lines transverse to the dip and strike, and there are in places thin veins of talcose clay cutting the reef transversely. There is also solid iron-free nearly white quartz. Near the surface the stone, when broken out, is seen to be highly ferruginous and is colored yellow, bright red, and bluish purple. Much of the quartz is cavernous, honey-combed, or mice eaten, and the associated minerals near the upper part of the vein are limonite and other oxyds of iron due to the decomposition of iron pyrites which are found in considerable quantities in the deeper levels. Sulphur is also seen occasionally in cavities. I have not seen any sulphide of antimony or any of the ores of lead.

Northward, twelve chains from Wright's Level, an adit made by native miners has been re-opened by me, and the thickness of the reef at this point is four feet; the strike is nearly north and south, and the dip is nearly due east at an angle at the outcrop of 45° and at a depth of twenty-four feet 60° nearly.

A section taken from the middle of this reef shows massive white nearly iron-free quartz. It is ferruginous and cavernous near the hanging wall and foot wall.

At the large excavation from which the reef derives its name about twenty-two chains north of Wright's Level, the vein is thick: at the face it is not less than fourteen feet from the hanging wall to what appears to be a "horse," the extent of which has not been ascertained. The total thickness of the reef at this point is not known. The general character of the stone is similar to that at Wright's Level, but there is much more sulphur. It is not difficult to find rather large quantities of clean sulphur in the cavities. Here also there is an absence of those minerals that are most detrimental to amalgamation. The strike of the reef is N. 20° W. and the dip N. 70° E. at an angle of 18° to 30°, but the dip nowhere is uniform.

About four chains and fifty-six links north-westerly from the excavation the reef is again seen on the bandy-road where it intersects a low hill. Here the dip is N. 80° E. at an angle of 40°, and the thickness as well as can be observed is six feet. On the north-western side of the hill the outcrop is again found, and it is seen also on the further side of a stream which runs at the foot of the hill. On a bandy-road south-easterly of the Skull Reef there are thin ferruginous veins containing numerous cubes of iron-pyrites decomposing into limonite which are said to be highly auriferous. The "casing" of the reef throughout is generally a talcose schist.

There is another reef within the boundaries pointed out to me, west of Wright's Level and one near the Alpha Bungalow. Neither of these has been opened by the Company.

The Mines.

Now that the thick and high grass is burnt on many of the ridges it is comparatively easy to follow the outcrops of the reefs and to discover old native

workings. Since this report was commenced, I have examined very extensive native workings south and west of Wright's Level quite on the edge of the ghât. The ridge southward of the Alpha workings has been sluiced on both sides, and a channel has been cut in the valley about five feet in width and eight feet in depth for a length of more than three hundred yards. There are also numerous subsidiary small channels and deep and large excavations. On following the main channel downwards (it commences at the outcrop of the reef at Wright's Level) in a direction 8° south of west a strong vein of quartz is found nearly three hundred and fifty yards from the Alpha workings. One shaft has been sunk here, but the reef has not been excavated. It appears to have a strike of N. 30° W., and is probably a continuation of that which crops out in the jungle on the further side of a stream trending towards the ghât. The existence of these native workings and the reef referred to is, I am informed, unknown to the proprietors of the Alpha Mine. Surrounding the recent excavation at Wright's Level there are other native workings evidently very ancient. There are several shallow pits and small excavations; and heaps of broken quartz are to be seen all along the strike of the reef. At one place, between Wright's Level and the Skull, there is a shallow pit communicating with an aperture like a chimney in which it is probable the quartz was roasted.

Near the Skull and for some distance northwards the workings are numerous, and at the Skull itself there is an excavation the full extent of which cannot be ascertained as the roof has fallen: as far as it can be examined it shows a width at the entrance of twenty-nine links, a breadth at the broadest part of fifty-three links; and it measures seventy-five links to the mouth of a drive which cannot be followed until some expenditure is incurred in clearing it and securing it. The height of the excavation from flow to roof is twenty-five links. There are vertical shafts communicating with this excavation which no doubt were sunk long before the adit was commenced. The amount of work done on the reef is conclusive proof that the native miners found gold in quantities sufficient to remunerate them. They appear to have dug into the soft casing and taken stone from the footwall, but they did not confine their operations to this part of the reef. They followed the run of gold wherever they were able to do so.

According to the information I have been able to obtain it appears that the Alpha Company commenced their mining operations by quarrying stone in the old native workings at the Skull, where they took out about one hundred tons of quartz. Subsequently they quarried stone near Wright's Level, and then the adit named Wright's Level was driven for a length of about twenty feet.

At a point a little more than ninety feet eastward of Wright's Level and twenty-five feet below it an adit forty-two feet in length, five feet in width, and six feet in height was driven to cut the reef, and the reef is now seen in the "face" where a hole has been sunk in quartz to the depth of five feet. The Company or the Tributaries also put down a shaft east of but quite near Wright's Level. It was sunk to the depth of forty feet where the reef was struck, and it is said good stone was got from the bottom. Further northward but still within a few yards of Wright's Level a shaft was sunk to the depth of sixteen feet and an adit was driven cutting the shaft about five feet from the bottom. This is known as "Harris' Tunnel." On the slope of the range towards the ghât and about three hundred and thirty feet east of "Harris' Tunnel" another adit was driven evidently for the purpose of cutting the reef. It has been continued for a distance of over fifty feet. It is not timbered, and near the mouth there is a fall of earth. It has intersected a small vein of quartz. It is nearly on the same level as the other adit below Wright's Level. A shallow pit was sunk south of the large excavation at Wright's Level with, I am informed, good results.

Another shaft now filled in and completely covered with broken quartz was sunk on the dip a few feet south of Wright's Level. It was fourteen feet in depth and a drive was put away for a distance of fourteen feet. It is stated that rich stone was got in the shaft and drive. Subsequently rich stone was broken out, it is said, at the north-western corner of the excavation.

The excavation at Wright's Level as it appears at present is eighty feet in length, twenty-two feet in breadth, and from ten to fifteen feet in depth.

Near the excavation at the Skull and about fourteen feet below it some native workings were re-opened by those who had the management of the mines. What is known as "Binny's Level" is situated a little distance northward of the Skull. The reef was cut here about twenty feet from the entrance. Still further northward is "Ryan's Level" which is about twenty-five yards from the battery. A commencement only was made with this work. Indeed it may be described as a hole from which broken quartz—the results of native labor—was carried away to the battery. An adit known as "Withers' Level" not far from the works was driven about fifty feet and then abandoned. It did not cut the reef. It was undertaken prior to the formation of the Alpha Company.

It would seem then that quartz in some quantities was taken and crushed by the Alpha Company and Tributurs from the Skull, from the excavation at Wright's Level, and from shallow pits and short adits near Wright's Level, and that seven adits were driven at various points and two shafts sunk which, even where the reef was struck, were, for reasons probably known to the Managers, discontinued. These works, the seven adits and the two shafts were unproductive, and it would be difficult to discover why they were undertaken at all. Having regard to the position of the battery nothing was to be gained by making adits east of Wright's Level.

It is probable that the Company expended some moneys in other similar works not known to me. I have, however, made every effort to ascertain the facts.

Yield of Gold from Quartz.

It will be apparent from the statements already made that little has been done to develop the reef within the boundaries of the Alpha Company's area or to determine its value. The apparently purposeless scratchings on the surface and the useless expenditure of moneys in driving short adits and sinking shallow pits have not even had the result of proving the character of the reef except at one or two points. It is however evident from the character and extent of the native workings and from experiments made in the laboratory that the stone in some places is highly auriferous.

The yields obtained by myself have been as follows:—

Wright's Level.		OZ. DWT. GR.	
1. No gold visible in the stone at the rate of ...	...	0 11 6.0	per ton of 2,240 lbs.
2. No gold visible in the stone ...	...	2 16 1.6	" " "
3. A little gold to be seen ...	...	56 13 19.5	" " "
4. Gold visible in the stone ...	...	204 11 16.7	" " "

Large blocks of quartz were broken out at the spot where the stone giving these results was obtained; and in several of these gold was visible. In one or two instances loose gold was found in cavities; and indeed some of the quartz was so rich that if portions of it had been tested the yields would have occasioned excitement amongst persons not acquainted with quartz mining, and unheeded of the cautions and statements which would necessarily have accompanied the report of any such yields. According to the judgment of those well able to form an opinion some of the quartz from the reef near Wright's Level would have yielded at the rate of 1,000 oz. or more per ton. The value of the reef however cannot be measured by such results. Where this quartz was obtained the vein is about four feet in thickness; and the heaviest gold is found mostly in the upper part of the vein, as it is now exposed, and near the foot-wall, throughout a thickness of two feet only. It is to be followed downwards across the line of dip for a distance of sixty feet where there is good stone showing gold near the footwall. Quartz with pyrites obtained from the adit below Wright's Level, and not on this run of gold, gave at the rate of only 3 dwt. 23.04 grs. per ton.

At the face of the large excavation at the Skull a vertical section of the reef was taken, and the results for the several parts were as follows:—

	Rate per Ton.		
	OZ.	DWT.	GRS.
1. One foot in thickness (hanging wall) ...	0	0	16.19
2. Three feet in thickness ...	0	0	9.92
3. Four feet in thickness ...	0	1	2.20
4. Five feet in thickness ...	0	2	2.21
5. Six inches in thickness ...	0	0	4.25

Northward of the excavation and within a few yards of it the run of gold is found, and quartz from that portion yielded at the rate of 1 oz. 4 dwt. 5 grs. per ton.

