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THE PROPERTIES OF THE RINGAROOMA GOLD MINING COMPANY, ALBERTON, TASMANIA

Introduction

Two years ago the Ringarooma United Gold Mining Company was in Adelaide to acquire a number of properties in the Alberton district, which are traversed by gold-bearing lodes. Some of the ore-bodies had been exploited many years ago with varying success by local companies, and in their operations a considerable amount of exploratory work was performed. The mining works are of very great value to the present Company providing access to many of the lodes at depth, and also approach openings to others not intersected. All these mine openings have lately been put in good working order and some of them have been extended.

The result of the first crushing of ore not being up to expectation, the Company applied for the services of an officer of the Mines Department to investigate and report on the ore-bodies and on the method of mining and treatment. This report describes in detail the various operations of the Company, mineral deposits, and the mine equipment.

Area, Situation, Etc.

The properties of the Company consist of mining leases 1551/G of 10 acres, 1260/G of 20 acres, 1443/G of 10 acres, 1590/G of 8 acres, and water right.

The mining properties are situated at Alberton a small settlement six miles by road from Ringarooma. Legerwood, a station on the North-Eastern Railway line is nine miles distant and is easily accessible by road from the Mine.

Production - Total Value

All records relative to the operations of earlier companies are lost, but from local sources, it is learned that the total value of gold recovered amounted to £35,000.

The Ringarooma United Gold Mining Company has produced:-

150 ozs of gold valued at £600 from 375 tons of stone; 4½ tons of mineral concentrate, consisting of pyrite, and arsenopyrite containing gold in the proportion of 2 ozs. 18 dwt. per ton; (under M. Hannah's superintendence)

30 ozs. gold from 12 tons (Rofe's workings)
55 ozs. gold from 43 tons

Production Cost

The mistaken idea is held here, as in many

other places, that it is not advisable to treat rich ore alone, but that to get the highest recovery, poor material should be mixed with it. In general, it may be stated definitely that the greater the proportion of poor material added, the greater the loss. Moreover, poor grade ore that will not return sufficient gold to pay for mining, transport, and treatment, should be left in the mine untouched. The first consideration in any mining undertaking is the determination of the critical point below which mining cannot be performed at a profit. All ore of lower grade is commercially valueless.

It is difficult to arrive at the cost of production as the costs of breaking, development and trucking are not known; but after a very careful survey of the mine a rough estimate has been formed. Under existing conditions it is considered that ore of lower average content than 12 dwt. per ton in the Rosalind adit and Long adit workings is of no present commercial value.

The Ore-Bodies

The ore-bodies consist of the fillings of a number of parallel lode fissures intersected by a number of parallel fault fissures. These two sets of fissures intersect at right angles of 40 to 60 degrees. The lode fissures course in a north easterly direction and dip to the south-eastward; the fault fissures trend in a north-westerly direction and as a rule dip westward. The heave of the lodes is generally eastward from 25 to 60 feet and the faults give a southerly pitch to the ore-bodies. Both lode and fault fissures were formed prior to mineralisation, therefore both were filled with gold-bearing quartz, but, as a rule, the lode fissures are the richer. This lode system occurs in a zone of mineralisation that has been proved to extend many miles in a southerly direction and a considerable distance northward.

These lode and fault fissures are filled with quartz, sulphides, sulpharsenides, gold, carrying silver, and a little chalcopyrite. It is noticeable that the sulphides, arsenides and gold are more persistent in their period of crystallisation than is the quartz and they therefore characteristically occur not only in the quartz, but in little fissures that cut the quartz and they even pass in some places into the wall-rock. Where arsenopyrite is most abundant the gold content is highest. In places arsenopyrite and fine gold are intimately associated, indicating contemporaneous deposition. Arsenopyritic ores are the richest. Some specimens show an equal proportion of gold and arsenopyrite and are of phenomenal richness, but such specimens are rare. Generally, the proportion of sulphidic ore is very small.

