June 25 GOLCONDA TUNGSTEN MILL (128)

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S. Power (pi) Warren, (Colorado) Superintendent Item 8

The process of recovering tungsten from ore developed at this plant is unique. Process is still in experimental stage. Tungsten occurs in gouge probably in form of tungstic acid - no tungsten mineral identifiable. Ore is dry ground in ball mill and added to soda ash, salt (NaCl) and coal on conveyor belt, then moistened, mixed and fed to Dwight-Lloyd sintering machine oil-fired. Cake hits ball mill in wet grind and is cool by this time after being fused at 800 deg. C (?) Ball mill discharge is agitated with 3 tons water to 1 ton pulp. In Dwight-Lloyd fusion, NaCl is not decomposed, but is melted and carries Na_2CO_3 in solution - this forms Na_2CO_3. Also formed are $NaMO_3$, $NaPO_4$, and $NaSO_4$ with NaCl and Na_2CO_3. This ground calcine is pumped from agitator to 4 thickeners in series C.C.D. Pregnant solution is heated in storage tank. Soluble salts have been removed in thickeners and pregnant solution carries soluble salts listed above. About 100 tons of solution assaying $\frac{1}{2}$ to 1% WO_3 are ppt. each day. Each batch must be tested in laboratory before percipitation to determine exact amount.of $CaCl_2$ needed. Temperature of 65 deg. C is maintained by heaters and heat exchangers using hot water from Golconda Hot Springs. In the first precipitation tank just sufficient $CaCl_2$ is added to precipitate $CaCO_3$, $CaCl_2$, $CaPO_4$ and the molybdate is also precipitated as $CaMO_3$ with some other precipitant. Clear solution carrying Na_2WO_3 is decanted into another tank while precipitate is returned to agitators, and eventually gets out with tails. In second precipitation tank $CaWO_3$ is precipitated with more $CaCl_2$. This precipitation point is very definite. Precipitate is dewatered with small Oliver drum fulter and dried in rotary drier and sacked. Concentrate is 65% WO_3; solids discharge from thickeners about 0.27% WO_3 and solution from precipitate about 0.01% WO_3. After ball milling solids only carry 0.27% WO_3. In first precipitate about 0.2 - 0.6 WO_3 and when this is returned to agitators, temperature is just right and other salts in right concentration to put $CaWO_3$ back into solution. "Pi" talks of inertia of chemical reactions - when one reaction gets started, it has a tendency to keep on. Solubility products are important. Some material (6% WO_3) from Nevada Massachusetts (Mill City) treated also. Heads at Golconda run about 3% - some 4 and 5%. No concentration in mill.

MINE

About 3 miles from Golconda towards Midas. The deposit carries much manganese and iron and is a blanket-like deposit in tufa and talus evidently a hot spring deposit. The deposit is blocked out by churn drills and drifts - some will be mined by underground room and pillar - other by open pit.

Pau F. Kerr, Columbia, describes this deposit as a tungsten-bearing Mn deposit in G.S.A. Bulletin 51, Sept. 1, 1940. Origin of deposit was series of manganese-bearing veinlets with N 25 deg. E trend. Main bedded deposits are 100 ft. above old Lake Lahontan level (4400') at junction of Edna & Osgood Mountains. Tungsten occurs with Mn and Iron. No mineral has been identified; WO_3 with psilomelane, limonite and hollandite. Tungsten-bearing psilomelane called Tungomelane by Kerr. Mn and Fe gels appear to have concentrated tungsten from solution. These gels thought to have been deposited upon underlying sediments (E dipping shales) by hot waters which later deposited tufa derived from calcerous beds in sediments. Deposit thought to be hypogene. Hydrothermal minerals with abundant Barite. Tufa is not mineralized by Mn and iron but angular shale fragments are cemented by the mineralized material.

FLOW SHEET - GOLCONDA TUNGSTEN MILL

Coarse ore bin
(too small)

Jaw crusher

Rolls

Elevator

Screen

Rotary kiln dryer

Bin

Ball mill (dry) — Cyclone dust ppt. and screen

Na_2CO_3 NaCL Coal

100 tons $\frac{1}{2}$ to 1% WO_3 solution precipitate per day.

Moisture & mixer-rotary

Dwight-Lloyd sintering machine

Ball mill (wet)

3 agitators in series

No.1 No.2 No.3 No. 4

Storage tank and heat exch.

Tails 0.27% WO_3

Tails 0.01% WO_3

First pot. (impurities)

$CaWO_3$ Pot.

drum Filter

65 deg. C Water heaters

Rotary drier

65% WO_3 concts.