3400 0001

286

item 1

REPORT ON

UNIT B

REPORT ON UNIT "B"

LOCATION: This mining estate is located on the eastern slope of the Nightengale Mountains, in the unorganized mining District of Nightengale, Pershing County, Nevada, U.S.A., at elevations ranging from 5000 to 6000 feet.

Nightengale Camp is located 68 miles in a northeasterly direction from the city of Reno, and 50 miles northwest from the town of Lovelock, Pershing County, Nevada; Lovelock being a town of 1500 population located on the main line of the Southern Pacific Railroad. The Company owns its own telephone line connecting the mine with Lovelock and long idstance points. It is reached by good auto roads from both Reno and Lovelock, and a fair road connects with Nixon, Nevada, located on the north route of the Southern Pacific Railway, 20 miles from the property, the same being the nearest shipping point.

For a more definite location of this property see Map No. 3, which is a state map of Nevada, showing by red circle marked B, the position of the Nightengale property.

PROPERTY:
This unit is divided into three groups of mining properties, follows:

1 - The property that is owned in fee simple known as The Nightengale Mine proper;

2 - Those mining locations held under U.S. mining laws in the immediate vicinity of the Nightengale Mine;

3 - The Star Group.

Group 1 comprises,-

The East Half ($E\frac{1}{2}$) of the East Half ($E\frac{1}{2}$) of Section Twenty-five (25); Township Twenty-five (25) N. R. 24E., M.D.B.& M., containing One Hundred Sixty (160) acres, according to Government Survey;

Also the High-Grade Lode Mining Claim, designated by the Surveyor General as Survey No. 4475, containing nineteen and six hundred seventy nine thousandths (19.679) acres; located in the Nightengale Mining District, Pershing County, Nevada.

Also the Marvelous, and Marvelous No. 1 Mining claims, designated by the Surveyor General as Survey No. 4476, and containing Forty One and three hundred twenty-two thousandths (41.322) acres, located in the Nightingale Mining District, Pershing County, Nevada.

Group 2 comprises,-

Twelve mining locations containing approximately 230 acres of mineral land and consist of the following claims.-

Senator
Nederland No. 1.
Mammoth
Scheelite Extension
Tungstite
Don
Dum
West View
West View No. 1
Nederland No. 2
Nederland
Summit Extension.

(See Sheet No. 1)

Group No. 3.

The Eastern Star Group is six and one-half miles east of Nightingale Camp and is in Sections Twenty-four and Twenty-five (24 & 25), Township Twenty-five (T. N. 25) North, Range Twenty-five East (R. 25 M.D.B. & M.) and Section Nineteen and Thirty (19 & 30) Township Twenty-six (T.N. 26) North, Range Twenty-six East (R.26 E.M.D. B & M.)

There are eleven lode claims in this group, namely:

Eastern Star No. 6,
Star Fraction,
Star Lode,
Eastern Star No. 5,
Eastern Star No. 8,
Eastern Star,
Eastern Star No. 2,
Sunrise No. 1,
Sunrise,
Sunrise No. 2,
Sunrise No. 3

(See Sheet No. 2)

CLIMATE: The climate at the mine is mild. There are a few hot days during the summer but the evenings and nights are always cool. During the winter some snow falls, however, the cold snaps do not last for more than a few days at a time. Pipes must be covered two feet in the earth to prevent freezing. The rainfall is about 8 inches, most of which falls in December and January. The altitude is 5500 feet above sea level.

WATER SUPPLY: The water for mining and domestic purposes is obtained from wells located on property approximately a mile east of the mine which the company holds under long term lease. There are four wells which produce approximately fifty gallons of water per minute as determined by a test run made June 29-30,1930. Prior to this time the wells had been pumped quite steadily to a capacity of approximately 35 gallons per minute. On June 29th, all pumps were closed excepting No. 4 and this was run to its ful capacity from 9:00 A.M. until 7:00 P.M., and the water was lowered in the well until it was running freely from the tunnels into the sump. During this ten hours of operation 54" of water was run into the lower storage tank which has a capacity of 533.10 gallons per inch of depth. Therefore, in the ten hours time 28,787 gallons were pumped into this tank or 2,878.7 per hour, or 48 gallons per minute. As No. 4 2311 has a capacity greater than all the other wells combined and the pumping of this well undoubtedly partially drains the others, I am basing the production of the area entirely upon this one well, using the other wells as a factor of safety in my assumption of fifty gallons per minute.

The water supply from these wells could probably be increased twenty-five percent by the extension of the cross-cut

tunnels, but any further increase above the twenty-five percent is unlikely, and this no doubt represents the ultimate possible amount of water from this particular source. However, I am of the opinion that in sinking the Nightengale Shaft to a depth of six hundred feet as hereinafter outlined sufficient water will be encountered in the mine itself to run a mill of five hundred ton capacity.

The water from the aforesaid wells contains considerable lime carbonate in solution and therefore without treatment is unfit for use in boilers and Deisel engines, but is perfectly satisfactory for milling purposes. The tops of these wells, at the present time are open, which permits small animals to fall into the water making it unfit for domestic consumption. However this could easily be remedied by putting in cement bulkheads and tight manhole entrances at the cellars of the wells. The water naturally is excellent domestic water and contains no poisonous minerals of any nature. Water is pumped from these series of wells directly into a storage tank located at the wells 33' in diameter and 20' high, 18' of the same being serviceable. This gives a total live capacity of 115,156.8 gallons, or 6,397.6 gallons for each foot in depth, or 533.1 gallons for each inch in depth. From this tank it is pumped to a second tank of similar size and capacity by means of a Demming deep mine pump through a 3" pipe approximately a mile in length and against a hydraulic and fricitional head of 600'. An actual test of delivery was made on August 11th, 1930 and is shown on Exhibit 'E', in which case the actual delivery was 35.69 gallons per minute, and the actual cost of pumping including oil, gas, operators and mechanics time, was ten cents per thousand gallons. From the upper tank, the water flows by gravity to the mill make

