May 25 - TUNGSTEN METALS CORPORATION, Minerva, Nevada.

Guides;- Dwight M. Lemmon, PhD., and Donald Wyant - U.S.G.S. geologists. Ore horizon in limestone above Pioche shales and below Secret Canyon shale. Three main ore bodies in E-W faults offset by N-s faults. These are fissure veins and not replacement or metamorphic.

Three main veins are Everit, Oxide and Scheelite Chief. Veins dip N and strike E-W. Ore shoots rake west. Much quartz in veins and outcrops are prominent. No garnet or epidote found. Average grade of the scheelite ore is 0.6% to 0.7% WO_3. 0.5% is lowest grade treated. Carbonate gangue. One mile or so north is a vein of Hubnerite ore.

Upper Middle Cambrian fossils have been found in overlying shales and defines them as Secret Canyon series of shales found in Eureka District by H. E. Wheeler.

6000 feet of diamond drill core - drilled in district under supervision of U.S.G.S. 30-ft. holes with deepest about 450 feet.

To date around $500,000 to $600,000 in tungsten produced.

At present the mill is treating 150 tons of old sand tails daily. Slime tails are being shipped to U. S. Vanadium at Bishop, California, for treatment, 60% WO_3 concentrate being shipped to Niagara Falls.

Concentrate from sand tables (30% WO_3) is being combined with slime concentrate to raise to 60% WO_3. Very small amount of concentrate taken from sand tables when treating tails. Sand table middlings and tails being ground to 70% -200 mesh and floated. Float concentrate is reconcentrated on slime table.

Scheelite is easily floated but not too easily recovered from slime table.

There are only three sand tables and this seems to be insufficient, judging from Nevada-Massachusetts practice at Mill City, where 250 tons for ten sand tables. When enough ore is accumulated, a batch is run through.

Reagents used are: $CuSO_4$, Sodium Silicate,

MINERAL, Continued.

FLOW SHEET

Jaw Crusher

Rod Mill (30 h.p.) Callow Screen

Hydraulic Classifier (splitter with tails circ.)

3 Wilfley Sand Tables Slime Table (when ore run)

Middlings - Tails Conc.

Ball Mill (60 h.p.)

Classifier (70% -200)

Conditioner

Agitator

Float Cells

(Tails) (conc.)

Two Thickeners Slime Table

Tailing Pond Conc. Tails

June 5 - COMBINED METALS, Pioche.

Guides:- E. H. Snyder, General Manager; R. L. Dean, Sup't., Ken Cochran, geologist, Sam Arentz, engineer, and Marion Brooks, assistant geologist, and Mr. Kelsey, Chief Designing Engineer.

Down No. 1 shaft in Pioche and up Castleton Shaft on west side of Ely Range. Mine quite wet in haulageways and main drives, but ore bodies visited are fairly dry.

2250 gallons per minute is pumped from 1470' level up Castleton Shaft. Capacity of pumps is 4500 g.p.m. Pomona deep well pump lifts water from 1470 to 840 where centrifugal pumps lift it to surface. Centrifugal pumps also on 1470'. Water door between two shafts in case of pump failure. Safety margin is 24 hours.

1200' level at No. 1 shaft is main haulage for eastern portion of mine. Western portion of ore body is faulted down 150' by a N-S fault. Mineralizing fissures are E-W.

Three beds are mined. Upper bed about 2' thick seperated by 2-3' shale. Second bed is 6' thick. Lower bed 18" thick. Ore is lead-zinc replacement in C M limestone bed in Pioche shale series. Pyrite in limestone and shale stained to look like chalcopyrite; carries gold, Silver is with lead and zinc. Ore runs about 6 oz. Ag., 6% Lead; 16% Zn., .02 ozs. Au, and 17-19% iron.

MINING

Room and Pillar method of mining. In places where beds are step-faulted wheelbarrows used as most efficient and economical with these small offsets. The upper two beds mined with square sets in places - lower bed mined, then shale reef and finally upper bed.

45% volume strength Hercedite powder used with wood-rubber plugs for holes before blasting.

EIMCO Finlay Muckers used where possible.

5 tons per man is expected production. Miner mucks too - mucker is swamper.