The main lodes are the Rosalind, No. 3, Premier, Thomas Hannah, No. 5, Strahan and Rofe. Others that may become of considerable importance are known but are not developed. Some of the lodes mentioned are really fillings of fault fissures in which the distribution of gold is more irregular.

Development

Development work commenced on this property about 30 years ago and has been carried on intermittently up to the time of the organization of the Ringarooma United Gold Mining Company two years ago. Since then exploration and development work have been carried on vigorously and in a systematic manner. The workings consist of a number of trenches, adits, and shafts, cut into a number of lodes out-cropping on the western side of a steep hill rising 600 feet above the piedmont. These workings have established the existence of several lines of mineralisation parallel to one another in a belt of Cambro-Ordovician slates, sandstones and tuffs. No less than eight distinct ore-bodies have thus been exposed and partly explored. They trend in a direction almost parallel to the slope of the hill and therefore can be easily attacked by means of adit crosscuts. Each of the long crosscuts intersects two or more ore-bodies. The main and lowest crosscut is that known as Long Adit. This is the first to be described.

Long Adit

The crosscut has been driven east 1134 feet and has intersected Rosalind vein and several ore-bearing fault fissures. At 1009 feet a north drive was opened on the vein and at 1013 feet a south drive exposed a rich shoot of ore. The first 380 feet are in sandstone, then a change to slate occurs. At 660 feet a 22 feet dyke of quartz porphyry crosses the level nearly parallel to the planes of bedding which here bear north 20 degrees west. Tuffs succeed slate at the point of intersection of Rosalind vein, and are over 200 feet thick.

North drift from the adit has been driven 44 feet on a 3" vein bearing N 20 degrees E and dipping easterly. At the end of the drift the lode is faulted and the drive turns north-westerly along the fault, to connect with a shaft from surface in which some rich stone was discovered years ago. The faults were intersected in an easterly crosscut from the end of the drift.

South drift from main crosscut has been driven 120 feet. The first 40 feet of stone 3 inches wide against the hanging-wall was worked 12 feet below this level, and, according to report, gave a return of 3 ozs. gold per ton. Here a fault displaces the reef a few feet to the east. From this point south 80 feet of stone of 12 inches average width rises to the level above and to a point a few feet south of the shaft, where another fault displaces the vein. The drive then turns south-eastward along the fault, connects with a shaft from surface, and continues to 80 feet. This fault stone, which dips westward, is irregular but rich, some of it 30 feet above the adit level, containing very coarse gold. One section has been stoped to surface, the shoot shortening as it approached the level above. Where the lode or vein fissures and fault fissures intersect, the stone is generally poor, but a few feet away the gold content increases appreciably. It is noticeable that where the fault

fissure is nearly vertical to the stone filling it is poor and where the dip is westward it is likewise of low grade.

In the last 16 feet of the southern drive the vein is very poor, but the dip is again easterly, indicating the point of intersection of the displaced vein, which here is bunchy and irregular. The stone in the face of this drift will probably turn west of south again and continue in that direction until the next fault is met. This drift should be continued southward when the opportunity is favourable.

Main shaft (12' x 4') sunk on Rosalind vein from a point along south drift, 80 feet from the Long Adit crosscut, is down 110 feet. A short shoot 40 feet in length on the north side has been stoped to Long Adit level, but very little work (30 feet of driving) has been performed in the south end where some rich stone appeared in the fault fissure higher up. The ore-body at shaft level is 3 to 5 feet wide, and contains gold in the proportion of 1 to 3 ozs. per ton, free gold being readily visible. In the end of north drive the shoot is displaced by a fault. Here, as in every part of the mine, the fault fissures are filled with gold-bearing quartz of variable quality, which lead directly to the ends of the displaced north-easterly lode fissures.

The main adit crosscut from the point of intersection of Rosalind lode is continued 100 feet further eastward cutting two north-westerly bearing fault fissures on the way. These fault fissures have been mistaken from No. 3 and Premier lodes respectively. Very little stone (and that poor) appears in the first fault fissure; in the second 3 inches of stone show on the south side, and up to 8 inches of poor stone is exposed on the north side in a drift 50 feet long. The first fault dips easterly, the second westerly. On the foot wall of the second fault 3 inches of selvage allows of easy mining. The end of this drift is in curly tuff in which the veinstone is scattered in veinlets.