Mr. W. King, B. A., the Deputy Superintendent of the Geological Survey of India, estimated from preliminary crushings made by him that the yield per ton of the reefs in this district would be 7 dwts., and he refers to the results obtained by the Tributurs who worked at Wright's Level, viz., 11 dwts. and 17 dwts. per ton.

In the table attached to Mr. King's report in the *Records of the Geological Survey of India* (No. 3 — 1878, Vol. XI) it is stated that 769½ tons crushed by the Alpha Company gave an average yield of 2 dwts. 9 grs. per ton. One large parcel included in this return yielded only 1 dwt. 17 grs. per ton, but another parcel—6½ tons—treated at the Wynad Prospecting Company's works, yielded 19 dwts. 22 grs. per ton.

In a report, dated 2nd April 1875, Mr. King writes as follows:—

"Among the lodes detailed above [referring to a table] the Skull Reef about to be mined by the Alpha Company was tried most carefully by seven parcels of quartz obtained from one cross cut through the reef where it is 15 feet wide. There was no gold visible in the sample which gave the proportion of 25.92 dwt. to the ton. This rich proportion of gold is from a band of laminated quartz about 2 feet thick, within a couple of feet of the footwall or under-side of the reef. The average proportion from this two-foot band would be 22.68 dwts., or taking the 10th, 12th, and 13th feet of the 15-foot cross-cut, from each of which I have samples, we get a proportion of 16 dwts. for what appears to be the richest part of this reef. The work was done by hand and dry crushing."

In a pamphlet entitled "Gold Prospecting in the Wynad" a table is given which purports to be an extract from a report made by Mr. King. The experiments were made on quartz taken from the Skull Reef, and they are as follows:—

Appearance, Color, &c.	Results.	Depth in cross-cut from back of reef.
Compact, coarse texture, laminated, white color ...	2 dwts. to ton.	1st foot.
Still white in color but stained with ferruginous matter ...	2.5 dwts. to ton.	3rd foot.
Whitish, discolored with iron ...	None.	5th foot.
Whitish, discolored with iron, good color in dish-host in amalgamation ...	...	7th foot.
Still white but ferruginous matter ...	5.18 dwts. to ton.	10th foot.
Highly colored, red and brown, ferruginous, cellular with white iron pyrites; gold visible ...	19.41 dwts. to ton.	12th foot.
Highly colored, red and brown, washed and amalgamated in my presence by Mr. Withers; gold not visible ...	25.92 dwts. to ton.	13th foot."

In a printed report made by Mr. R. Lindon to the Directors of the Alpha Company there are results of trials as follows:—

	OZ.	DWT.	GR.
Quartz from Wright's Level, picked specimens ...	25	13	0
Quartz from Wright's Level, picked pieces without gold visible ...	11	13	0
Quartz from Skull working ...	0	6	16

It would be altogether injudicious to attempt to give an average from the above results; but they are sufficient to prove that the reef within the boundaries

of the Alpha Company's area is in some parts highly auriferous, and, having regard also to the large extent of native workings, that its character is such as to justify a Mining Company in opening it thoroughly with a view to the erection of works for treating the quartz.

The Machinery and Works.

The machinery consists of a battery of fifteen stamps, in three groups of five and a fourteen horse-power steam-engine having a tubular boiler and a fire-box constructed to burn coal. It was intended that this engine should drive also a pulverizer and a circular saw, both of which can be connected with the engine and are under the same roof as that which covers the stamps and the engine. The stamps, including the shanks and discs, are said to weigh about $3\frac{1}{2}$ cwt. each, but they appear to be very much heavier. Motion is given to the stamps by cams attached to a shaft. The coffers in which the stampers work have in front of them only (and not at the back) perforated iron plates with 125 holes to the square inch. There are three copper plates, four feet six inches in width—one is seven-teen inches in length, one three feet eleven inches, and the lowest twenty inches. These are divided by ripples. The angle of inclination of the plates is from 3° to $3\frac{1}{4}^{\circ}$, but they are not even. They bulge a little in some places. The tables are from ten feet eight inches to twenty-six feet in length, each group of stamps having tables of different lengths; each table is in three partitions, seventeen inches in width; the angle of inclination of the tables is 6° . The blankets were nine feet in length, and only nine feet in length of the tables were covered with blankets. The tailings ran through launders to catchpits.

A small furnace for roasting the tailings, a retorting furnace and kilns for roasting the quartz previous to crushing, complete the list of appliances at the mill.

The information I have received furnishes a melancholy history of the various attempts to work the machinery. When it was erected, it is said, it worked very well, that is to say, the machinery moved smoothly, but it never crushed any such quantities of stone as ought to have been crushed. One day about eight tons of stone were crushed; but the Alpha Company crushed, at the best of times, only seven tons in twenty-four hours, and even this rate would not be maintained. It was found impossible to move the stamps, the pulverizer and the circular saw at the same time. The engine, it is stated, was worked at a pressure of 60 lbs., but it was never possible to keep up steam. It usually took three hours to get up steam. No firewood was stored. It was cut green, and even old wood that was gathered was often quite wet.

The present condition of the battery and tables is, of course, worse than it was when they were erected. The weather and use have injured them; and one of the Managers in order to re-arrange the tables of the middle battery, according to his ideas, cut away one of the main bed-logs, and since that was done the vibration has been so great, with the machinery in motion, as to shake the tables to pieces. The wood of the tables is shrunken and warped; there are numerous apertures through which water, quicksilver, and amalgam could escape; and I am told that 35 lbs. of quicksilver were found under one table. The fall from the coffers is not on to the plates; there is a space of over an inch between the plates and the edge of the coffers, and even now the course which the water and tailings took as they escaped through this aperture is plainly to be seen under the tables. The fastenings, too, are bad; the nuts and washers below the coffers do not cover the holes in the plates for the bolts, and the mercury and amalgam fell through the spaces thus exposed. Some of the arms of the drum for the belt connecting the engine with the pulverizer are broken, owing, it is supposed, to their having been screwed up too tightly.

The pulverizer is said to have reduced the tailings to a fine powder, but the quicksilver "floured" owing to the iron pyrites not being properly roasted.

About 10 cwt. of "tailings" could be ground by this machine in a day. Owing to the condition of the machinery I would not deem it prudent to put the pulverizer in motion. It is to be noted that the taps through which the quicksilver or amalgam flows from the pulverizer are made of brass. They are now nearly entirely eaten away.

The Treatment of the Quartz and the Results.

From information furnished by the Directors it appears that mining operations were commenced by the Alpha Company in February 1875, and ceased in March 1876, and that the total quantity of quartz treated from first to last was $779\frac{1}{2}$ tons. The time occupied in crushing and treating this quantity was seven months, including stoppages. The gold obtained weighed 91 oz. 12 dwt. 23 grs., being at the rate of 2 dwt. 8.43 grs. nearly per ton. This is inclusive of six tons and a-half which were treated at the Wynad Prospecting Company's works for the Alpha Company, and which, as already stated, yielded at the rate of 19 dwt. 22 grs. per ton. The average cost of raising quartz was Rs. 2 per ton; the average cost of conveying the stone to the mill was Rs. 1-8-0 per ton, and the average cost of crushing Rs. 1-13-0, per ton. The total cost of raising and crushing quartz is stated to have been Rs. 2,971-6-0.

To these must be added the following items as given in the statements furnished by the Directors:—Firewood (estimated) Rs. 50 (per week); Timbering in the mine, Rs. 150; Blasting-powder, Rs. 700; and Quicksilver (quantity used not known), Rs. 3,000. The cost of supervision is set down at Rs. 2,384 for seven months only. The machinery is stated to have cost Rs. 25,000, and the erecting of it about Rs. 1,800. The construction of roads cost Rs. 795-7-7.

The aggregate of these sums, including interest on the capital invested, shows that the quartz, for raising, treating, supervision, stores, &c., must have cost more than Rs. 15 per ton or, to put the matter in another way, that the gold was obtained at an expense of Rs. 127 per ounce.

The balance sheet of the Alpha Company, prepared by the Secretaries and Treasurers (copy hereto marked A) shows that the sums expended in preliminary expenses were Rs. 8,708-4-5, and in supervision, management, &c., Rs. 14,675-11-9; and the only point in the statement that is really important is the relatively small sum expended in actual mining operations, which under the head of "Mining, Felling, and Storage" is set down as Rs. 11,327-0-10. The value of the gold got, the result of these operations, is stated at Rs. 3,037-6-3.

The stone treated at the Wynad Prospecting Company's works, six tons and a-half, was got from the reef at Wright's Level, and it cost for sinking the shaft and raising Rs. 70-10-0; for breaking Rs. 3-10-0; for conveyance to the works Rs. 21; and for crushing Rs. 65—total Rs. 160-4-0.

The gold got sold for Rs. 297-6-3. The stone treated by the Alpha Company at their works was not roasted before being sent to the mill; but the "tailings" collected in the settling pits were roasted in a furnace and ground in the pulverizer. I have not been informed as to the results of the treatment of the tailings.