Main haulage on 1470' level of Castleton Shaft - 8-ton battery locomotive with 3-ton cars. M-G sets underground to charge batteries.

Castleton Shaft sank with "Big Bertha", the multistage, deep well, propeller turbine pump.

SAFETY

Mr. Cochran is head of safety program. Attempting to get all men to take First Aid course. Have first aid kits underground and also stretchers.

GEOLOGY

No. 1 Shaft originally down to 1500 where fissure veins mined for Ag, Au, Zn, and Pb.

N-S faults younger than E-W faults. Geology underground is mapped in section in drifts to show up slight changes in altitude which often controls ore deposition.

Diamond drilling campaign 24 hours per day for last 5 years.

HOISTING PLANT

At No. 1 converted steam hoist single drum. Also main compressor a converted steam machine.

At Castleton 200 h.p., induction motor on double-drum hoist.

150 h.p., two-stage compressor 12 x 16 - 19 x 16. All company ore from this shaft and some leasers' ore from No. 1.

POWER

Boulder Dam, 8.5 mils/k.w.hr.

DRINKING WATER

35 G.P.M., from Floral Springs at Eastern Base Highland Peak Range. This supplies mine and Pioche.

MILLING

New 500-ton all-steel, air conditioned mill to be completed July 1, but behind schedule. Kelsey chief engineer and designer.

Calcium sulfite generating plant being built. Sulphur (bought in Bingham) is burned and fumes pass through milk of lime spray. Spray created by revolving drum touching surface of lime. Reagents are "Bozo", a secret reagent; $Ca(OH)_2$ and calcium sulfite.

FLOW SHEET

Ore brought to car dump from shaft bin and also other properties. Hits conveyor belt with magnet weightometer. 1-1/4" Symons vibrating screen. Oversize goes to 7' Traylor T-Y gyratory; discharge and undersize from screen go to double cone 5' T-S gyratory (Traylor) then 3/8" Symons screen and to four 350-ton fine-ore bins, fine ore to 10' x 48" Hardinge (driven by 300 h.p., induction motor - V belt drive) and ground to 200 mesh,- this inclosed circuit with 78" Akins classifier. Overflow from Akins to conditioners and reagents, then to 56" and 66" Fagergren float cells (26 cells - dimension is of Froth Wier. Sides sloped to double capacity is innovation by C.M. cells built on spot. 10' cell now being built - in Utah?) Three circuits for Pb, Zn, FeS_2. Froth from cells is taken to 7' - 6 disc EIMCO

filters. (Iron from thickener later to be added, will be handled by bucket elevator as is zinc, PB which is less abrasive will be handled by new propeller type reaction turbine pump).

Pb and Zn froth go to separate filters where some is filtered and dropped to R.R. cars below. Overflow not handled by filter goes to 60' x 12' concrete bottom thickeners (also serve as storage), underflow is taken (by pump and elevator respectively) to filters with new froth.

Iron will be stock-piled from filter and later sent to smelter as flux containing Au and Ag.

(Compressor and receivers in mill also).

Reference:- Mining World, May '41 - Mercur Mine & Mill - Snyder property.

Mr. Wheelwright, construction engineer (Univ. of Utah) under Kelsey, observed that propeller deep well pumps are more efficient for handling frothy material than are the centrifugal types, due to their suction which draws froth in instead of letting it pile up in box. Often the cost of steam to kill froth in feed box to centrifugal pump costs more than does the actual pumping.

Kelsey also patented new reaction pump which is 97% efficient. This has special streamlined guide vanes; A-bladed propeller to give anial flow.

METALLURGICAL DEPARTMENT

Separate building - has windows - double thickness steel walls. Steel tables with concrete tops, linoleum covered. Three hoods. Lead lined sinks. Balances to be set on one of these concrete-steel tables on rubber pads - no bed-rock supports. Reagents overhead. Electric furnace and regulating thermostat. In this building will also be petrographic microscopes.

Ely, Nevada.

Mar. 7, 1912.

Preliminary Report on the "Tungsten Mining and Milling Company's" tungsten property at Tungsten, Nevada.