In a rise from a short drift along the first fault, stone 10 to 30 feet in length and up to 3 feet in width, of 1 oz. average grade, was stoped within 30 feet of Long Adit level.

The end of Long Adit crosscut is over 300 feet below the surface. The south-eastward continuation 450 feet would result in the intersection of Hannah's lode at a depth of 475 feet below the surface. This may become the main mine opening for the exploitation of Hannah and Strahan lodes and the main line of communication for them all.

Intermediate Level

An intermediate level has been driven on Rosalind lode between Long Adit and Rosalind Adit, 70 feet on the underlie below the latter. About 15 feet south of the winze from the north

drive from Rosalind Adit, the lode has been driven on south and stoped to the level above. Here 18 inches of stone of high grade was removed. Further southwards the channel and stone appear to peter out, where the fault leads off southeastward carrying a little poor quartz.

Returning now to the north drive on the Rosalind reef, the vein 2 inches wide crosses from the east to the west wall at another fault. Near the north end of the drift at winsome winze was a horseshoe body of rich ore, and the same shape was observed in the stope above.

Rosalind Adit Crosscut

About 142 feet higher than, and 720 feet south eastward of entrance to Long Adit, this crosscut is 400 feet in length and explores the same area. At 200 feet from entrance a body of ore has been driven on 41 feet in a north-easterly direction and a winze of unknown depth has been sunk on it. From this winze 72 ounces of gold were recovered from 24 tons of stone.

At 217 feet the south drift on Rosalind Lode leaves the Adit on a bearing of 9 degrees west of south for 18 feet, thence along the course of a fault 59 feet, where Rosalind Lode is intersected again. The south drift along the lode cuts the shaft at 40 feet and continues to 80 feet where a fault again interrupts its course. A drive 34 feet along the course of the fault discloses irregular bunches and veinlets of barren quartz in slate. This section of Rosalind Lode is poor and small in general, but a short rich shoot has been stoped above the level.

In the Adit at 274 feet a fault fissure bearing 345 degrees has been driven on a few feet north and rises on a little in the back of the level.

At 316 feet another fault fissure is cut and driven upon 76 feet north and 23 feet south. No vein stone shows in either end, but from a winze sunk to a depth of 30 feet, stone to the value of 8 dwt. is reported. The north drive showed 4 to 12 inches of average grade stone, all of which has been removed from Premier Adit level and underfoot.

At the end of the Adit is a large crush fault channel about 4 feet in width dipping westerly. A north drift follows the hanging wall 25 feet, where it is cut across and is 3 feet wide. The ore-body represents the filling of interstices in brecciated slate. Although the material is nearly barren, the channel is wide and may lead to rich bodies of ore where lode fissures intersect it. Exploratory work north and south on this fault fissure is warranted and is advised.

Premier Adit Crosscut

This Adit is 60 feet above Rosalind Adit and is 357 feet long. It bears in the same general direction as the others and commences at the point where Rosalind Lode reaches the surface.

This lode has been stoped right to surface north towards a shaft connecting with Long Adit and south towards another deep shaft. It courses here N 16 degrees E and dips easterly. At Adit entrance a fault dislocates the lode, the southern portion being leaned eastward about 8 feet.

At 57 feet from entrance is No. 3 lode. The lode shoot is short but it produced a large quantity of average grade ore.

One hundred and ninety-three feet from the entrance, Premier lode is met. A north drive on a bearing N 10 degrees W and 40 feet long exposes the ore. The south drive is filled with mullock. A shoot of rich ore 60 feet in length was stoped to surface.