up tank, which is a redwood tank 18' high and 31' in diameter and having a total active capacity of 95,976.5 gallons at a depth of 17', or 5,645.7 gallons per foot, or 470.5 gallons per inch of depth. The mill is fed directly from this tank; the tailings from the mill are run by gravity to a settling tank or Dorr thickener 23' in diameter and 10' high with a total active capacity of 27,970.2 at a depth of 9', or 3,107.8 gallons per foot, or 259.0 gallons per inch of depth. The sludge is discharged through a one-half inch spigot into the tailings pond. The total amount of water lost or discharged is 17.54 gallons per minute (See Exhibit 'F'), when the mill is operating at four tons per hour capacity. The 3/16" spigot becomes clogged when the mill is operating at the aforesaid capacity, but the 1/2" spigot would easily discharge the tailings from a six tons per hour operation and a two hundred ton mill would discharge approximately twenty-five gallons per minute, based on the above experiment. Therefore, the present water system is adequate for a mill of two hundred tons capacity for which the Nightengale Mill was designed.

TAILINGS:

The tailings from the Nightingale Mill are stored in a tailings pond north and east of the thickener house in which they directly flow. The tailings at present run about .2%, but after the installation of the improvements hereinafter mentioned, they should run under .1%. However, in any case they should be stored for future consideration.

POWER:

There is no commercial electric power in the vicinity. The mine and mill is operated by electric power generated by Deisel and semi-Deisel engines. The Deisel engine consists of an Allis-Chalmers 220 H.P. installation which I estimate delivers 160 H.P. at the Nightingale Mine.

The semi-Deisel installation consists of two eighty horse power Muncie engines which I estimate to deliver at this altitude and under operating conditions 80 H.P. for the two. Therefore, the total net operating power is 240 H.P. which is sufficient power for all requirements of the mill as it now exists including compressor and hoist for the mine, as well as domestic light for the entire mine and camp. The cost of generation at the present time is 1½¢ per K.W.H. on the Allis-Chalmers and 3¢ per K.W.H. on the Muncies.

In all future extensions of the mine and mill it would be advisable to build along a unit system and as a basis of the power unit I would advise the installation of a Buda type full Deisel enginer of approximately 120 H.P. (see level rating) which would deliver 80 H.P. under the conditions found at Nightingale for each unit installed.

The advantage of the unit system is that extra parts of machinery, or even the full machine, may be kept on hand to replace worn and broken parts of machines without loss of time incident to replacement.

TIMBER:

There is no timber in the immediate vicinity of the Nightingale Mine, the nearest growing timber is the eastern slope of the Sierra Nevada Range, fifty miles west of Reno, Nevada. The timbering in the Nightingale shaft is sawed Oregon fir which I

estimate to cost $100.00 per M in place.

MILLING:

The milling of the Nightingale ore consists of gravity concentration and magnetic separation. Scheelite ($CaWO_4$) has a specific gravity of 6.00, has a very definite cleavage and is friable and easily broken when in crystal form from the rock magna in which it is found. It does not slime nearly so much as the ferberite ores of Boulder County and for that reason ores running less than one percent can be treated with a saving that will average eighty-five percent. However, since scheelite is so firable and brittle it is often times ground to the finest powder under normal milling operations and when in this state remains in suspension in the water for several hours and on account of this propensity it is spoken of as easily slimed. The problem, therefore, in the milling of tungsten is coarse crushing, careful sizing both by screen and hydraulic methods and finally re-grinding the middlings and concentrating the finely ground product over sliming tables. While the specific gravity of garnet is from 4.0 to 4.5 and the specific gravity of pyrite is 5.0, it is almost impossible, by gravity concentration to remove the garnet and pyrites from the scheelite without extreme loss. This is probably due to the physical shape of the particles and while the iron pyrite and chalcopyrite could be moved by flotation the garnet would remain. Hency the practice in milling scheelite ores in the Nightingale District is to concentrate to forty percent WO_3, thence to pass over a magnetic separator after drying to remove the garnet content. The concentrate is then roasted in an oxidizing roast for about five minutes or until the surface of the pyrite grain has been changed to a magnetic sulphide

when it is again passed over the magnetic separator and the greater portion of the iron pyrite and the chalco-pyrite are removed. If, however, the roast has been carried too far, the hematite formed will have to be removed by re-tabeling. The concentrates are then further subjected to a dead or white-hot roast which removes the remaining sulphur and any voletile impurity'(See Exhibit 'C') for the methods and costs of concentrating tungsten ore at The Nevada-Massachusetts Mill, Mill City, Nevada' which is one of the successful milling plants on scheelite ore operating in the United States.

For a plan of the present Nightingale Mill see sheet 3-B, it's flow sheet is as follows:-

1 - An outside receiving bin for receiving ore from the various properties hauled in by truck. Size 15.4' long by 9.5' wide with sloping bottom 3' deep on short side and 10' deep on discharge side, having a live capacity of 78.7 tons.