Location

This property is located fifty miles southeast of Ely, Nevada on the east side of Spring Valley and the west slope of Mt. Wheeler. There is a good wagon road between the mine and Ely; this being the nearest railroad point. The average elevation of the camp is 8000 feet. Just above the camp on Mt. Wheeler there is an abundance of timber for all mining and construction purposes.

Equipment

The present equipment consists of, one air compressor of four drills capacity, four 2-3/4 inch drills, one 50 ton concentrating plant, one steam plant, one water power plant (each of the latter being of sufficient horse power to run both the conpressor and mill), an office, mess house and bunk houses enough to accomodate 35 or 40 men. All of the above is of good construction and in first class condition. The mill is well adapted to the ore, made a good saving of values during the time it was running, and is a good piece of construction throughout. The water power plant can be run during the summer months only. Probably six months out of the twelve. The first one and one quarter miles of the flume is an open ditch and this fills with snow and freezes during the winter.

Claims

I am enclosing a claim map (No. 1) of the Company's holdings which shows that they own practically the entire district. I believe

that this map is correct except that the open fractions which are shown on it have since been located.

Geology

The whole area consists of a very regular grade of rather fine grained granite. The percentage of mica is very small and it is always muscovite. Capping this granite higher up on Mt. Wheeler, and dipping at such an angle that 100 feet less erosion would have left it over the entire area, there is a large body of quartzite. It seems to me that this fact may have had an important bearing on the ore deposition, to be mentioned later.

The granite body is cut by nine (known) parallel veins. Their strike is about N - 70 - E and their dip 70° to the north. These veins are all of about the same size, having average widths of about three feet. The vein material is a clean,white, hard quartz and is identical in all the veins. The tungsten ore occurs in the veins as hubnerite (tungsten with manganese). Specimens of schelite (tungsten with calcium) have been found near surface but only in very small quantities. The hubnerite occurs in the quartz in one or more stringers (usually several) with the best one on the hanging wall. All nine of the veins have traces of ore on surface, much the best showing however is on the so called Hubnerite Vein; which has received most of the development work. The second best showing being on the Side Issue Vein which has received a little development.

Development Work

The development work done on the Hubnerite Vein consists of 1200 feet of drifting and 300 ft. of raises. The location of all

of this work is shown on the enclosed profile (No. 2). The development on the Side Issue Vein consists of a cross cut tunnel driven to the vein and a raise on the vein from there to surface, a distance of 80 feet. At the tunnel level the vein is only a stringer. Going up the raise it gradually increases in width until it is 2½ feet wide at surface. It shows no values except in the first 25 ft. from surface, however. (No map of this)

The result of the development has been discouraging. You will note from the profile that they have gone through the ore into a barren zone in five different places as follows - Main Tunnel, Hub Tunnel, Shaft D and Upper Tunnel on the Hubnerite Vein and in the one raise on the Side Vein. At no point developed does the ore extend more than 50 feet below surface. I have drawn in this ore zone, in yellow, on the profile map. The white background denotes the stoped portion and the dark the unstoped. I have figured five blocks of ore, i e, A, B, C, D and E, which are also designated on the profile. I have obtained the following tonnages.

Ore in Sight

Block A - - - - - - 1300 tons
" B - - - - - - 290 "
1590 tons in sight

Probable Ore

Block C - - - - - - 610 tons
" D - - - - - - 750 "
" E - - - - - - 1000 "
2360 tons probable ore.

2360
1590
3950 total ore in sight and probable ore.

$14.58 - extraction value
5.00 - total cost using steam
$ 9.58 - probable profit per ton using steam.

$ 9.58 x 4850 tons = $46,463.00 - probable profit using steam.

I have figured that by means of an inclined raise about 60 feet below surface, (and parallel to it) and with vertical raises to surface at intervals of 80 ft. along it, that the ground between Tunnel E and the Upper Tunnel could be developed for about $25,000. If this work showed up the 7,500 tons of ore as estimated above, it would give a development cost per ton of $25,000 ÷ 7,500 tons = $3.33 per ton.

Using the same total costs and values as before we have -

$ 4.10 - total costs (without development) using water power
3.33 - development costs
$ 7.43 - total costs on undeveloped ore " " "

$14.58 - extraction value
7.43
$ 7.15 - probable profit per ton " " "

$ 7.15 x 7,500 tons = $53,625.00 - probable profit using water power.