Thomas lode is 77 feet further east than Premier lode. It has not been cut in the lower Adits, but a shaft has been sunk on it 28 feet. The trend of this lode is north-westerly and the dip is north-easterly and at an angle of 75 degrees. It does not appear on the south side of the crosscut, but driven on 90 feet north, it gradually increases to 22 inches in width at 70 feet and is 10 inches wide in the face of the drift where it is contained in slate and enclosed by two well-defined walls. A little free gold is noticeable occasionally and arsenopyrite is present. From a number of samples it is estimated that the average gold content is 8 dwt. per ton. At that rate this ore-body is one of the most important on the property. It is one of the longest and widest shoots so far exposed, and if the gold content remain at 8 dwt. per ton, this should prove one of the main sources of supply.

Hannah Adit Crosscut

This Adit, about 110 feet above the Premier and 340 feet south-eastward of it, has been driven 392 feet in a south-easterly direction. At 66 feet from entrance, a rich leader coursing N 40° E and dipping S.E. at 75 degrees, was cut and driven on 15 feet on the south side of the adit. At 250 feet another parallel leader of similar nature was driven on south 20 feet. Hannah lode was cut at 281 feet where it is dislocated by a fault. On the south side of crosscut a drift has been opened 40 feet, at the end of which a winze has been sunk 30 feet. In the winze 8 inches of stone carrying 8 to 10 dwt. of gold per ton is showing.

On the north side of Adit this section of the lode has been heaved 30 feet, whence it continues north-easterly 20 feet and is heaved easterly 25 feet, thence north-easterly again 20 feet to the intersection of another fault. The lode will be picked up again by continuing the drive on the fault south-eastward.

There is no break in the stone from fault to lode fissures. The richest material appears near the elbows, especially towards the lode fissure in it. Some bulk samples of stone from these workings yielded 3 to 7 ozs. of gold per ton, but the quality varies greatly

from point to point, and in some sections the stone is comparatively poor. A winze is now being sunk at the second elbow on the north side where 18 inches of fair quality stone is showing.

Hannah lode trends north-easterly and dips south-easterly; the faults have a north-westerly course and dip south-west at 80°. The stone is not heavily mineralised, a little arsenopyrite showing here and there. Free gold, coarse and of good colours, is prominent in some sections of the ore-body.

At 310 feet a rise connects with a shaft from surface. No other ore-body has been cut in this adit.

No. 5 Adit Crosscut

This adit on a bearing of 15 degrees E of S at 118 feet connects with a shaft sunk at the point of intersection of a fault fissure coursing 320 degrees and a lode fissure. Stone in fault fissure is 12 to 18 inches wide and poor; lode stone is 3 to 6 inches wide and contains arsenopyrite, pyrite, and chalcopyrite, and gold in the proportion of 10 dwt. per ton.

Strahan Adit Crosscut

The mine opening was cut many years ago to explore Strahan lode and to mine the rich ore contained therein. From these workings a large quantity of ore, estimated to contain gold in the proportion of 1 oz. per ton, was mined and sledged to the mill at the foot of the hill. The stopes and the drift are now inaccessible.

At 98 feet from the entrance a north-east drive recently cut by the Company intersects, at 34 feet, a body of stone 8 to 12 inches wide, the value of which has not been determined at this point, but which, having the same bearing and dip, is probably identical with Rofe lode.

At 188 feet Strahan lode was intersected and drifts were cut north-westward and south-westward along its course. It is here a very well-defined body on the same course (123 degrees) as Rofe lode, but is interrupted by a fault coursing 337 degrees and dipping south-west. Apparently this is the displaced portion of Rofe lode, the dip, however, is not in the same direction.

Rofe Workings

These consist of two shallow shafts (25 feet deep) sunk at the junction of lode and fault fissures on a small but very rich body of stone. The collars of these shafts are 40 feet above Strahan Adit Level and 150 feet above Hannah Adit.

Lode consists of white, opaque, dense quartz in the body of which are large blebs, patches of arsenopyrite, pyrite, cellular quartz and cellular gold. These minerals were deposited simultaneously. On the footwall is a rich streak

of coarse cellular gold. Yellow puggy selvage carrying gold occurs on the fault wall where there is also 8 inches of rich stone. The rich gold shoot is apparently very short, but average grade material may be found to continue in much longer shoots.