The stone crushed for the Alpha Company at the Wynad Prospecting Company's works was roasted before being crushed.

"The Prince of Wales Quartz Reef Gold Prospecting Company" took possession of the Alpha Works on the 1st June 1877 under an agreement with the Alpha Company. They commenced mining operations on the 17th August 1877, and continued to mine with some interruptions until the end of February 1878. The pecuniary results of this adventure are shown in the balance sheet hereto marked B. The value of the gold got, including specimens, is stated at Rupees 8,132-10-8.

Copies of the reports furnished by the Manager, as well as several papers relating to this Company's proceedings, have been placed in my hands for perusal by one of the proprietors, and I gather the following facts from them:—

Quartz crushed and treated.

	TONS.	Average yield per Ton.		
		OZ.	DWT.	GRS.
Wright's Level 41½	63	...	...	...
Skull Reef	104½	...	...	...
Skull Reef	12	...	0	2 18.5
Wright's Level 50	...	...	0	2 5
Do.	50	...	0	11 19
Do.	104	...	0	16 12.5
Do.	2	...	0	14 21.34
		...	0	8 0

The average yield per ton from these parcels was 10 dwts. 12 grs. nearly. Pieces of quartz containing gold were sold for Rs. 1,251-4-0. The "specimens" containing gold got from the parcel of 104 tons are said to have been sold for Rs. 920, and it may be assumed therefore that the stone was very rich.

There is not much information to be obtained as to the mode of treatment pursued by the Alpha Company, but it is stated that the stamper-boxes were charged with quicksilver, not largely, and that they relied mainly on their copper-plates and ripples for saving the gold. They used sodium amalgam very freely.

The Manager of the Prince of Wales Tribute Company has furnished many details respecting the mode of treating the quartz when the results of the operations were apparently to some extent satisfactory to the shareholders.

Kilns were built, and the stone before being sent to the mill was roasted. Wood was placed in the kilns and the stone piled thereon and the roasting was continued for forty-eight hours.

He informs me that a small quantity of quicksilver was put in the coffers two or three times a day according to the estimated richness of the stone. On the copper plates 2½ per cent. of sodium amalgam was used with the quicksilver, and in the pulverizer as much as 3 per cent. Still the quicksilver "floured."

Blankets of the ordinary kind were used, and the length covered by the blankets was nine feet. They were washed every half hour. It seems that all the tables were for this length covered with blankets and the water was allowed to spread itself over the whole.

Water was conveyed to the mill through troughs which discharged into a tank, and an iron pipe, fed from the tank, was fixed in front of the battery. To this were attached smaller pipes provided with taps, two to each battery, and when the supply was sufficient the water must have entered the coffers with great force. The flow, however, was not even, the smaller pipes were often choked with grass, and owing to the troughs or boxes being badly made and improperly placed the water escaped and sometimes there was not sufficient for the tables.

The stone was broken by hand before being sent to the mill, at a cost of nine annas per ton.

The feeding was very irregular. It happened not seldom that so much quartz was put into a coffer as to stop the action of the stamper, and at other times the coffer was not fed and the disc struck upon and injured the cam.

Oil from the machinery often dropped on the plates and it found its way also into the coffers.

Tailings escaped from the catchpits.

The stone treated, as already mentioned, must have been rich. In one "cleaning up" of a stamp-box coarse pieces of gold were found weighing from 6 grs. to 3 dwts., and of these about thirty were obtained; one piece weighed about 7½ dwts.

Causes of Failure.

The first important step taken by the Alpha Company was to erect machinery, and subsequently they made attempts under the advice of various Managers to open their main reef. As stated in another part of this report they first quarried stone at the native workings on the northern extension of the reef, and subsequently at the southern portion of it, but no successful effort was made to mine systematically. There was consequently unnecessary cost incurred in getting stone, and great cost in conveying it to the mill.

There was no stone-breaking machine at the mill; the stone was broken by hand. There was no self-feeding apparatus; the feeding was irregular; and the platform on which the quartz was delivered was not partitioned off from the stampers and engine. The dust rose sometimes in clouds and fell on the bearers, injuring them and rendering necessary a large supply of oil, &c., for lubricating the various parts of the machinery; some of which often dropped on the plates, thus making effective amalgamation impossible, even if there had not been other detrimental influences in operation.

A great error was committed by the Tribute Company in roasting the quartz in kilns before sending it to the mill. Nearly all the quartz in the reef is more or less pyritous, and the percentage of iron pyrites in several sections probably varies from 0.1 or less to 5 per cent., and when this is placed in a kiln in the manner described elsewhere in this report it is impossible to oxydise the sulphur. The fusible lower sulphides coat the gold and prevent its amalgamation with mercury. The roasted stone I have seen in Devalah is often a slag, and any gold in it must be "glazed."

Sodium amalgam appears to have been used in excessive quantities. This amalgam has all the valuable properties ascribed to it by the patentee, Mr. William Crookes, F.R.S.; but the utmost care and caution are necessary in using it in the extraction of gold and silver. A very minute quantity of sodium amalgam added to quicksilver has the effect of rendering the metal more mobile and more "eager" for gold, and therefore it is the more likely to escape from the mill and carry the fine gold with it unless the ripples are properly arranged and other precautions taken.

It was a mistake to put quicksilver in the coffers. The undecomposed pyrites, reduced to powder, would accumulate in the coffers and cause the "sickening" and "flouring" of the mercury. The metal breaking up into minute globules or adhering to the powdered pyrites would be carried away.

If no quicksilver had been put in the coffers the copper plates might have been dispensed with.

The inclination of the tables was excessive. Instead of 1 in 10 they should have been not more than 1 in 14 or 1 in 16.

The water from the battery (often insufficient) was allowed to spread itself over the whole extent of the tables, whereas, as there was not sufficient water, but under any circumstances, it should have been so regulated as to carry the tailings evenly over the blankets. And the length of the blanketing, nine feet, was not enough. I have been informed that iron pyrites from the Alpha Mill was taken out of the bed of the stream quite 200 yards away, and that it was found to yield 1 oz. to the ton.

Buddles were not used for concentrating the tailings, and a large proportion of the stuff sent to the furnace must have consisted of quartz.

The furnace which was built by the Tributors is unsuitable for treating pyrites.

The steam-engine was never equal to the duty required of it. One of forty horse-power would be needed to drive the stampers and keep in motion the pulverizer, fully charged, and the saw. The Alpha Company and the Tributors are said to have crushed 1,102 tons of quartz in fifteen months: if the machinery had been effective, and if the works had been skilfully managed, at least 11,000 tons should have been reduced in fifteen months.

During the whole period that the works were in operation, when only an average of 2.8 tons were crushed per diem, the expenses of management, dead-work, &c., were running on as well as interest on the capital invested, and it is not a matter for wonder that doing only one-tenth of the work that ought to have been done the two adventures were not remunerative.

The greatest credit it appears to me is due, however, to the projectors for their spirit and enterprise. They failed because they did not first of all commence to mine, and because they had not appliances for saving gold.

How the Operations should be conducted.

A run of gold in the main reef is found at Wright's Level, and this has been followed for a distance of sixty feet. I would advise that in the first instance this run should be followed still further on the underlie—say—if the good stone continues—for 100 feet or 150 feet; that the shaft should be well and safely timbered, and that skids should be put in so that the quartz might be brought to grass with facility. It may be assumed, judging from the stone already taken out, that the quartz from this shaft would yield a fair proportion of gold.

This preliminary work, but productive, would indicate the best site for a main adit, and that will be found at a point on the slope of the ghât eastward of Wright's Level.

This main adit running west should be driven at a low level so as to intersect the reef at a considerable depth below the outcrop on the ridge.

From this adit and other cross-cuts the reef could be mined economically. It could be stoped from different levels quite up to the surface. A site for the battery could be found near the mouth of the main adit. All these undertakings and all arrangements connected with them should be well considered, and the objects in view should be to open the mine on a good plan, and to raise a large quantity of stone which from careful assays should show such a yield per ton as would justify the erection of machinery.

I recommend that water-power be employed for driving the machinery, either an over-shot wheel or a turbine.

I regret to say that I am not sufficiently acquainted with the laws or regulations in force in India under which water may be diverted, but it would be no doubt practicable to arrange for the diversion of water from the stream near the Wynad Prospecting Company's works.

Perhaps reservoirs would have to be constructed for storing water.

The relative cost of using steam and water in this district cannot be fairly estimated by me, as I am ignorant at what cost fuel could be got if proper arrangements were made for procuring it in large quantities, but in mills elsewhere the proportions are—for water about 1.2, and for steam 2.1.

There is not much at the Alpha Mill that could be used in any new adventure. The stamps could be made available, and the coffer seems to be uninjured and might again be set up; but in my humble opinion it would be more economical to procure a new plant furnished with all the best appliances than to patch up the machinery at the Alpha.

All patent contrivances that have not been proved to be of value by a lengthened experience should be rejected, and only those adopted that are known to have yielded good results and now find a place in the best conducted mines.

As well as a battery there would be required:—

- (a.) A stone-breaking machine. The smaller pieces of quartz would be separated from the larger and sent direct to the stamps and the latter to the stone-breaking machine.
- (b.) A self-feeding hopper.

(c.) A buddle for concentrating the "tailings" which are saved in the settling boxes.