$ 5.00 - total costs (without development) using steam
3.33 - development costs
$ 8.33 - total costs on undeveloped ore " "

$14.58
8.33
$ 6.25 - probable profit per ton " "

$ 6.25 x 7,500 tons = $44,062.50 - probable profit using steam.

$50,828.00 - profit on ore in sight and probable ore using water power
$53,625.00 - profit figured on undeveloped ore using water power
$104,453.00 - total profit using water power.

$46,463.00 - profit on ore in sight and probable ore using steam
$44,062.00 - profit figured on undeveloped ore using steam
$90,525.00 - Total profit using steam.

This covers all the surface possibilities of the vein. The figures are much better than I expected them to be when I sent you the telegram on March 6th. I would call your attention to facts that if, the undeveloped part of the veim did not prove as good as expected, if I have been misinformed as to the values, or if the management were not first class, that these profits would not be realized. Before any investment is made the ore values, especially, should be gone into more thoroughly. On the other hand I think the above is a fair estimate of what the owners may expect.

My advice would be to start the inclined raise at once, using steam power for the air drills. If this were pushed as rapidly as possible it would be far enough ahead by June first so that the mill could be started on water power with a reasonable assurance that it could be kept going all summer. Our total estimate of 11,450 tons would keep the mill running 230 days. Whatever ore was left in the fall could either be run out with steam power or held over until the following spring.

Whether or not it would be advisable to do any deep work to determine if there are ore bodies below the surface zone I would rather leave entirely to Mr. Spurr.

I am told that at a similar deposit in Boulder, Colo. they went through a deep barren zone and then came into the ore again. I have had no experience in the matter.

During the time that other work is being carried on the Hub Tunnel could be driven 1000 feet along the vein at a cost of about $8,000. It would seem that this would cut any lower ore bodies that might be there.

Respectfully yours,

(signed) M. B. Huston.

heretofore made from Chinese crude antimony. [Notes on antimony production in China will appear soon in the Press.—EDITOR.]

The tendency has been for some companies to go to an expense for mine development, machinery, and mills, not wholly warranted by the circumstances. The present high prices are necessarily temporary. The Chinese deposits are extensive, and worked by very cheap labor, and other deposits are being developed in other parts of the world, and as soon as the War is over, and possibly before, prices will probably drop to a level with or close to those of 1914.

Tungsten in 1915

The production of tungsten ores in the United States during 1915 broke the record, and was apparently equivalent to about 2165 short tons of concentrates, carrying 60% of tungsten trioxide (WO_3), and was valued at more than $2,000,000. These figures are based on preliminary returns to the U. S. Geological Survey. The largest previous output of tungsten ore was in 1910, when 1821 tons was produced.

Conditions and prices in the tungsten market were unsettled and somewhat anomalous. Although the price in the latter part of 1914 was $9 or more a unit, 60% ore was sold in the early part of 1915 as low as $5.80 a unit, so that tungsten mining did not start very briskly. Early in the summer, however, floods of orders for munitions of war caused a great demand for high-speed steels, to be used in cutting shells, rifle-barrels, etc.; an embargo was declared by the British government on the export of tungsten ores from any part of the British possessions, and there was soon a country-wide scramble for tungsten ores. Probably no one foresaw the height to which the price of tungsten would rise, and some operators contracted for ores at prices which in ordinary years would be high, but which were soon exceeded by several hundred per cent. Tungsten metal was also contracted for at prices much below those afterward reached. In the fall the prices of tungsten reached unheard-of heights; $48 per unit was paid for numerous lots, $50 for some, and even higher prices were reported. The prices moved upward so rapidly and unexpectedly that strenuous tungsten prospecting did not follow at once, but early in the fall a large number of men were in the field looking for deposits.

The mining activities are described by Frank L. Hess in some detail. The output of the Boulder (Colorado) field was for various reasons not increased as had been hoped. Many properties had been worked by leasing, so that there was no development of orebodies, for the ore had been removed as fast as it was exposed, and it is reported that in the Conger mine, whose shaft was sunk below the 800-ft. level, development was disappointing. Sinking is said to have been continued. The output of the district was estimated by the Boulder County Metal Miners' Association as equivalent to 960 tons of 60% concentrate.

