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ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: IRON KING PROPERTY

ALTERNATE NAMES:

PATENTED CLAIMS MS 1714
LIME ROCK, PATENTED 1714
COPPER PLATTER, PAT. 1714

YAVAPAI COUNTY MILS NUMBER: 713D

LOCATION: TOWNSHIP 13 N RANGE 1 E SECTION 16 QUARTER SE
LATITUDE: N 34DEG 30MIN 02SEC LONGITUDE: W 112DEG 15MIN 25SEC
TOPO MAP NAME: PRESCOTT VALLEY S - 7.5 MIN

CURRENT STATUS: PAST PRODUCER

COMMODITY:

ZINC
LEAD
GOLD
SILVER
COPPER

BIBLIOGRAPHY:

ADMMR IRON KING PROPERTY FILE
BLM MINING DISTRICT SHEETS 18, 19
ADMMR GEOLOGY FILE BIG BUG DISTRICT GENERAL
REPORT
KOSCHMANN, A.H. AND M.H. BERGENDAHL PRINCIPAL
GOLD PRODUCING DISTRICTS OF US USGS PP 610
1968 P 46
CLAIMS EXTEND INTO SEC. 15, 21, 22 & 28
ADMMR IRON KING MINE FILE
KUMKE, C.A. AND H.F. MILLE MINING METHODS
AND PRACTICES AT THE IRON KING MINE USBM
IC 7539 1950
USGS PP 467 GEOLOGY OF PRESCOTT AND PAULDEN
QUADS 1965 P 104
ADMMR IRON KING GROUP COLVO FILE
ECOMOMIC GEOLOGY VOL. 47, NO. 1 P 24-56

CONTINUED ON NEXT PAGE

CONTINUATION OF IRON KING PROPERTY

GEOLOGY OF THE IRON KING MINE BY P. GILMOUR
AND A. STILL, P. 1239, ORE DEPOSITS OF THE
U.S 1933-1967., AIME, GRATON SALES VOLUME 2

PRINTED: 01/15/2003

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IRON KING ~~XXXXXXXXXX~~

YAVAPAI COUNTY

NJN WR 4/3/87: Don White (card) reported that art Still owns the Kron King Tailings (Iron King - file) Yavapai County. The tailings are estimated to be 5.5 million tons containing .055 oz/ton ~~A~~, 1% zinc and 1/3% arsenic.

----- + .7 A -----

KAP WR 5/1/87: In the company of Nyal Niemuth a visit was made to Iron King Tailings (file) Yavapai County. Earth products continues to recover tailings and process them for soil supplement. The Iron King Tailings have been used for this purpose for about 20 years, and yet the excavation within the pile appears insignificant in relation to the total extent of the tailings.

KAP WR 5/1/87: In the company of Nyal Niemuth, a visit was made to the Iron King Mine (file). The east (samller) production shaft is open and the collar is in good shape and very well fenced. The main production shaft is plugged. All surface plant and mill equipment has been removed except a old Ingersol Compressor and its open frame motor. All of the support buildings, constructed of concrete block are still standing and are in fair condition.

MG 10/23/87: The new owner of the Ironite fertilizer operation at the Iron King mine (file) Yavapai County is Metex Ltd., 7496 E. Pleasant Run, Scottsdale, AZ 85258: Mr. Heinz Brungs is the president. Ironite production from the mine tailings is to be expanded.

IRON KING MINE

YAVAPAI CO.

RRB WR 5/1/81 - Jack Pierce reported that Metex Ltd. and Lurgi are to set up 3,000 TPD plant this fall to treat tails at the Iron King Mine. Expect to go underground later.

MG WR 1/8/82: Ben R. Dickerson III, Exploration Manager, Callahan Mining Co., Phoenix, reports a rumor that someone is mining the tailings at the Iron King mine, Yavapai County. I suggested he contact the owner, Mr. Arthur Still, consulting geologist of Tucson.

RRB WR 4/23/82: George Rohrs was in to look at the Iron King file. He said that he had been swindled on an earlier deal and this time he was trying to determine if the deal he'd been offered at the Iron King was at least in the realm of possibility. We had a long talk about things to ask for and things to watch for.

NJN WR 3/4/83: Fred M. Johnson reported that he was the geologist at the Iron King Mine, Yavapai County when it shut down. Before the Shutdown he drilled several sections that were not economic to get to from the #7 shaft. If that shaft were in use today, the relatively high precious metal content contained would make that material left behind economic.

NJN WR 10/4/85: Allan St. James(c) reported that Sante Fe Mining will begin drilling on the Iron King Mine (f) Yavapai County soon.

NJN WR 10/24/85: It was reported that a company called Metex Co has floated a multi-million dollar bond to expand production of "ironrite" from the Iron King (f) tailings, Yavapai Co. by 10 times.

NJN WR 6/27/86: Provided information to Tom Lordam, an attorney in Phoenix for the Iron King Mine (f) Yavapai County. He has sent us a copy of an affidavit regarding his client's royalty lease on the property.

~~IRON KING MNE~~

Office visit by Gary Smith, 12/11/75: Reported the placer operations is marginal. (talking about Ironwood Mng. Co.) Must find some other way (\$110,000 invested) Reported that a Mr. Del Schultz (?) from Naples, Florida, was going to put money in Kinman's process. Kinman moving operations to Iron King Mine. Mr. Smith said Kinman would process concentrates for 10% of values. Mr. Smith would have to provide the equipment to process the ore into a concentrate. This would include pulverizer (-150 mesh), mixing vats, burner (kiln), agitator and dryer. Discussed possibilities of cyaniding cons. Mr. Smith stated Dr. Wilson (Tempe) took some of their concentrates - never returned them. JHJ.