(d.) An inclined reverberatory furnace for roasting the "tailings." This would consist of a fire-box, hearth, &c., and should be on the plan of some of those that have given the best results in Victoria.

The quartz should be crushed raw. Quicksilver should not be used in the coffer: and copper platforms are likely to cause a loss of amalgam, and I do not recommend that they should be employed. Ripples and blanket-strakes will do the work more effectually. The tables should be twenty feet or more in length, and about fourteen inches in breadth for each stamp-head; the fall should be about one in sixteen (if a good supply of water is maintained), and they should be covered with closely woven green baize.

Experience would of course lead to some modifications in the arrangements, but it would not be difficult to adjust the length and fall of the tables so as to meet any conditions that might arise.

Summary.

I have endeavoured to indicate as briefly as possible the causes which prevented the Alpha Company from obtaining profitable results from their adventure. I am satisfied that their machinery and appliances are such as to make it impossible to save the gold even if the best scientific and technical knowledge was brought to bear on the operations. The one fact that oil and grease were allowed to fall on the copper plates and to get into the coffer is sufficient to show what the state of affairs was when the best results were obtained.

The main reef within the area held by the Alpha Company is nearly 2,000 feet in length; it is from 4 to 14 feet (at least) in thickness; in one part the quartz is of extraordinary richness; and other parts have yielded well.

Native miners have picked what must have been auriferous quartz all along the outcrop, and at the "Skull" their excavations are extensive. The position of the reef and the formation of the ground both offer facilities for economical mining.

It appears that the yields of gold have been for 779½ tons of quartz 2 dwts. 9 grs., and for 322.66 tons, 10 dwts. 12 grs., and the gold was got, as I have shown, under the most disadvantageous circumstances.

These results may be compared with some operations in Australia.

The compilation of mineral statistics was commenced in Victoria in 1860, and from 1860 to 1876 (inclusive) information has been obtained respecting the results of the treatment of 13,402,915 tons of quartz, and the returns show an average yield of 11 dwts. 6.30 grs. per ton. The average yield of gold from 1,011,808 tons crushed in Victoria during the year 1876 was 10 dwt. 13.48 grs. per ton.

The Black Hill Company at Ballarat crushed 283,550 tons, which yielded an average of 2 dwt. 23 grs. per ton and the dividends paid amounted to £23,900. It is stated that the machinery cost £10,030, and that the Company paid £24,235 for "claims" (i.e. land on which to mine).

Other Companies have treated large quantities of quartz yielding averages per ton of 2 dwt. 13.4 grs.; 3 dwts. 6.01 grs.; 3 dwts. 7.89 grs.; and 3 dwts. 18.53 grs., and have paid dividends.

The prices paid by the Alpha Company and Tributaries for labor, for timber, and for firewood are no criteria to guide me in estimating the costs of mining at Devalah. Under skilful management arrangements would be made for procuring all necessary supplies at the minimum cost, but in desultory operations the maximum cost as a matter of course has to be paid.

In reply to the questions in the paper, dated 10th January 1879, No. 42, I can safely say that the want of success of the Alpha Company has not arisen from any peculiar difficulties in separating the gold from the matrix, and I cannot believe the cost of labor or fuel would be so great here as injuriously to affect mining pursuits.

In this report I have omitted all details that appeared to me not necessary to the full elucidation of the questions with which I was instructed to deal.

I have the honor to be,

Sir,

Your most obedient Servant,

(Signed) R. BROUGH SMYTH,
Mining Engineer.

Note—The late Manager of the Prince of Wales Tribute Company states that the wages paid for native labor were from four to five annas per diem; the cost of fuel was Rupees 3 per ton; the cost of drilling in hard rock was four annas per foot, and in soft rock two annas per foot; and the cost of driving such adits as are seen here varied from six annas to Rupees 3 per foot.

The cost of carrying stone from the "Skull" to the battery was six annas per ton, and the cost of carting stone from Wright's Level to the battery was thirteen annas per ton.

A.
Balance Sheet of the Southern India Gold Mining Company Limited, 30th April 1878. C.

[illegible]

The "Prince of Wales" Quartz Reef Gold Prospecting Company.
Details of Tribute Company's Expenditure to 28th February 1878.

Cash expended.			Cash received.		
	£s.	s. d.		£s.	s. d.
Superintendence	2,877	3 4	From Prince of Wales Com- pany.	3,088	2 1
Buildings	259	2 10	By fines	7	12 0
Roads	146	8 6	From sale of a bullock ...	30	0 0
Engine-Drivers	543	0 0	Do. do. of October's gold ...	635	12 8
Do. Repairs	615	5 0	Do. do. of November's gold and specimens.	1,223	6 0
Do. House	731	1 8	From sale of December's gold and specimens.	2,012	3 0
Artisans	421	12 0	From sale of January's gold and specimens.	4,261	5 0
Reverberating Furnace ...	79	15 6	From sale of February's gold and specimens.		
Fuel	924	7 8	By sale of stock in hand (at auction).	11,235	8 4
Carts and Bullocks	250	0 0		506	4 0
Keep of Bullocks	100	13 6		11,564	12 9
Mining	1,600	1 0	Balance in hand	1,954	0 1
Tools	319	5 0		9,610	12 8
Variously and Sundries ...	712	6 3	Total...	1,954	0 1
	9,610	12 8	By balance in hand	1,954	0 1
To repairs, &c, to Alpha block and stock.	1,274	0 0	Total ...	1,954	0 1
To profits realised by Tribute Company.	680	0 1			
Total...	1,954	0 1			

Exd. W. H. French.

Devulak, 18th February 1878

From R. Brough Smyth

To J. H. Garstin Esq
C. S. I.,

Acting Secretary to Government

Sir,

Referring to the paper dated
10th January 1879 No. 42, wherein
I am instructed by the Government
to ascertain how it is that
notwithstanding the presence
of considerable quantities of
gold in the reefs at the
Alpha Mine and to the
extent reported by me
operating

operations have not proved successful,
and especially whether this want of
success has arisen from any peculiar
difficulties in separating the gold
from the matrix at this particular
spot or from the cost of labor
or fuel or from other reasons
within or beyond the control of
the mine proprietors I now do myself
the honor to submit the following
report for the consideration of
His Grace the Governor in Council.

Preliminary.

Immediately on receipt of the
instructions above referred to, and
as directed by the Government, I
communicated with the Directors
of the Alpha Company and sought
permission

permission to make a careful examination of the Mine, and at the same time I asked a number of questions respecting the operations of the Company.

Subsequently, I wrote to the Secretaries and Treasurers in Madras requesting them to furnish such information respecting the work done in the past as they could supply.

The Directors very promptly furnished papers relating to the expenditure of money, the quantities of quartz raised and the results, and they replied to some of the questions asked by me; and I would wish to record my appreciation of the assistance afforded by them, by Messrs Parry and Company and by Mr. G. E. Withers who at one time had the management of the works under

4

under what is known as "The Prince
of Wales Quartz Reef Gold Prospecting
Company" - a company which held
and worked the Alpha Mine on tribute
for a brief period.

Though necessarily from the nature
of the duties which I have had to discharge
since I came to this district I was well
acquainted with the mine and the machinery
of the Alpha Company I have since the receipt
of instructions made a further careful
examination of the land held by them,
the reefs, and the works erected for the
purpose of reducing the auriferous quartz.

The area granted to the Alpha Company.

I have not been able to obtain a
plan or a ^{sufficient} description of the boundaries
of the area granted to the Alpha
Company. The extent is said to be
fifteen acres, but on the map of the
District.

322.
Duck L'long Valley and 3 Anshams of South
East Wymond the area marked "Alpha
Company" exceeds one hundred acres.

The lines of demarcation as pointed out to
me on the ground seem to embrace a larger
area than fifteen acres.

The boundaries are thus described in the
Prospectus of the Company: - "A block of
fifteen acres bounded on the west and
south by two large streams, and on
the east and north by four demarcation
stones.

As my report deals principally with
only so much of the main reef as is known
to be within the area granted to the company,
the question of boundaries need not be
further referred to.

The Quartz Veins.

The principal Quartz vein intersecting
the land is that known as the "Skull
reef". It appears at the surface
at

at various points between "Wright's Level" and the northern boundary of the Company's area and is traceable further northward for a great distance. Wright's Level is on the eastern slope of the range that forms the western rim of the basin drained by the Carcoor Poya, and is distant thirty chains from the Alpha Mill.

The country is intersected by streams trending to the Carcoor Poya, and there are low and high hills, some very steep, but nearly all with smooth contours.

At Wright's Level the vein is from four to five feet in thickness near the surface, and seven feet six inches at a depth of thirty feet. Its strike for a distance of more than one ~~mile~~ chain is nearly north and south and the dip is east at an angle of 30° to 40° .

The quartz in some parts of the vein is laminated.

82/17
laminated, the laminae being from two to four inches and more in thickness and they are nearly parallel to the line of strike.

These are crossed by other lines transverse to the dip and strike and there are in places thin veins of talcose clay cutting the reef transversely.

There is also solid iron-free nearly white quartz. Near the surface the stone when broken out is seen to be highly ferruginous and is colored yellow, bright red and bluish-purple. Much of the quartz is cavernous, honeycombed or mic-
-cated and the associated minerals near the upper part of the vein are limonite and other oxides of iron due to the decomposition of iron pyrites which are found in considerable quantities in the deeper levels. Sulphur is also seen occasionally in cavities.