2 - The ore from 1 is discharged through Meese Gottfried gate onto a ½" grizzley 4½' long and delivered to,-

3 - An 18" X 24" Wheeling Crusher No. 6, the jaws set to crush to 2"; the crusher operated by a 50 H.P. Allis Chalmers motor, running at a speed of 865 R.P.M.
The crushed ore and the bipass from grizzley (2) is elevated by,-

4 - a bucket elevator with 10" X 6" buckets elevates the crushed ore to the mine bin,-

5 - 16.8' X 14.5' X 13.77' where it joins the ore hoisted from the Nightingale Shaft. The dead capacity of this bin is 218 tons, its live capacity is 40 tons. Under the plan as outlined on Sheets 4-B and 5-B, the bin would be divided into halves with hopper bottoms as shown on said sheets. The north half would be for waste rock, while the south half would be for ore. An automatic device would be installed so that the hoistman could dump the skip either way. Both compartments would have a live capacity of 125 tons. The mine bin is emptied through,-

6 - a Meese Gottfried gate onto,-

7 - a 1" grizzley five feet long which feeds,-

8 - an 8" X 16" Sampson crusher set to 1" crushing size. The

crushed ore, together with the bipass of the grizzley falls upon,-

9 - a 12" belt conveyor which transports it to,-

10 - a bucket elevator (should be lengthened 10 feet) which discharges it into,-

11 - the mill bin, the same being a circular ore tank 23½' inside diameter and 15½' high, whose dead capacity is 437 tons and whose live capacity is less than 50 tons. Under the plan as outlined the live capacity would be 400 tons. From the mill bin, the ore is fed by,-

12 - a Hammil ore feed operated by a 5 H.P. G.E. motore, operating at a speed of 900 R.P.M. onto,-

13 - a 12" conveyor belt, which discharges it into,-

14 - a 3 X 6' trommell of ¼" mesh set on a slope of one inch to the foot. At this point water is introduced. The oversize from this trommell flows through a launder to, -

15 - a set of Allis-Chalmers 14" X 30" rolls, set to crush to ¼". The ore from this set of rolls joins the undersize from trommell (14) and flows directly into,-

16 - a 3' X 6' ten mesh trommell, the undersize flowing to,-

17 - wet elevator No. 1, the oversize from the 3' X 6' ton mesh trommell (16) flows to a wet,-

18 - Elevator No. 2 which delivers it to the second set of,-

19 - Allis-Chalmers 14" X 30" rolls set as close together as possible. The material from these rolls joins the undersize from trommell (16) at elevator No. 1 (17). It then flows through,-

20 - hydraulic pocket classifiers. From the first feed to,-

21 - Plate-Deister Sand Table No. 1. From the second feed to,-

22 - Plate-Deister Sand Table No. 2. From the third feed to,-

23 - Plate-Deister Sand Table No. 3. The slimes passing to,-

24 - Two 6' X 6' Callow tanks. The overflow from (24) to,-

25 - an 8' X 8' Callow tank outside building. The underflow from (24) to,-

26 - Wilfley Table. The underflow from (25) to,-

27 - diagonal Deck Deister table. The tailings from all tables carried by launder to,-

28 - Aikens classifier; the sand to conveyor belt and tailings dump; the slimes to,-

29- Dorr Thickener. Overflow pumped to,-

30 - Mill Make-up Tank, underflow to,-

31 - Tailings dump.

The middlings from all tables runs by gravity to,-

32 - Wilfly Pump, and is pumped to,-

33 - McFarland Rolls, size_____, thence back to the circuit.

The scheelite ores of both Nevada and Arizona have a tendency to oxidize near the surface of the ground to tungstite, which can not be saved by the ordinary process of table concentration and, therefore, becomes lost in the Nightingale Mill. This condition of oxidation was noticed by Mr. Arthur Collins in his report on the King mine of Arizona copy of which is given in my report under Exhibit 'A', Unite 'C'. Mr. Collins does not specifically state that the mineral is tungstite, but he does state there is a refractory tungsten mineral in the King ore as well as the ore of the Huachuca Mountains of Arizona, while in my examination of these properties, I have definitely determined that such refractory mineral is tungstite. Fortunately, the tungstite is a purely surface oxidation and does not extend to a depth of more than a hundred feet, and in the Nightingale district appears to be entirely absent on the first level in the Nightingale shaft. For this reason the milling consideration of tungstite is negligible.

The screen analysis made on the Nightingale ore first by H. K. Lidstone under date of June 9th, 1928 as shown by Exhibit 'G', and second the screen analysis made by Mr. Axel Johnson under the supervision of Fred A. Fair, under date of July 2nd, 1930, as shown by Exhibit 'H', indicate that approximately 50% of the values

are in particles under 30 mesh, and 50% are in particles over 30 mesh. For this reason a double proceds of concentration will have to be carried out in order to make an 85% saving of the scheelite content.

In the first stage coarse grinding and coarse concentration is proper and the present mill equipment is satisfactory; for the second stage fine grinding is necessary, therefore, a rod mill and callow or other equally efficient screens should be installed. (See Sheets Nos. 4 and 5B.) Therefore I recommend the following:-

1st:
That before anything further is done, an expert on mill design be employed to examine and report on the Nightingale Mill, and redesign it along the Unit System on a basis of five units of one hundred tons capacity or a total of five hundred ton capacity when completed.

2nd:
That a Mill Superintendent be employed to run the mill who has had at least five years experience in the concentration of tungsten ores.

3rd:
That the gallows frame of the Nightingale shaft be raised ten feet and a hopper bottom be put in the mine bin to bring its live capacity up to its present dead capacity; that it be subdivided by an easterly and westerly partition into two compartments, the north compartment for waste rock and the south compartment for ore, and that an automatic hopper arrangement be installed so that the hoistman can dump into either bin at will.

4th:
That the present waste bineon the north of the mine bin be torn down and the material be used in the construction of a crushed ore mine bin to feed Roll No. 1.

5th:
That Roll No. 1 be moved out of the Roll House to the position shown on Sheet No. 4 - B and No. 5 - B.; Elevation of base 5533, and that a crushed ore mine bin be constructed to feed Rolls No. 1 as shown on said sheets. That the rolls and grizzley from said bin be set at 3/4 inch.