In the Atolia (California) field there were great developments. The Atolia Mining Co. is reported to have employed more than 300 men, and many men worked the desert sands in the vicinity for float scheelite. P. J. Osdick discovered rich ore east of the Atolia Mining Co.'s property and made large profits. On and near the Baltic claim a number of men worked the gravel of a shallow gulch for scheelite and the sands on the Sunshine and other claims are also reported to have been worked at a profit. Several gold mines also produced scheelite. The Consolidated Gold Mines, in Randsburg, had found water at a depth of about 500 ft., and this has been piped to the Atolia company's mill, about five miles distant. Formerly water was hauled on the railroad for a distance of about 50 miles. The company is reported to have erected a new mill to treat its tailing.

Several discoveries of tungsten ores were reported from Gilpin county, Colorado, but the most extensive discoveries, as indicated by the number of outcrops, were made in White Pine county, Nevada. Veins of scheelite were found at several places between the Minerva district, 30 miles south of Osceola, and Cherry creek, 50 miles north of the settlement. Some of the veins were formerly prospected for precious metals, but the scheelite was not recognized. The hübnerite mine and mill 12 miles south of Osceola were actively operated toward the close of the season; the mill at Camp Bonita, on the east side of the Snake range, was operated part of the year, and mills were erected or started by the St. Anthony Mines Co. at Toy (Browns), Humboldt county, by A. R. Shepard and associates in the Reagan district, and by the Doyle Mining Co. in Sacramento Pass, White Pine county. Some hübnerite was dry washed from desert sands at Round Mountain and Spanish Springs, Nevada.

The dumps of gold mines at White Oaks, New Mexico, were worked over for hübnerite and yielded a considerable quantity of concentrates, and at Tip Top, Arizona, a mill was under construction to work the tailing and dumps of the old Tip Top silver mine for the wolframite they contained.

Mills were erected by the Primos Chemical Co. at Dragoon and by the National Tungsten Co. at Arivaca, Arizona, for treating the tungsten ores, and tungsten was produced at these places and at Camp Wood, Yucca, Oracle, and other points.

At Lead, South Dakota, the Homestake gold mine produced wolframite from the claims west of the great open-cut, and the Wasp No. 2 mine, two miles south, produced a considerable quantity of ore. It has erected a concentration plant. Only a little ore was produced in the southern Black Hills.

Small quantities of tungsten were produced in Idaho and at Silverton, Colorado, and a few hundred pounds was saved from the old concentrates of the gold placers at Nome, Alaska.

The wolframite deposits on Tungsten peak, near Cathedral peak, 45 miles northwest of Oroville, Washington, became the property of the Tungsten Mines Co., and the new owners produced some ferro-tungsten in an electric furnace at Tacoma.

The price of tungsten as metal or ferro-tungsten rose from $1 a pound in January to $8 in December. In the same period tungsten steels increased in price from 60 or 75c. to $3 a pound.

(Special Correspondence.)—The new mill and equipment of the Atolia Mining Co., which was only recently completed, was partly destroyed by fire today. The plant was the only one for producing tungsten concentrate on the Pacific Coast. Atkins, Kroll & Co. of San Francisco were its managers, with Charles Taylor as superintendent. The mill began operating at full capacity of 100 tons per day about January 1, and had not stopped since then. The disaster means about 40 days' shut-down, which will affect 400 employees and every resident of Atolia, nearly 600 people. The cause is said to have been back-firing in the gasoline engine in the hoisting room, where the flames spread by contact with distillate leakage to the whole structure. There was $56,000 insurance, and the loss is said to be $40,000.

Atolia, California, January 24.

MANGANESE production of the United States in 1915 was nearly 6000 tons, compared with 2635 tons in 1914. Prices rose from $12 to $22.50 per ton for 50% ore. It is not likely that domestic deposits will make more important contributions to the supply. Imports from India were one-twelfth normal; from Russia, negligible; and from Brazil, over twice the average for the three preceding years.

CARNOTITE ORES produced in Colorado last year contained 23.4 tons uranium oxide and 6 grams radium, and 635 tons of vanadium, against 87.2, 22.3, and 435 tons, respectively, in 1914.