I have not seen any. Sulphide of Antimony or any of the ones of lead.

Northward strike changes from
Wrights

Wright's level, an adit made by native miners has been re-opened by me, and the thickness of the reef at this point is four feet; the strike is nearly north and south; and the dip is nearly due East at an angle at the outcrop of 45° and at a depth of twenty four feet 60° nearly.

A section taken from the middle of this reef shows massive white nearly iron-free quartz. It is ferruginous and cavernous near the hanging wall and footwall.

at the large excavation from which the reef derives its name about twenty two chains north of Wright's level the vein is thick: at the face it is not less than fourteen feet from the hanging wall ^{what appears to be} to a "house" the extent of which has not been ascertained. The total thickness of the reef at this point is not known.

The general character of the stone is similar to that at Wright's level; but there is

is much more sulphur. It is not difficult
to find rather large quantities of clean
sulphur in the cavities. Here also there
is an absence of those minerals that are
most detrimental to amalgamation.

The strike of the reef is $N 20^{\circ} W$ and the
dip $N 70^{\circ} E$ at an angle of 18° to 30° but
the dip nowhere is uniform.

About four chains and fifty six links
northwesterly from the excavation the
reef is again seen on the bandy road
where it intersects a low hill. Here the
dip is $N 80^{\circ} E$ at an angle of 40° and
the thickness as well as can be observed
is six feet.

On the north-western
side of the hill the outcrop is again
found, and it is seen also on the further
side of a stream which runs at the
foot of the hill.

On a bandy
road southerly of the Skull reef
there are thin ferruginous veins
containing numerous cubes of
iron.

11 32/100
for a length of more than three hundred yards. There are also numerous subsidary small channels and deep and large excavations. On following the main channel downwards (it commences at the outcrop of the reef at Wright's level) in a direction 8° South of west a strong vein of quartz is found nearly three hundred and fifty yards from the alpha workings. One shaft has been sunk here but the reef has not been excavated. It appears to have a strike of $N 30^{\circ} W$. and is probably a continuation of that which crops out in the jungle on the further side of a stream trending towards the ghat. The existence of these native workings and the reef referred to is, I am informed, unknown to the proprietors of the Alpha Mine. Surrounding the recent excavation at Wright's level there are other native workings evidently very ancient. There are several shallow

shallow pits and small excavations; and
heaps of broken quartz are to be seen
all along the strike of the reef. - at
one place, between Wright's level and
the Skull there is a shallow pit communicating
with an aperture like a chimney in
which it is probable the quartz was
roasted.

Near the Skull and for some
distance northwards the workings
are numerous; and at the Skull
itself there is an excavation the full
extent of which cannot be ascertained
as the roof has fallen: as far as ^{it} can
be ~~ascertained~~ examined it shows a
width at the entrance of twenty nine
links, a breadth at the broadest part
of fifty three links; and it measures
seventy five links to the mouth of
a drive which cannot be followed
until some expenditure is incurred
in clearing it and securing it. The

13 8/32 (15)

The height of the excavation from floor to roof is twenty five links. There are vertical shafts communicating with this excavation which no doubt were sunk long before the adit was commenced. The amount of work done on the reef is conclusive proof that the native miners found gold in quantities sufficient to remunerate them. They appear to have dug into the soft casing and taken stone from the footwall but they did not confine their operations to this part of the reef. They followed the run of gold whenever they were able to do so.

According to the information I have been able to obtain it appears that the Alpha Company commenced their mining operations by quarrying stone in the old native workings at

14 8/23 14
at the Skull where they took out about
one hundred tons of quartz. Subsequently
they quarried stone near Wright's level,
and then the adit named Wright's level
was driven for a length of about
twenty feet.

at a point a little more than ninety
feet eastward of Wright's level and
twenty five feet below it an adit forty
two feet in length, five feet in width
and six feet in height was driven to
cut the reef. and the reef is now seen in
the "face" where a hole has been sunk
in quartz to the depth of five feet. -

The ^{or the Tributaries,} company also put down a shaft east of
but quite near Wright's level. It was sunk
to the depth of forty feet where the reef was
struck and it is said, good stone was got
from the bottom. . . . Further northward
but still within a few yards of Wright's
level a shaft was sunk to the depth of
sixteen feet and an adit was driven
cutting the shaft about five feet from
the bottom. This is known as
"Harris's"

8/25 (15)

"Harris's Tunnel." On the slope of the range towards the Ghat and about three hundred and thirty feet east of "Harris's Tunnel" another adit was driven evidently for the purpose of cutting the reef. It has been continued for a distance of over fifty feet. It is not timbered and near the mouth there is a fall of earth. It has intersected a small vein of quartz. It is nearly on the same level as the other adit below Wright's level.

a shallow pit was sunk south of the large excavation at Wright's level with, I am informed, good results.

Another shaft now filled in and completely covered with broken quartz was sunk on the dip a few feet south of Wright's level. It was fourteen feet in depth and a drive was put away for a distance of fourteen feet. It is stated that rich stone was got in the shaft and drive.

Subsequently
rich

16 827 16
rich stone was broken out, it is said, at
the northwestern corner of the excavation.

The excavation at Wright's level as
it appears at present, is eighty feet
in length, twenty two feet in breadth and
from ten to fifteen feet in depth.

Near the excavation at the Skull
and about fourteen feet below it
some native workings were re-opened
by those who had the management of the
mine.

What is known as
"Boring's level" is situated a little distance
northward of the Skull. The reef was cut
here about twenty feet from the entrance.
Still further northward is "Ryan's level"
which is about twenty five yards from
the Battery. A commencement only
was made with this work. Indeed
it may be described as a hole from
which broken quartz - the results of
native labor - was carried away to the
Battery.

An adit
known

17 25/30 (17)
Known as "Withers' level" - not far
from the works - was driven about
fifty feet and then abandoned.
It did not cut the reef. It was
undertaken prior to the formation of
the Alpha Company.

It would seem then that quartz
in some quantities was taken and
crushed by the Alpha Company and
tributers from the Skull, from
the excavation at Wright's level and
from shallow ^{pits} and short adits near
Wright's level, and that seven
adits were driven at various points
and two shafts sunk which, even where
the reef was struck, were for reasons
probably known to the managers
discontinued. These works -
the seven adits and the two shafts -
were unproductive - and it would be
difficult to discover why they were
undertaken

18 822 18
undertaken at all. Having regard
to the position of the battery nothing was
to be gained by making adits East
of Wright's level, ~~and~~

It is probable that the Company
expended some money in other similar
works - not known to me. I have
however made every effort to ascertain
the facts.

Yield of Gold from Quartz.

It will be apparent from the statements
already made that little has been done
to develop the reef within the boundaries
of the Alpha Company's area or to
determine its value. The apparently
purposeless scratchings on the surface
and the useless expenditure of money in
driving short adits and sinking shallow
pits have not even had the result of
proving the character of the reef except
at one or two points. It

17 27/3/78 11

It is however evident from the character and extent of the native workings and from experiments made in the Laboratory that the stone in some places is highly auriferous. The yields obtained by myself have been as follows:-

Wright's level 1. No gold visible in the stone.	3. dwt. gr.	
At the rate of	0.. 11. 60	per ton of 2240 lbs
2. No gold visible in the stone	2.. 16. 1.6	" " " "
3 a little gold to be seen	56. 13. 19.5	" " " "
4. Gold visible in the stone	204. 11. 16.7	" " " "

Large blocks of quartz were broken out at the spot where the stone giving these results was obtained; and in several of these gold was visible. In one or two instances loose gold was found in cavities; and indeed some of the quartz was so rich that if portions of it had been tested the yields would have occasioned ~~any~~ excitement amongst persons not acquainted with such

Quartz mining, and unheeded of the cautions and statements which would necessarily have accompanied the report of any such fields. According to the judgment of those well able to form an opinion some of the quartz from the reef near Wright's level would have yielded at the rate of 1000 oz. or more per ton. The value of the reef however cannot be measured by such results. Where this quartz was obtained the vein is about four feet in thickness; and the heaviest gold is found mostly in the upper part of the vein, as it is now exposed, and near the foot wall, throughout a thickness of two feet only. It is to be followed downward across the line of ~~unusually high~~ dip for a distance of sixty feet where there is good stone showing gold near the foot wall.

Quartz

Quartz with pyrites obtained from the adit below Wright's Level, and not on the run of gold gave at the rate of only 3 dwts. 23.04 grs. per ton.

At the face of the large excavation at the skull a vertical section of the reef was taken and the results for the several parts were as follows: -

	Dwts. per ton	
	oz.	dwt.
1. One foot in thickness (Hanging wall)	0.	0.16
2 Three feet in thickness - - - - -	0.	0.99
3. Four feet in thickness - - - - -	0.	1.22
4. Five feet in thickness - - - - -	0.	2.22
5. Six inches in thickness - - - - -	0.	0.42

Northward of the excavation and within a few yards of it the run of gold is found, and quartz from that portion yielded at the rate of 1 oz. 4 dwts. 5 grs. per ton.