6th:
That the Sampson crusher be moved from the crusher house to position shown on said Sheets Nos. 4-B and 5-B, the elevation of the vase to be set at elevation 5534.5, and the grizzley

and jaws set to 1½ inch. That a chute from the crusher be so arranged that the crushed ore may be either conveyed to elevator to west of crusher, or directly to the belt conveyor to the south as desired.

7th:
That the present conveyor from the Wheeling crusher be changed to a vertical position and to discharge into a crushed mine bin to be built to the same height of mine bin as shown on said sheets.

8th:
That a belt conveyor be constructed as shown on said sheets, the discharge end to be of sufficient heighth as to allow the installation of a sampling device.

9th:
That a hopper bottom be constructed in the present mill bin so that the live capacity shall equal the dead capacity and that concrete foundations extending to bedrock be constructed under the west bents as shown.

10th:
That No. 2 Rolls be set to crush to 1/4 inch; That McFarlain Rolls be installed in roll house to duplicate No. 2 Rolls when out of commission.

11th:
That the installation of a 4 X 9' rod mill be made in roll house for the final regrind of oversize from Roll No. 2, and the middlings returned from the tables.

12th:
That three traveling belt callow duplex screens of 16 mesh, 24 mesh and 48 mesh respectively, be installed to handle the product from the rod mill.

13th:
That the floor of both concentrating rooms be extended to a full 24 Ft. width as shown and ten tables be installed as shown; the finer concentrating tables and the alimers to occupy the lower floor.

15th:
My opinion on these ores is a two stage concentration; the first stage is to take the scheelite out in as coarse a crystal as possible - rolls and trommel screens and plate-Deister coarse sand tables as now installed is proper; the second stage is fine grinding of middlings with rod mill and callow screens and Deister-Overstrom fine sand tables; and for the slimes callow tanks and Deister-Overstrom slime tables is proper.

There is at present enough ore of a one percent grade in the various surface openings on the Mammoth, Scheelite Exten-

sion, Don, Nightingale, Nos. 1, 2 and 3, and in the Glory Hole of the Nightingale Shaft, and in the Star Group of Mines, to keep the present mill operating for one year at a one hundred ton capacity, providing the development work for such a grade of ore (1%) is carried on with reasonable diligence. This would allow sufficient time to sink the Nightingale shaft an additional five hundred feet and the various drifts run as hereinafter outlined, to support a mill of from two to five hundred ton capacity operating on ore running 5/10 of 1%.

TITLE:

No attempt is made to pass upon the title to the mines set forth in this report as this is the function of abstractors, and a careful examination of Abstracts of Title should be made by a competent attorney.

The ore bodies, however, reported upon and upon which all estimates are based, lie well within the boundaries of the claims herein shown on the various sheet maps. In other words, the mineral land and the apexes of the various veins are thoroughly and properly located, and upon those claims held by location the assessment work has been done for the year 1930, which holds them by possessory title under United States Mineral Laws, until July 1st, 1932.

GENERAL GEOLOGY:

The geology of the Nightengale Mountains is somewhat similar to that of The Little Dragoon and Huachuca Mountains of Arizona in that the ore occurrence is at the contact zone of porphyritic granite which has broken through ancient sedimentary beds but unlike them the contact along the westerly rim is vertical. The sedimentary beds form the highest peaks both in the vicinity of the Nightingale Mine proper and in the vicinity of the Star Group, lying six miles to the east of the Nightingale M.

Mine, while the valley, known as Sage Hen Flats, lying between the two above mentioned properties is eroded entirely into granite. The contact between the granite and the sedimentary beds in the Nightingale shaft (130 feet deep) is vertical, showing no indication of dipping either easterly or westerly. However, as we approach Winnemucca Lake the beds have a slight dip to the westward indicating to my mind that the granite contacts will dip westerly with depth.

This is also further evidenced by the westerly dip of the sedimentary beds on the Scheelite Extension Lode and the Don Lode (See Sheet No. 1 - B). However, the sedimentaries on these two lodes are split away from the main body of limestone and shales as shown on said plat. The general course of the contact is north 5° West, while the average course or strike of the sedimentaries is north 25° west. The sedimentary rocks of this locality are, although no fossil evidence has been found, probably Cambrian Limestone Shales highly altered, - limestones becoming marble and shales becoming slates. Schist appears at but one point on this property and that is in the cut on the south end of the Summit Extension Lode at the granite-slate contact. This schist somewhat resembles the Pinal schist of Arizona, but is probably of considerably later origin and in all probability is metamorphosed slate at the granite contact.

The general geology of the Star Group varies considerably from that of the Nightingale Group in as much as it appears that the sedimentaries are blocks floating in the granite magma as shown on sheet No. 2 - B. These blocks, however, are arranged in a general easterly and westerly alignment with the line of contact and ore deposition following the south edge. The general

The largest strata of limestone cutting the sedimentary granite contact I have labelled on Sheet No. 1 - B. "The Nightingale Limestone". This contact forms in the Nightingale Mine what is known as the "Glory Hole", which is a body of commercial ore running approximately .6 of 1% WO_3 one hundred feet in length and averaging twenty-five feet in width (See Sheet No. 6 6 - B between stations 2/30 S and 3/70 S).

The next largest strata of limestone cutting the sedimentary granite contact is that found in the No. 3 Nightingale Tunnel. This limestone occurs about six hundred feet easterly of the Nightingale Limestone and is labelled No. 3 Limestone as is shown on Sheet No. 1 - B. This limestone cuts the contact fourteen hundred feet north of the Nightingale shaft and is followed in a parallel course by an Aplite dike which extends to the feldspathic knob south of the Nightengale Camp to the granite intrusion near the center of Sec. 24, T. 25 N. of R. 24 East as shown on said sheet No. 1 B. This Aplite dike together with the aforesaid granitic intrusion seems to split off the sedimentaries lying north and east into two floating islands of sedimentary rocks both of which are highly mineralized. The southernmost of the two islands form the ore zone of the Mammoth, The Scheelite Extension and the Don Lodes where opened. This island appears to have been but slightly displaced both in strike and dip from the main sedimentary deposit to the west. The northernmost island, however, though mineralized is turned 90° to the eastward and in the case of the No. 3 Limestone, the dip is 70° to the north.