The more eastern of the two shafts is sunk on a 6 inch lode fissure coursing 65 degrees and dipping north-westerly at 45 degrees. The value of this body is not known.

The north-east drive, from Strahan Adit, is too far east to cut the downward extension of the rich shoot of ore. Probably the best way of approach would be from No. 6 Adit, which was driven 70 feet to cut Strahan lode at a lower level.

Old Mag Adit

On the same level as Strahan Adit but 10 degrees W of N therefrom a distance of 400 feet, an adit crosscut was driven to cut a body of ore exposed in a shallow shaft. Here again is a fault-lode junction where some rich gold-bearing stone occurs. The vein is very narrow and the stone consists of hard blue quartz, with pyrite and arsenopyrite and gold.

Cannon Adit

Further northward is another and parallel vein known as Cannon Lode. It is exposed in a short adit and then is essentially similar to others described.

Milling and Concentrating

The mine is equipped with a small milling and concentrating plant driven by a 48 h.p. Crossley Oil Engine. A small oil engine to be used in driving the concentrating tables is provided, but has not been used.

The milling plant consists of a small Gates Crusher which reduces the stone to 2 inch size, and a battery of 10 heads of stampers, each weighing 900 pounds. The crushed material passes through 250 mesh sieves to the amalgamating plates and to concentrating tables.

Three Card and one Wilfley Table constitute the concentrating section of the treatment plant. A small Bedan pan completes the outfit. The whole is set on a concrete foundation and comfortably housed. Provision is made for the addition of another battery of 10 heads when required.

Cost of Treatment

According to the report of the Works Manager, the cost of treatment is at the rate of 6/6 per ton. This amount is excessive and could be reduced by the addition to the plant of the two self-feeders which the Company has in its possession. Self-feeding machines provide a perfect supply of material to the stampers, thereby ensuring the greatest crushing capacity, and do not require any additional power for their operation. Two attendants only are necessary.

The capacity of the mill is 8 tons per working day of 8 hours. A loss of 18 grains per ton occurred in the treatment of the first parcel.

Preparation of Material for Treatment

Only the larger pieces of mullock broken with the gold-bearing quartz are picked out; the grade of ore then becomes greatly reduced, the proportion of mullock to ore being one to two. The loss in cost of transport and treatment of 33 per cent of mullock is obvious. A considerable amount of mullock inevitably finds its way into the ore bins, as it is impossible to keep ore and wall-rock quite separate in the process of mining, but by breaking each separately the proportion of rock could be greatly reduced.

The 10 head stamp battery is capable of breaking only 24 tons in 24 hours, therefore the richest material only can be mined and treated at a profit.

Water Supply

The water supply for the boiler and for milling and concentrating purposes is provided from mine drainage augmented by a small creek. This supply is available during winter months and during the periods of heavy rainfall in summer. At the present time (March) sufficient water for 5 heads of stamps only is available, as the creek contains very little.

Thirty chains away is Main Creek from which a bountiful supply can be obtained and conveyed to the old mill site along a water-race. An adequate supply cannot be provided for the mill at the present mill site nor is there any means of conserving sufficient for the purpose, except by pumping the water from the mill into a reservoir and using it again. It is advised that provision be made for the return of the water to a reservoir for use again.

Equipment

In addition to the milling and concentrating plant, a steam power plant consisting of a boiler and an air-compressor engine, is provided. Provision for operating from the main shaft is made by the erection of an air-driven winch and an air-driven Cameron pump.

Four air-driven rock-drills have been used in the operations ofsinking the shaft and breaking ore from that opening.

Electric Light is provided in Long Adit and at Main Shaft.

Accommodation for a number of men is made available. Other buildings include Manager's residence, mine office, workshops, changing house and store room.

Ore Reserve

At present development is very little ahead of mining; therefore the actual reserve is small. There are, however, no less than eight lodes, all potential sources of supply, and all easily accessible from existing mine openings.