Mr. W. King B. A., the Deputy Superintendent of the Geological Survey of India, estimated from preliminary crushings made by him that the yield per ton of the reefs in this district would be 7 dwts. ~~per ton~~ and he refers to

22 8²⁷/₃₁ (28)

to the results obtained by the Tributors who worked at Wright's level - namely 11 dwts and 17 dwts per ton.

In the table attached to Mr. King's report in the Records of the Geological Survey of India (No 3 - 1878 - Vol. XI.) it is stated that 769½ tons crushed by the Alpha Company gave an average yield of 2 dwts 9 grs. per ton. One ^{large} parcel included in this return yielded only 1 dwt. 17 grs per ton, but another parcel - 6½ tons - treated at the Wyand Prospecting Company's works - yielded 19 dwts. 22 grs. per ton.

In a report dated 2nd April 1875 Mr. King writes as follows: -

"Among the lodes detailed above [referring to a table] the Skull reef about to be mined by the Alpha Company was tried most carefully by seven parcels of quartz obtained from one cross-cut through the reef where it is 15 feet wide. There was no gold visible in the sample which gave the proportion of 25.92 dwts. to the ton. This rich proportion of gold is from a

a band of laminated quartz about 2 feet thick, within a couple of feet of the foot-wall or underside of the reef. The average proportion from 1 is two feet band would be 22.68 dwts., on taking the 10th 12th and 15th feet of the 15-foot Cross-cut from each of which I have samples, we get a proportion of 16 dwts. for what appears to be the richest part of this reef. The work was done by hand and dry crushing."

In a pamphlet entitled "Gold Prospecting in the Wyand" a table is given which purports to be an extract from a report made by W. King. The experiments were made on Quartz taken from the Skull reef and they are as follows:—

Appearance Color &c.	Results	Depth in Cross-cut from back of reef.—
Compact, coarse texture, laminated, white color.	2 dwts. to ton	1 st foot
Still white in color but stained with ferruginous matter	2.5 dwts. to ton	3 rd foot
Whitish, discolored with iron	None	5 th foot
do. do. do.	Good color in dish. Lost in amalgamation	7 th foot

a band of laminated quartz about 2 feet thick, within a couple of feet of the foot-wall or underside of the reef. The average proportion from 1 is two feet band would be 22.68 dwts., or taking the 10th 12th and 15th feet of the 15-foot cross-cut from each of which I have samples, we get a proportion of 16 dwts. for what appears to be the richest part of this reef. The work was done by hand and dry crushing."

In a pamphlet entitled "Gold Prospecting in the Wymad" a table is given which purports to be an extract from a report made by W. King. The experiments were made on quartz taken from the Skull reef and they are as follows:—

Appearance Color &c.	Results	Depth in Cross-cut from back of reef—
Compact, coarse texture, laminated, white color.	2 dwts. to ton	1 st foot
Still white in color but stained with ferruginous matter	2.5 dwts. to ton	3 rd foot
Whitish, discolored with iron.	None	5 th foot
do. do. do.	Good color in dish. Lost in amalgamation	7 th foot

Results

24 Depth in cross-cut
from back of reef.

" Still white but ferruginous
Matter - - - - - 18 dwt. to ton ... 10th foot.
Highly colored, red
and brown, ferruginous,
cellular with white
iron pyrites. Gold
visible - - - - - 19.44 dwt. to ton - - - 12th foot.
Do. Do. washed
and amalgamated
in my presence by Mr.
Withers. Gold not visible 25.92 dwt. to ton 13th foot.

In a printed report made by Mr. R.
Lindon to the Directors of the Alpha Company
there are results of trials as follows: -

Quartz from Wright's level. Picked specimens...	3 dwt. 91
Quartz. Wright's level. Picked pieces without gold visible - - - - -	25: 13: 0
Quartz from Skull working - - - - -	11: 13: 0
	0: 6: 16

It would be altogether injudicious to
attempt to give an average from the
above results; but they are sufficient
to prove that the reef within the boundaries
of the Alpha Company's area is in
some

25 737
Some parts highly auriferous and
having regard also to the large extent
of native workings that its character is
such as to justify a mining company
in opening it thoroughly with a view
to the erection of works for treating
the quartz.

The Machinery and works.

The machinery consists of a battery of
fifteen stamps, in three groups of five -
and a fourteen horse-power Steam Engine
having a tubular boiler and a fire-box
constructed to burn coal. It was intended
that this engine should drive also a
Pulverizer and a circular saw, both of
which can be connected with the engine
and are under the same roof as that
which covers the stamps and the engine.

The stamps, including the shanks and
discs are said to weigh about $3\frac{1}{2}$ cwt.
each, but they appear to be very much

much heavier. Motion is given to the stamps by cams attached to a shaft. The coffers in which the stampers work have in front of them only (and not at the back) perforated iron plates with 125 holes to the square inch. There are three copper plates - four feet six inches in width: - One is seventeen inches in length, one three feet eleven inches, and the lowest twenty inches. These are divided by nipples. The angle of inclination of the plates is from 3° to $3\frac{1}{4}^{\circ}$ but they are not ^{even} ~~perfect~~. They bulge a little in some places. The tables are from ten feet eight inches to twenty six feet in length. Each group of stamps having tables of different lengths. Each table is in three partitions - seventeen inches in width. The angle of inclination of the tables is 6° . The blankets were nine feet in length, and only nine feet in length of the tables were covered with blankets. ~~The~~

827/30
The tailings ran through launders to catch-
-pits.

a small furnace for roasting the tailings,
a retorting furnace, and Kilns for roasting
the quartz porous to crushing complete the list
of appliances at the Mill.

The information I have received furnishes a
melancholy history of the various attempts to work
the machinery. When it was erected, it is said,
it worked very well, that is to say the machinery
moved smoothly. but it never crushed any such
quantities of stone as ought to have been crushed.
One day about eight tons of stone were crushed,
but the Alpha Company crushed, at the best of
times, only seven tons in twenty four hours, and
even this rate would not be maintained.

It was found impossible to move the stamps,
the Pulverizer and the circular saw at the
same time. The engine it is stated, was
worked at a pressure of 60 lbs. but it was
~~never~~^{never} possible to keep up steam. It
usually took three hours to get up steam.

No

(28)

No firewood was stored. It was cut green - and even old wood that was gathered was often quite wet.

The present condition of the battery and tables is of course worse than it was when they were erected. The weather and use have injured them; and one of the Managers in order to re-arrange the tables of the middle battery, according to his ideas, cut away one of the main bed-lags, and since that was done, the vibration has been so great, ^{with} ~~the~~ the machinery in motion, as to shake the tables to pieces. The wood of the tables is shrunken and warped; there are numerous apertures through which water, quicksilver and amalgam could escape; and I am told that 35 ~~lbs~~ ^{lbs} of quicksilver were found under one table. The fall from the coffers is not on to the plates: there

29 827

there is a space of over an inch between the plates and the edge of the coffers, and even now the course which the water and tailings took as they escaped through this aperture is plainly to be seen under the tables. The fastenings, too, are bad: the nuts and washers below the coffers do not cover the holes ^{in the plates} for the bolts, and the mercury and amalgam fell through the spaces thus exposed.

Some of the arms of the drum for the belt connecting the engine with the pulverizer are broken, owing it is supposed to their having been screwed up too tightly.

The Pulverizer is said to have reduced the tailings to a fine powder, but the "quicksilver" "floured" owing to the iron pyrites not being properly roasted.

About 10 cub. of "tailings" could be ground by this machine in a day. Owing

31

of six tons and a half which were treated at the Wymann Prospecting Company's works, for the Alpha Company, and which, as already stated, yielded at the rate of 19 det. 22 grs per ton. The average cost of raising quartz was Rs. 2 per ton; the average cost of conveying the stone to the mill was Rs. 1.8 per ton and the average cost of crushing Rs. 1.13 per ton. The total cost of raising and crushing quartz is stated to have been Rs. 2971 : 6 : 0 :

To these must be added the following items as given in the statements furnished by the Directors :- Firewood (estimated) Rs. 50 (per week); Timbering in the Mine Rs. 150; Blasting-powder Rs. 700; and Quicksilver (quantity used not known) Rs. 3000. The cost of supervision is set down at Rs. 2384 for seven months only. The machinery is stated to

82 22 1/2 (32)

to have cost Rs. 25,000 and the erecting
of it about Rs. 1800. The construction
of roads cost Rs. 795:7:7

The aggregate of these sums, including
interest on the capital invested shows
that the quartz, for raising, treating, separating
stones &c must have cost more than
Rs. 15 per ton. or, to put the matter in
another way. that the gold was obtained
at an expense of Rs. 127 per ounce.

The balance sheet of the Alpha
Company, prepared by the Secretaries
and Treasurers (copy hereto marked
A.) shows that the sums expended in
preliminary expenses were Rs. 8,708:14
:5 and in Supervision, Management
&c Rs. 14,675:11.9 and the only
point in the statement that is really
important is the relatively small
sum expended in actual Mining
operations

82
operations, which under the head of
"Mining, Felling and Storage" is set
down as Rs. 11,327:0:10. The
value of the gold got, the result of
these operations - is stated at
Rs. 3,037:6:3.

The stone treated at the Wynaad
Inspecting Company's works. Six
tons and a half was got from
the reef at Wright's level - and it
cost for sinking the shaft and
raising Rs. 70:10:0; for breaking
Rs. 3:10:0; for conveyance to the
works Rs. 21, and for crushing
Rs. 65:— total Rs. 160:4:0.