Between the Nightingale Limestone and No. 3 Limestone the granite sedimentary contact cuts a series of small limestone beds and limey shales, so that there is practically a continuous

ore shoot on the line of contact extending from four hundred feet south of the Nightingale shaft to fourteen hundred feet north of the Nightingale shaft, as shown on Sheet No. 6 - B and Sheet No. 70-B, and a portion thereof on Sheet No. 8 - B. From this point the ore seems to follow No. 3 Limestone as shown on said sheet No. 8 - B where it is cut in No. 3 Tunnel, a total distance of 2300 feet of practically continuous ore shoots which I estimate will have an average width of fifteen feet and an average value of one half of one percent WO_3, for a depth of 500 feet below the surface of the ground.

By examining Sheets Nos. 6 - 7 - 8 B, it will be noted that the contact vein is cut in numerous places by spar dikes. Those dikes are usually barren of ore within themselves but that at the sedimentary lime contact with the dikes the local enrichment amounting to as much as 5% WO_3 more than offsets the barren area of the dike itself. It will also be noted in the vertical projections of the vein a series of dotted lines dipping approximately 25° to the north labelled on said sheets "Bedding Planes". These planes were first mistaken by me as true bedding planes, but after a more through study of the geology I am satisfied they are false bedding or relief fractures, but they have a very material effect on the ore bodies. The raising solutions having a tendency to follow and bank against them, resulted in large lenticular sections of the more porous laminations becoming more thoroughly mineralized than the laminations which were not so extensively fractured and were tighter in nature, thus we have zones in the vein which will average 1% WO_3 or in some cases even higher, while other zones are too low to pay to mine. This is especially true in No. 3 Tunnel where a grade of 2% ore six feet wide dips

between two barren zones of lime to the northward on a 20° dip. This zoning condition, however, becomes less and less with depth and in the bottom level of the Nightingale shaft the commercial ore is practically solid, although the local enrichment along these fracture planes is still noticeable.

The section of No. 3 Limestone between the No. 3 Tunnel and the Don Lode is little explored and little known, although the following so closely of the Aplite dike with the No. 3 Limestone would indicate the possibility of the enriched zone shown in the No. 3 Tunnel to be extended underneath this entire area, hence the importance of driving the breast of No. 3 tunnel following the dip of the ore is an important exploratory development.

The re-appearance of rich deposits of size in the Don, The Tungstite, the Scheelite and the Mammoth Lodes, would indicate to my mind a second mineral area centering near the tungstite shaft south of the granite wedge on the west end of the Tungstite Lode, Sheet No. 1 - B. This area has not been sufficiently developed to prove the extent of the mineral possibilities, but the higher quality of the ore where opened and the finding of rich scheelite float running 10% WO_3 near the south apex of this granite wedge would indicate to my mine the possibilities of an ore shoot even richer than the Nightengale shoot as hereinbefore described.

The depth to which the sedimentary blocking in the Star Group (See Sheet No. 2 - B) will extend is problematical. At first I was under the impression that it was of a purely surface nature and would be exhausted within one hundred feet as its greatest depth, but after climbing down the Star shaft and finding the sedimentaries in the lowest level which is one hundred and forty

feet below the surface practically in the same position as was found on the surface, which would indicate to my mine, that this blocking will most likely extend to depths as great as tungsten is usually found (from six to eight hundred feet).

If the above conclusion is correct the surface deposit labelled "Tract A" and shown in detail in Sheet No. 9 - B is probably the largest ore body in the district and may be the largest deposit of its kind in the world; and the quantity estimate of 44,604 tons as given on said Sheet No. 9 - B would be increased many times. The value of this ore as sampled by H.K.Lidstone on June 9th, 1928 and shown on "Exhibit C" was .6219% WO_3. The values of this ore is more correctly determined in volume in giving returns from the tonnage produced from this group, especially Star No. 8 as given under the heading "mill Runs" in a following paragraph and is the same mineral found at Mill City Nevada, which is successfully treated by the Nevada-Massachusetts Company, see exhibit C referred to on page 10 hereof; therefore your company has no complicated milling problems to over come in order to produce a pure tungsten concentrate, as the present mill at Nightingale is equipped to mill these ores by the proven method of concentration and magnetic treatment, and the mill additions recommended in this report, is installed will be an improvement over any other mill in point of saving that is now operating on this character of tungsten ores.

This particular character of ore which I have carefully examined is associated with copper in the form of asurite and malachite, which are alteration products from chalco-pyrite. The chalco-pyrite often times remaining in the center of the asurite and malachite ores so that as soon as live ores are encountered we may expect the copper to be in the form of chalco-purite and as it

contains enough iron to make it become magnetic upon roasting it responds readily to magnetic separation.

A deposit similar to that of tract A occurs on the Eastern Star No. 6 where the strike of the lime beds are in a northwesterly direction and their dip is an average of 70° southerly. They are quite regular in both their strike and dip, are approximately 1500 feet in length and 200 feet in width. The granite-lime contact is quite regular and resembles that of the Nightingale district, except that it dips 70° southerly. It is my opinion it is second in importance to Tract A, and will extend to considerable depth.

The third tract of importance is that found in granite lying between two sedimentary blockings on the Eastern Star No. 8. A mill run of thirty tons from this ore averaged 7/10 of 1% WO_3. The workings upon this claim are very shallow, hence the extent to which it will produce is unknown, but owing to the fact that sedimentaries occur both north and south of this granite tongue and the presence of an Aplite dike crossing the ore dike would indicate to my mind that the sedimentaries will come close together with depth and the granite tongue will become narrower with depth. This would be conducive of better ore deposition.