In mining the ore more than twice the quantity of wall-rock is broken with it, thereby diluting the material to that extent. Only coarse lumps of the broken wall-rock are sorted out, the remainder, with the ore, going to the mill. Thus it will be seen that it is impossible to form an exact estimate of volume, and this applies also to the determination of the average values.

Under present conditions the result of the first crushing is a fair representation of the average value of the material. There is, however, room for improvement in mining methods by which the grade of ore for crushing could be increased. It is necessary to sample every section of each ore-body as the work of mining is advanced in order that unprofitable material may be discarded. Development should be advanced well ahead of mining to provide for an adequate reserve.

Transport

As the farthest workings are nearly half a mile from, and 600 feet higher than, the milling plant, the problem of transportation is one requiring serious attention. The system adopted by the Manager as a matter of expediency, is suitable for present purposes, but a considerable saving could have been effected had advantage been taken of existing openings. For instance, by utilising the shaft from Premier Adit Level to Long Adit, the cost of the erection of high trestling and two long chutes would have been saved. Moreover the material broken from higher levels could have been conveyed to that shaft by means of self-acting gravity planes, tramways, or aerial ropeways, with self-acting tippling device at the shaft opening. At present material from the most distant mine opening is handled 5 times and the cost is very high.

If it is decided not to remove the mill to another site near Main Creek, it would be advisable to make of the Long Adit the main line of transport. By using trucks of ¾ to 1 ton capacity the cost of trucking would be greatly reduced. Rails of 20 lbs. per yard weight should be laid down for the main travelling way.

Mining

One of the most striking features of the later development work is the small extent that has not been productive of good results. Such are not the results of chance, but of the close study of these peculiar geological formations. One of the chief points to be remembered in the consideration of future mining works is that there are two distinct sets of fissures, and that both are filled with gold-bearing quartz. The north-westerly bearing fissures will be found poor in certain sections, but the gold content will increase as the cross fissures are approached.

One of the objects in sinking the main shaft is to ascertain the result of the coalescence of Premier and Rosalind lodes where it is hoped that the ore-body will prove to be both richer and

larger. It is difficult to understand upon what grounds these ideas are based. As there is rich ore in the shaft it is advisable to continue operations in that quarter, but there is no reason to believe that richer ore will be found at greater depth. The adits provide the greatest natural facilities for mining and should be regarded as the main openings for attack. Long Adit when extended eastward, will be 600 feet below Rofe workings.

The time for the selection of a site for a main shaft from the surface is not yet. That is a matter for consideration if future developments warrant it.

More use could be made of the rock-drills if sufficient power were available. Mining by hand is too costly and slow.

General Remarks

At this stage of development a proper appreciation of the potentialities of this mine cannot be formed, as opinion based on present conditions leads one only into the bounds of conjecture. The mine has but little rich ore developed save those inestimable quantities in the workings of earlier operators, but all the known lodes can be explored at little cost from existing openings. Some of the lodes cannot be worked at a profit because the proportion of overhead expenses to the capacity of the mill is too great. If developments warrant it another milling unit of 10 heads of stampers should be erected, as much lower grade ore could be mined and treated at a profit in a mill of twice the capacity.

Provision should be made for the development of all the known lodes from existing mine openings, and for the extension of the battery, if required. If the mine Manager thoroughly understands the peculiar structure of the lode formations occurring here very little unproductive work need be performed. The mine is now fairly well equipped and can be worked economically.

The outlook is now brighter and, although the element of uncertainty is never absent, from any mining undertaking, the Company may look forward with hopefulness to the future.

Before concluding these remarks the writer desires to express his thanks to Mr. J. C. Matthews, late Mines Manager for the Company, for his assistance and hospitality during his stay on the field. He desires it to be understood also that the work of opening up the mine and equipping it, and the design laid down for further development, reflect credit on the late Manager for the technical skill and judgement displayed by him.

(Signed) A. McINTOSH REID,
GOVERNMENT GEOLOGIST.

18th March, 1925.