The gold got sold for Rs. 297:6:3

The

34 83
The stone treated by the Alpha Company at their works was not roasted before being sent to the mill; but the "tailings" collected in the settling pits were roasted in a furnace and ground in the pulveriser. I have not been informed as to the results of the treatment of the tailings.

The stone crushed for the Alpha Company at the Lyriand Prospecting Company's works was roasted before being crushed.

"The Prince of Wales Quartz Reef Gold Prospecting Company" took possession of the Alpha works on the 1st June 1877 under an

34 83 13
The stone treated by the Alpha Company at their works was not roasted before being sent to the mill; but the "tailings" collected in the settling pits were roasted in a furnace and ground in the pulveriser. I have not been informed as to the results of the treatment of the tailings.

The stone crushed for the Alpha Company at the Wyndham Prospecting Company's works was roasted before being crushed.

"The Prince of Wales Quartz Reef Gold Prospecting Company" took possession of the Alpha works on the 1st June 1877 under

35-327/41
an agreement with the Alpha Company.
They commenced mining operations
on the 17th August 1877 and
continued to mine with some
interruptions until the end of
February 1878. The pecuniary
results of this adventure are
shown in the balance sheet
hereto marked B. The value
of the gold got, including specimens,
is stated at Rs. 8,132. 10. 8.

Copies of the reports furnished
by the Manager, as well as several
papers relating to this Company's
proceedings have been placed in
my hands for perusal by one
of the proprietors, and I gather
the following facts from
them

them: -

Quartz crushed and treated.

~~Quartz~~

Average yield per ton.

	Tons	3	dwts.	grs.
Wright's level	$41\frac{2}{3}$			
Skull reef	63			
	$104\frac{2}{3}$	0	2	18.5
Skull reef	12	0	2	5
Wright's Level	50	0	11	19
Wright's Level	50	0	16	12.5
Wright's Level	104	0	14	21.34
Wright's Level	2	0	8	0

The average yield per ton from these parcels is 10 dwts. 12 grs nearly. Pieces of quartz containing gold were sold for Rs. 1251: 4: 0. The "Specimens" containing gold got from the

37820

the parcel of 104 tons are said to have been sold for Rs. 920, and it may be assumed therefore that the stone was very rich.

There is not much information to be obtained as to the mode of treatment pursued by the Alpha Company but it is stated that the stampers - boxes were charged with quicksilver - not largely - and that they relied mainly on their copper-plates and ripples for saving the gold.

They used sodium amalgam very freely.

The manager of the Prince of Wales Tribute Company has furnished many details respecting the mode of treating the quartz when

when the results of the operations were apparently to some extent satisfactory to the shareholders.

Kilns were built and the stone before being sent to the mill was roasted. Wood was placed in the kilns and the stone piled thereon and the roasting was continued for forty eight hours.

He informs me that a small quantity of quicksilver was put in the coppers two or three times a day according to the estimated richness of the stone. On the copper plates $2\frac{1}{2}$ per cent. of Sodium amalgam was used with the quicksilver; and in the Pulverizer as much as

3 per cent. Still the quicksilver
"flamed."

Blankets of the ordinary kind
were used - and the length covered by
the blankets was nine feet. They
were washed every half hour. It
seems that all the tables were for this
length covered with blankets and
the water was allowed to spread
itself over the whole.

Water was conveyed to the mill
through troughs which discharged
into a tank - and an main pipe -
fed from the tank - was fixed in
front of the battery. To this
were attached smaller pipes
provided with taps - two to each
battery - and when the supply
was

was sufficient the water must have entered the coffers with great force.

The flow however was not even - the smaller pipes were often choked with grass, and owing to the troughs or boxes being badly made and improperly placed the water escaped and sometimes there was not sufficient for the tables.

The stone was broken by hand before being sent to the mill at a cost of nine annas per ton.

The feeding was very irregular. It happened not seldom that so much quartz was put into a coffer as to stop the action of the stamper and at other times the coffer was not fed and the disc struck upon and injured the cam.

Oil from the machinery often dropped

dropped on the plates and it found its way also into the Coffers.

Tailings escaped from the catch-pits.

The stone treated, as already mentioned, must have been rich. In one "cleaning-up" of a stamp box coarse pieces of gold were found weighing from 6 grs. to 3 dwts. and of these about thirty were obtained. One piece weighed about $7\frac{1}{2}$ dwts.

Causes of Failure.

The first important step taken by the Alpha Company was to erect machinery and subsequently they made attempts under the advice of various managers to open their main reef. As stated in another part of this report they first quarried stone at the native workings on the northern extension of

22/20

of the reef and subsequently at the southern portion of it but no successful effort was made to mine systematically. There was consequently unnecessary cost incurred in getting stone, and great cost in conveying it to the Mill.

There was no stone-breaking machine at the mill: the stone was broken by hand. There was no self-feeding apparatus; the feeding was irregular, and the platform on which the quartz was delivered was not partitioned off from the stampers and engine. The dust rose sometimes in clouds and fell on the hearers injuring them and rendering necessary a large supply of oil &c for lubricating the various parts of the machinery - some of which often dropped on the

10875v (44)
a slag, and any gold in it must
be "glazed."

Sodium amalgam appears to
have been used in excessive quantities.
This amalgam has all the valuable
properties ascribed to it by the patentee,
Mr. William Crookes F.R.S., but the
utmost care and caution are
necessary in using it in the
extraction of gold and silver.
A very minute quantity of sodium
amalgam added to quicksilver
has the effect of rendering the metal
more mobile and more "eager" for
gold and therefore it is the more
likely to escape from the Mill
and carry the fine gold with
it unless the ripples are properly
arranged and other precautions
taken.

the plates. this making effective amalgamation impossible. even if there had not been other detrimental influences in operation.

A great error was committed by the Enibake Company in roasting the quartz in kilns before sending it to the mill. Nearly all the quartz in the reef is more or less pyritous and the percentage of iron-pyrites in several sections probably varies from 0.1 or less to 5 per cent. and when this is placed in a kiln in the manner described elsewhere in this report it is impossible to oxidise the sulphur. The fusible lower sulphides coat the gold and prevent its amalgamation with mercury. The roasted stone I have seen in Bevalah is often
a

45

It was a mistake to put quicksilver in the coppers. The undecomposed pyrites, reduced to powder, would accumulate in the coppers and cause the "sickening" and "flouring" of the mercury. The metal breaking up into minute globules or adhering to the powdered pyrites would be carried away.

If no quicksilver had been put in the coppers the copper plates might have been dispensed with.

The inclination of the tables was excessive. Instead of 1 in 10 they should have been not more than 1 in 14 or 1 in 16.

The water from the battery
(often

often insufficient) was allowed to spread itself over the whole extent of the tables. Whereas, as there was not sufficient water - but under any circumstances - it should have been so regulated as to carry the tailings evenly over the blankets. And the length of the blanketing - nine feet - was not enough. I have been informed that man-pyrites from the Alpha Mill was taken out of the bed of the stream quite two hundred yards away, and that it was found to yield 1% to the ton.

Buddles were not used for concentrating the tailings and a large proportion of the stuff sent to the furnace must have consisted of quartz.

The
furnace

47 3/4 (47)

furnace which was built by the
Tributors is unsuitable for treating
pyrites.

The steam-engine was never equal
to the duty required of it. One
of 40 horse-power would be needed
to drive the stampers, and keep in
motion the pulverizer, fully charged,
and the saw. The Alpha Company
and the Tributors are said to have
crushed 1102 tons of quartz in fifteen
months: if the machinery had
been effective, and if the works
had been skilfully managed at
least 11,000 tons should have been
reduced in fifteen months.

During the whole period that the
works were in operation - when only an
average of 2.8 tons were crushed per diem -
the

the expenses of management, dead-work
we were running on, as well as
interest on the capital invested.
and it is not a matter for wonder
that doing only one-tenth of the
work that ought to have been
done - the two adventures were
not remunerative.

The greatest credit it appears to me
is due however to the projectors for
their spirit and enterprise. They
failed because they did not persist
of all commence to mine, and
because they had not
appliances for saving gold.

How the operations should be
conducted.

A run of gold in the main reef
is

49
is found at Wright's level and this has been followed for a distance of sixty feet.

I would advise that in the first instance this run should be followed still further on the underlie - say - if the good stone continues - for 100 feet or 150 feet; that the shaft should be well and safely timbered, and that skids should be put in so that the quartz might be brought to grass with facility. It may be assumed, judging from the stone already taken out, that ~~the~~ the quartz from this shaft would yield a fair proportion of gold.

This preliminary work - but productive - would indicate the best site for a main adit and that will be found at a point on the slope of the Ghat Eastward of Wright's level.

This main adit running west, should

50 8 1/4 (50)
Should be driven at a low level so
as to intersect the reef at a considerable
depth below the outcrop on the
ridge.

From this adit and other cross-cuts
the reef could be mined economically.
It could be stoped from different
levels quite up to the surface.
A site for the battery could be found
near the mouth of the main adit.
All these undertakings and all arrange-
ments connected with them should be
well considered and the objects in
view should be to open the mine
on a good plan, and to raise a
large quantity of stone which from
careful assays should show such a
yield per ton as would justify the
erection of machinery.