MILL RUNS:

In addition to the assay returns as shown on the various exhibits and maps of this report, a series of mill run tests were actually made in ten to thirty ton lots to determine the value of the ore from various places on the Nightingale Mine and the Star Group which are shown by "Exhibit I". The values herein given and estimate of ore bodies are based upon the assays herein given, numerous pannings and the mill runs hereinbefore mentioned, and from those numerous sources I am of the opinion that the average

value of all the ore of the Nightingale Mine and Star Group is as follows under caption "Ore Bodies".

ORE BODIES - Nightingale Mine.

Developed Ore: In the Nightingale Shaft above Elevation 5430 (See Sheet No. 6).

Average Width	15 feet	
Average value	8/10% WO_3	
NOTE: See Exhibit "D". Assuming 40% waste.		
Total Quantity of Ore	60,000 Tons.	
60,000 Tons = WO_3 Content, 480 Tons		
85% Saving = 408 tons $1,000.		$408,000.
Cost to Mine @ $1.50 X 60,000 = 90,000		
Cost to Mill @ $1.00 X 60,000 = 60,000		$150,000.
		$258,000.

Surface Ore:

Development Plan No. 1.
(Sink Nightingale Shaft 75 Ft. to El.5350)
Drift N.5°W 2000 feet and S 5°E 500 feet at elevation 5375. Average width 10 feet, Average value 7/10%.
Assuming a waste of 40%, total quantity ore is 200,000 tons of an average value .7% equals 1400 tons of WO_3 @ .85% saving, equals 1190 tons @ $1,000. = $1,190.000

3000 Ft. Drift @ $15.	45,000.	
450 Ft. Upraise @ $20.	9,000.	
Mining 200,000 Tons @ 1.50	300,000.	
Milling " " @ 1.00	200,000.	
	$554,000.	554,000.
Net Value		$ 636,000.

Probable Ore:

Development Plan No. 2.
(Sink Nightingale Shaft 425 feet to E.4950.)
Drift N.5°W 2000 feet and S.5°E 1000 feet.
Average width 10 ft - Average value.6/10%
Assuming a waste of 40%, total quantity ore is 828,750 tons of an average value of .6% equals 4,972.5 tons WO_3 @ 85% saving equals 4,226.625 tons WO_3 @ $1,000. $4,226,625.

600 ft.double Comp't shaft @ $100.00	60,000.	
6000 ft.drifts @ $15.	90,000.	
1200 ft.uprise @ $20.	24,000.	
828750 tons to mine @$1.50	1244,125.	
828750 tons to mill @$1.00	828.750.	2,245.875.
Net Value		$1,980.750.

Possible Ore:

Development Plan No. 3.
Drive breast No. 3 tunnel E.5550 ft. along No. 3 Lime to Mammoth cut 4000 ft. as shown on Sheet No. 1 - B. Average width 5 ft - average value 1% WO_3 equals 750 tons at 85% saving, equals 637.5 tons @ $1,000. equals---------- --- 637,500

4000 ft. drift E.5550 @ $15.	60,000	
1700 ft. drift E.5700 @ $12.	20,400	
5000 ft. upraise @ $20.	10,000	
75,000 tons ore to mine @ $1.50----------	112,500	
75,000 tons ore to mill @ $1.00----------	75,000	277.900
NET VALUE----------		$ 359,600.

Possible Ore:

Development Plan No. 4.
Extend Drift El.5375, Nightingale Mine from sta. 2000 N. a distance of 4000 feet. Average width of ore 5 ft - average value 1% WO_3.
Assuming 2/3 waste, leaves 100,000 tons of ore 1% WO_3 equals 1000 tons WO_3 @ an 85% saving equals 850 tons @ $1,000. 850,000.

4000 ft drift @ $15.00	60,000.	
700 ft uprai se @ $20.00	14,000.	
100,000 tons ore mined @ $150	150,000.	
100,000 tons ore milled @ $1.00	100,000.	324,000.
Net value----------		326,000.

STAR MINE

Surface Ore:

Development Plan No. 5 (open cut) See Sheet No. 9 - B
Ore above elevation 0/00 (Assumed)
22,302 tons of 7/10% ore equals 156.1 tons WO_3 at 85% saving, equals 132.7 tons @ $1,000.00, equals----------$132,700.
11,151 tons of 6/10% ore equals 66,906 tons WO_3 at 85% saving, equals 56.87 tons @ $1,000.00---------- 56,870
Total Value---------- 188,570

Cost to mine with steam shovel and haul to mill 33,453 tons @ $1.50----------50,179
Cost to mill 35,453 tons @ $1.00----------33,453 83,632.
Net Value---------- ----------83,632 $ 104,938

Possible Ore:

Development Plan No. 6.
Sink 500 ft. shaft at Tract A from 0 to -500 elevation.
557,550 tons ore 7/10% value equals 3,902.85 tons WO_3 at a saving of 85%, equals 3317.42 tons WO_3 @ $1,000.00 equals---------- 3,317,000.
278,775 tons of ore 6/10% value equals 1672.65 tons WO_3 at an 85% saving equals 1,421.75 @ $1,000.00. 1,421.750.
Total Value---------- 4,739,750

500 ft. shaft @ $40.00	20,000.	
2400 ft. drift @ 15.00	36,000.	
To mine 836,325 tons ore @ $1.00----------	836,325	
To mill 836,325 tons ore @ $1.00----------	836,325.	
To haul 6 miles 836,325 tons @ $1.00----------	836,325.	2,564,975

Net value---------- $2,173,785

Possible Ore:

Development Plan No. 7.
Sink No. 6 shaft 500 feet.
Surface area of shoot 11,970 Sq. Ft.
500 ft. equals 400,000 tons ore allowing for a 40% waste.
400,000 tons 7/10% ore equals 2,800 Tons WO_3, and at an 85% saving gives
2,380 tons @ $1,000 equals---------- 2,380,000.

500 ft. shaft @ $40.00	20,000	
2000 ft. drift @ $15.00	30,000	
400,000 tons ore mined at $1.00----------	400,000	
400,000 tons ore milled at $1.00----------	400,000	
400,000 tons ore hauled at $1.00----------	400,000	1,250,000.

Net Value---------- 1,130,900.

CAPITULATION:

		Net Value
Developed Ore: ----------		
Surface Ore:		
Nightengale Mine (Development Plan No. 1.)	$636,000	
Star Mine (Development Plan No. 5.)	104,938	740,938

Probable Ore:		
Nightingale Mine.		
Development Plan No. 2	1,980,750	
Development Plan No. 3	349,600	
Development Plan No. 4	526,000	
Development Plan No. 6	2,173,785	
Development Plan No. 7	1,130,000.	6,170,135
TOTAL----------		7,169,073
Cost of Equipment:		
Nightingale Mine	100,000.	
Star Mine	30,000	
Nightingale Mill to 500 ton capacity.	250,000.	400,000
Net Value of Project--- ----------		$6,769,073

EXHIBIT "D"

EXHIBIT "D"

Assays from Nightingale Mine

No. Assay	Width	WO_3 Content	Location
1	11' "	1.01	6N/10 Surface
2	9 - 5	.90	" "
3	14	.95	3S/35 Bottom Level N.M.
4	3 4	.88	2S/75 " " "
5	7 3	.93	2S/75 " " "
6	4 0	.92	" " " "
7	7 6	1.02	1S/85 " " "
8	11 0	.83	1S/30 " " "
9	4	.84	" " " "
10	4 3	1.01	0S/35 In Breast Drift
11	5 7	.68	1N/15W Side Streak
12-A Star Mine.	6 5	1.10	1N/50
12	8 8	----	See Sheet No. 2 - B
13	7 1	.95	" " " "
14	12 6	--	
15	8 8	.62	" " " "
16	10 2	.58	" " " "
17	16	.57	" " " "
18	16	.62	" " " "
19	20	1.10	" " " "
20	36	----	" " " "
33	10	.60	3N/23
34	10 3	.72	"
35	9 5		4N/4
36	12		4N/51
37	12		6N/56
38	7	.58	6N/80
39	3	.70	7N/10
40	8 6	.73	7N/10
41	15 4	.83	7N/62
100	5		Senator Disc. See S.N.1-B.
101	5		Mammoth " " " "
102	5	.60	Tungstite" " " "
103	5	.61	Star Shaft " " 2-B.
104	5		Scheelite " " 1-B.

NOTE: These assays were made by Richards and Son of Denver, Colorado; signed certificates of which are hereto attached. Samples Nos. 21-32 Star Group were never taken as mill runs were made in lieu thereof.
Samples Nos. 42-99 were skipped because they were taken at separatetimes. Others will be written in in ink as they are not completed.

EXHIBIT "E"

EXHIBIT "E".

QUANTITY TEST --- AUGUST 11, 1930.

Purpose: - To determine actual amount of water delivered from lower to upper tank and to check by calculation the experiment.

All well pumps were closed. The Demming Triplex pump was started. The lower tank was lowered 16" in 4 hours of continuous pumping. The capacity of the lower tank is 533.1 gallons per inch. Therefore, a total of 16" X 533.1 gallons per inch, or 8529.6 gallons were pumped in 4 hours or 240 minutes. So, 8529.6 gallons divided by 240 minutes equals 35.5 gallons per minute as the actual working capacity of the pump.

Quantity of water pumped by above Demming Triplex as determined by calculation.
Each pump plunger makes 28 R.Pm., therefore, three plungers make 84 R.P.M.
The size of each piston is 3 61/64ths inches in diameter or .2394 feet.
The stroke is 8" or .6667 feet, therefore thecontent is area in square feet times stroke.
The area equals.085216 Sq.Ft. X .6667 equals .0568 Cu.Ft. or .42486 gallons of water for each stroke. Therefore, 84 strokes X .42486 equals 35.69 gallons per minute, while that actually pumped was 35.5 gallons per minute by actaul measurement hereinbefore given.

The cost is as follows:

Stove oil used was 1.56 G.@ 12½¢ -	19.5¢
Cup Grease ½ Pound @ .07	3.5
Mechanic (¼ Hr. @ 90¢)	22.5
One-half Gal Gas @14¢	7.
Operator (½ Hr. @ 60¢)	30.
Total---	82.5¢

8529.6 gallons at a cost of 82½¢. or 9.7 per 1000 gallons.

EXHIBIT "F"

EXHIBIT "F"

WATER CONSUMPTION TEST MADE JUNE 26th,1930

One-half inch spigot from door thickener running freely. The mill running on four tons per hour capacity.

I procured two oil buckets of equal capacity, each weighing 23 pounds, and by using the two and running the spigot discharge through a launder was able to measure by bucketsful the discharge of both water and sediment.

I filled twenty of these buckets in 6.5 minutes, each bucketful of water and sediment weighing 72.75 pounds. Subtracting 23 pounds for the weight of the bucket left 49.75 pounds as the combined weight of water and sediment.

Taking one bucketful of water and sediment I then evaporated off the water from the sediment. The residue including the bucket weighed 30.5 pounds. Deducting the weight of the bucket leaves 7.5 pounds of sediment to each bucket of water.