I recommend that water-power
be

5/27/66 (5)

be employed for driving the machinery - either an over-shot wheel or a turbine.

I regret to say that I am not sufficiently acquainted with the laws or regulations in force in India under which water may be diverted, but it would be no doubt practicable to arrange for the diversion of water from the stream near the Wagnard Prospecting Company's works.

Perhaps reservoirs would have to be constructed for storing water.

The relative cost of using steam and water in this district cannot be fairly estimated by me as I am ignorant at what cost fuel could be got if proper arrangements were made for procuring it in large quantities but

52
327
E

but in Mills elsewhere the proportions
are - for water about 1.2 and for
Steam 2.1.

There is not much at the Alpha
Mill that could be used in any
new adventure. The stamps could
be made available, and the coppers
seem to be uninjured and might
again be set up; but in my humble
opinion it would be more economical
to procure a new plant furnished with
all the best appliances than to patch
up the machinery at the Alpha.

All patent contrivances that have not
been proved to be of value by a lengthened
experience should be rejected and only
those adopted that are known to have
yielded good results and now find
a place in the best conducted mines.

As well as a battery there
would

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827
would be required: -

- a. A stone-breaking machine. The smaller pieces of quartz would be separated from the larger and sent direct to the stamps and the latter to the stone-breaking machine.
- b. A self-feeding hopper.
- c. A Buddle for concentrating the "tailings" which are saved in the settling boxes.
- d. An inclined reverberatory furnace for roasting the "tailings". This would consist of a fire-box, hearth &c. and should be on the plan of some of those that have given the best results in Victoria.

The quartz should be crushed raw.

Quicksilver should not be used in the Coppers: and Copper platforms are likely to cause a loss of amalgam, and I do not recommend that they should be employed. Ripples and blanket-strikes will

will do the work more effectually.

The tables should be twenty feet or more in length, and about fourteen inches in breadth for each stamp-head; the fall should be about one in sixteen (if a good supply of water is maintained) and they should be covered with closely woven green baize.

Experience would of course lead to some modifications in the arrangements but it would not be difficult to adjust the length and fall of the tables so as to meet any conditions that might arise.

Summary.

I have endeavored to indicate as briefly as possible the causes which prevented the Alpha Company from obtaining profitable results from

55 32/8 (55)
from their adventure. I am satisfied that their machinery and appliances are such as to make it impossible to save the gold even if the best scientific and technical knowledge was brought to bear on the operations. The one fact that oil and grease were allowed to fall on the copper plates and to get into the coppers is sufficient to show what the state of affairs was when the best results were obtained.

The main reef within the area held by the Alpha Company is nearly 2000 feet in length; it is from 4 to 14 feet (at least) in thickness; in one part the quartz is of extraordinary richness; and other parts have yielded well.

Native miners have picked what must have been auriferous quartz all along the outcrop, and at the "Skull" their excavations are extensive. The position of
of

of the reef and the formation of the ground both offer facilities for economical mining

It appears that the yields of gold have been for $779\frac{1}{2}$ tons of quartz 2 dwts. 9 grs and for 322.66 tons. 10 dwts. 12 grs., and the gold was got as I have shown under the most disadvantageous circumstances.

These results may be compared with some operations in Australia.

The compilation of Mineral Statistics was commenced in Victoria in 1860, and from 1860 to 1876 (inclusive) information has been obtained respecting the results of the treatment of 13,402,915 tons of quartz and the returns show an average yield of 11 dwts 6.30 grs per ton.

The

5782

(57)

The average yield of gold from 1,011,808 tons crushed in Victoria during the year 1876 was 10 dwts. 13.48 grs per ton

The Black Hill Company at Ballarat crushed 283,550 tons which yielded an average of 2 dwts. 23 grs per ton and the dividends paid amounted to £23,900. It is stated that the machinery cost £10,030 and that the company paid £24,235 for "Claims" (i.e. land on which to mine).

Other companies have treated large quantities of quartz yielding averages per ton of 2 dwts. 13.14 grs.; 3 dwts 6.01 grs.; 3 dwts. 7.89 grs.; and 3 dwts 18.53 grs and have paid dividends.

The prices paid by the Alpha Company and Tributens for labor

labor,
for timber and for procuring and
no criteria to guide me in
estimating the costs of mining
at Devulak. Under skilful
management arrangements would
be made for procuring all
necessary supplies at the minimum
cost, but in desultory operations
the maximum cost as a matter
of course has to be paid.

In reply to the questions
in the paper dated 10th January
1879-1882 I can safely say
that the want of success of
the Alpha Company has
not arisen from any
peculiar difficulties in
separating the gold from
the matrix, and I cannot
believe

57 1/2 (57)
believe the cost of labor or
fuel would be so great
here as injuriously to
affect mining pursuits.

In this report I have
omitted all details that appeared
to me not necessary to the
full elucidation of the questions
with which I was instructed
to deal.

I have the honor to be,
Sir,

Your most obedient servant,

R. Brough Smyth

Note —

60 22/18
Note.

The late Manager of the Prince of Wales
Tribute Company states that the
wages paid for native labor were
from four to five annas per diem;
The cost of fuel was Rs. 3 per ton;
the cost of drilling in hard rock
was four annas per foot and in
soft rock two annas per foot; and
the cost of driving such adits as are
seen here varied from six annas to
Rs. 3 per foot.

The cost of carrying stone from
the "Skill" to the battery was six
annas per ton; and the cost of
carting stone from Wright's level
to the battery was thirteen annas
per ton.

1

A.

561

India Gold Mining Co. Ltd. 30.11.1908

Property & Assets

Immovable Property			
Leasehold Land	44,000	.	.
Additional land for fuel	234	.	.
Buildings	7670	12	6
Movable Property			
Plant	19699	.	11
Stock & Tools	9543	11	11
Furniture	255	.	.
Preliminary Expenses			
Advertising & Printing	874	11	7
Carriage of Machinery, Stores, Freight & Landing	5895	3	.
Roads	1621	5	10
Registration	617	.	.
Expenses of Supervision & Management			
Salaries of Secretary & Treasurer	1965	.	.
Office Rent	4,35	.	.
Salaries of Engineer, Manager & Assistant	6330	2	4
Wages of Native Staff	318	14	6
Grants	450	.	.
Mining, Selling & Storage	11327	.	10
Miscellaneous	5176	10	11
		26002	12

Total Expenses 116113 10 4

Copy The Union of Labor Union's May Gold Meeting Co. 62
 Articles of Association, Constitution and By-Laws 1878.

Each Extended.

Unsubscribed	287 54
Subscriptions	254 16
Receipts	146 80
Interest	543 7
Dividends	815 50
Balance	738 15
Gifts	42 12
Interest on Savings	913 0
Gifts	426 78
Costs of Printing	250 00
Costs of Postage	100 56
Printing	1600 10
Interest on Savings	519 50
Postage and Express	742 08
	9610 12 8
Go to Librarian Co. & Charles Blackwell	1374 00
Go to Librarian Co. & Charles Blackwell	880 00

Total Received: 1954.1

From Union of Labor Company	288 21
From Union of Labor Company	7 1/2
From Union of Labor Company	20 00
From Union of Labor Company	135 1/2 8
From Union of Labor Company	1223 6
From Union of Labor Company	2012 3
From Union of Labor Company	1481 5
From Union of Labor Company	11288 87
From Union of Labor Company	306 4
From Union of Labor Company	11564 19
From Union of Labor Company	1954 00
Total Received	9610 12 8
From Union of Labor Company	1954 00
Total Received	1954 00

Total Received: 1954.1

80 10 January 1879 N^o 127.

Revenue 1879 Sept^r

N^o 1649.

From

C. Brough Smyth Esq
Mining Engineer
Dorvalah

Dated 18th Feb^r
Rec^d 22nd Feb^r

En: 3.

Reporting, with reference
to G.O. 10 January 1879 N^o 42,
on certain points regarding the
unsuccessful working of the
Alpha Gold Mine.

Mr Brough Smyth
Esq on the Alpha Gold
Mine

18 Feb^r 79.

Not having in published
form, will not be published
unless published by

Send E.O. saying
we are obliged for
the report and would
like to publish it in
the Engineer - I will
forward it to you

The report is interesting
and valuable to all
engaged in the industry.
But I rather doubt
the propriety of our
publishing it without
the consent of the
C. I do not communicate
it then such leave
publish - I think
it is of the S. of S.

22

Robert J. Williams

Loan from Bank of England
 10000
 11, 7/12 1788

1484

Vol. 113 104

Wynaad.

7 Feb George
1 March 1797

Copy

Balance Sheet of the Year

Brought up the
Report on Alpha
Gold Mines.

8/12/1897
1897

C2

Mr No 827

The Directors of the
Alpha Gold Mining Company

Gentlemen,

I am directed
to communicate to you
a copy of Mr. Brough
Smeyth's report on his
examination of the
Alpha Gold Mines,
and to state, if you
have no objection, the
Govt. propose to publish
the report in extenso
as it has such an im-
portant bearing on
the development of
gold mining in
Weynaad.

F. H. G. 2
1 March 1897

Estab

Jan 4 - 1771
87/178

Jan 10 - 1771
82/771

Mar 10 - 1771
87/178

no 627