20 Buckets X 49.75 Pds ----------995. Pds.
995 Pds divided by 6.5 Min gives the spigot outflow at ----------153.62 Pds. of water per minute. (Water and sediment)
Sediment equals 20 X 7.5 Pds or -------150. Pds
150 Pds divided by 6.5 M equals-------- 23.62 Pds.P.M. or a net loss of 130 pounds of water per minute.
(NOTE: A gallon of water (U.S.Standard) weighs 8.35 pounds)
130 divided by 8.35 equals ---------- 15.56 G. P. M on a basis of four tons per hour ore concentration.

The sediment loss through the spigot is 23.62 Pds. per minute or 1416 pounds per hour, the total quantity through the mill being 8000 pounds per hour.

Therefore the Akens classifier removes 6584 pounds of sand with a 15% water content, or 987.6 pounds of water per hour, or 16.5 pounds of water per minute which equals 1.96 gallons per minute.
15.56 plus 1.98 equals 1754 Gallons Per Minute, which represents the total loss of water.

EXHIBIT "G"

EXHIBIT "G"

SCREEN ANALYSIS FROM SAMPLE NUMBER ONE.
ANDERSON BIG CUT. SAMPLE CUT FROM
BOTH SIDES FROM 59.0 FACE.

Screen Size	Weight of Product	Percentage of Total Weight	Assay WO_3 Content.	By Weight Content WO_3	Per centage of WO_3 content.
On ½ inch	16.10 Grs.	1.42	0.36	0.0051	0.82
On 3 mesh	131.605	11.62	0.44	0.0511	8.19
On 4 Mesh	188.70	16.66	0.435	0.0725	11.64
On 6 Mesh	139.805	12.34	0.475	0.0586	9.40
On 10 Mesh	168.20	14.85	0.485	0.0720	11.65
On 14 Mesh	80.105	7.08	0.51	0.0361	5.79
On 20 Mesh	59.00	5.21	0.575	0.0299	4.81
On 28 Mesh	63.00	5.56	0.58	0.0325	5.22
On 35 Mesh	52.50	4.64	0.635	0.0293	4.71
On 48 Mesh	41.505	3.66	0.725	0.0265	4.26
On 65 Mesh	36.00	3.18	0.83	0.0264	4.25
On 80 Mesh	5.905	0.53	1.41	0.0747	12.01
On 100 Mesh	19.01	1.68	1.385	0.0233	3.75
Thro.100 Mesh	131.00	11.57	0.725	0.0839	13.50
Totals	1132.66	100.00		0.6219	100.00%

Sample No. 1.
WO_3 0.625
P. 0.0074
S. 0.132
Cu. 0.095
Calculated WO_3 value taken Screen Analysis 0.6219%. Copper seems to be intimately associated with the scheelite and can not be separated without a chemical process can be perfected. From observation with a powerful metallurgical microscope, I found some of the copper combining with scheelite, forming a cupro-tungstate. Some of the copper minerals are free, in the form of Assurita, malachite and some minute crystals of chalcopyrite.

(Sgd.) H.K.Lidstone
6/9/1928.

EXHIBIT "H"

EXHIBIT "H"

Samples taken by Axel Johnson July 2, 1930.
Fred A Fair in charge of operations.

Sample No.	WO_3 Content	Size	Percent	Description
1	.24			Coarse tailings from conveyor belt Thickener House.
2	.16			Spigot Sample Dorr Thickener.
		Screen Test on Mill Tailings.		
3	.17	-16/20	22.95%	Tail Race outside Mill.
4	.25	-20/30	19.66	
5	.42	-30/40	6.55	
6	.16	-40/100	21.31	
7	.15	-100	29.53	

EXHIBIT "I"

EXHIBIT "I"

On August 29, 30, 31st, 1930, the mill operated twenty-two hours total, and milled 170715 pounds of Star No. 8 ore of a head value of .85% and made 1865 pounds concentrates 45.7% tails run .4%.

The concentrates contained	852.30	Pounds WO_3
The tails contained	675.40	" "
Total	1527.70	

Therefore, the heads probably run .89% instead of .85% as there is no automatic head sampler.

Therefore, the % saving was 49/89 or 55% saving. This loss was due to coarse grinding and not regrinding middlings.

On August 8th to 12th, 1930, the mill operated thirty three and one-half hours total from surface ore North stope Nightingale Mine. The heads assayed .57% WO_3. Total amount of ore milled 237,374 pounds ore, produced 2302 pounds concentrates that run 45.73% WO_3 while the tails went .14% WO_3.
237,374 Pounds X .4573 equals 1052.7 pounds WO_3 in concentrates.
237,374 - 2302 equals 235,072 X .0014 equals 309.1 Pounds.
1052.7 and 309.1 pounds equals 1361 pounds as against 1353.05 pounds, showing these samples and assays to be correct. Therefore 1052.7 divided by 1361.8 equals 77% saving. The probable average saving made in the mill at its present condition is approximately 66% or 2/3.

July 24th to August 5th there was milled 273,868 pounds of ore from No. 2 stope, that produced 3315 pounds of concentrates assaying 31.65 which equal 1049.2 pounds WO_3.

Assuming a 2/3 saving, would mean 1574.8 pounds of WO_3 in the ore, or a head value of .57%. This corresponds to the batch of 237,374 pounds of ore milled August 8th to 12th, 1930. It therefore appears that the surface ore from the North stope of Nightingale Mine and surface ore from No. 2 Tunnel runs .57% WO_3.

On August 12th milled from North stope Nightingale Mine, 100 feet below the aforesaid batch of 237,374 pounds, 43132 pounds of ore that produced 445 pounds of concentrates which assayed 45.73% or 197.24 pounds of WO_3. Assuming a 2/3 saving, the heads should have contained 295.86 pounds WO_3 or approximately .7% WO_3.