Ed Armstrong, geologist for Goldex Mining Company, said that the company has taken over the Iron King mine at Humboldt and would begin installing a headframe and mill in the near future. GW WR 9/29/76

Ed Armstrong, Wickenburg, geologist for Goldex Company, came in for a brief visit saying his company is negotiating for a double-drum hoist and gallow frame at Bisbee for the Iron King project. GW WR 10/15/76

Messrs. Vian & Sylvania came in to be shown the results of their experimentation on some Iron King mine tailings. They had Mr. Statler assay some of the sediment they had recovered from Phoenix tap water; while at Iron King they got some tailings and obtained some dark gray to black sediment from them, it wasn't magnetic. It was suggested they try to dissolve the sediment in HNO_3 . WR GW 3/25/77

WR KP 1/3/78 - Additional discussions were held with Dick Burns on the need for a pilot plant roasting facility to evaluate his Wickenburg area silver ores. The soil supplement plant at the site of the Iron King Mine in Humbolt District of Yavapai has a roaster capable of treating 25 tons per day is likely the best choice if a short-term arrangement can be made. 2/22/78 sef

KP/WR 10/25/79 - Walt Statler reported that the German interests, Metex Co. are continuing their evaluation of the tailings at the Iron King Mine, Yav. Co.

Mine visit and plant tour. Iron King mine and interview with Mr. Jack Pierce. Toured soil supplement plant. Material flow through plant is as follows:

Dry mine concentrator tailings are delivered to soil supplement plant intake storage bins. From the storage bins, the intake is fed to a 3 foot long horizontal screw mixer, concentrated sulphuric acid is added at the input to the mixer. A chemical reaction, converting approximately 10% of the sulphides to sulphates, takes place in the first 12 inches of the mixer. Water is added at the 12 inch point to dilute the remaining sulphuric acid. In the remaining 24 inches of mixer length most of the pyrite is reacted to form pyrrhotite. The wet material is then dried in a gas fired dryer and crushed in a roller crusher to +16-8 mesh; the fines being returned to the mixer. The +16-8 material is fed to a two stage column in which dry ammonia is added to supply nitrogen. The final product from the ammonia column is bagged or boxed and shipped.

KAP Report of Dec. 14, 1972

Mr. Walt Statler is hardly "making beans" in the assay lab at the Iron King, he said. He also said 3 Canadian geologists working for AS&R had been making a geologic reconnaissance of the Iron King area. GW WR 1/24/73

Stopped at Humboldt and saw Walt Statler, assayer, who said he was about "shut down." GW WR 2/8/73

Jack Pierce of Iron King concerning Santa Fe Railway intention to pull spur line out of service. FTJ WR 3/7/73

Went to the Iron King mine to see Walt Statler, assayer, but he was gone. GW WR 3/21/73

Stopped at the Iron King mine but Walt Statler wasn't around and Mr. Pierce was underground so came to Phoenix. GW WR 3/22/73

Visited briefly with Walt Statler at Iron King who also said he had seen nor heard from Selco for sometime, He had several dry drill samples from Jerry Withers who has been sitting on 8-10 holes for Steve Radback near Lake Pleasant. GW WR 5-16-73

Bear Creek Company conducted a mercury vapor survey in the Iron King mine area and is reported to have found an anomaly east of the old mine. GW AR 73-74

IRON KING MINE

YAVAPAI COUNTY

Visited Iron King office - interview with Jack Pierce. They were placing soil over tailings dump in hopes of native grasses taking over. FTJ WR 7-24-70

Iron King Mine office closed. FTJ WR 9-18-70

To Iron King - Jack Pierce in Colorado for the week. FTJ WR 1-22-71

To Iron King mine - Jack Pierce was in New York. FTJ WR 5-24-71

Went to Prescott. Stopped at Iron King and met Mr. Statler at the assay office. G.W. WR
9/17/71

SEE: IC 6905 p. 51

See: ABM Bull. 180, p. 99

Went to Iron King assay office where Walter Statler said he had recently received some samples for Mr. Loretto of Mayer who is drilling a prospect hole on the west side of the Black Hills. Walt had samples from a Mr. Frost in Glendale; he thought they were probably from the White Tank Mountains. GW WR 1/25/72

Saw Walt Statler at Iron King who was busy as usual. GW WR 4/7/72

Walter Statler, assayer at the Iron King mine, said his business had fallen off considerably in the past couple of months. GW WR 5/24/72

Stopped at Walter Statlers assay office at the Iron King Mine, Humboldt, but he said his business was almost nil. GW WR 12/7/72

IRON KING MINE

YAVAPAI COUNTY

Mr. Erland Dengts phoned about properties in Arizona. He said he represents Canadian interests and that they have purchased the Iron King surface equipment. JHS WR 4-11-69

Visited Iron King Mine. J. Pierce away. Walter Statler has an assay office at the mine. Fertilizer and machinery sales activities are as usual. FPK WR 6-4-69

Visited Iron King - short visit with Jack Pierce who was giving prices on mill equipment to R. J. Allison and partner. Allison has drill working about 1½ miles south of Iron King and has several properties tied up - Gladstone-McCabe, etc. No information on what they are finding. FTJ WR 7-18-69

Interview with Fred Copeland, soil specialist at Iron King. He wanted information on bentonite to spray on tailings pond for dust control. FTJ WR 9-19-69

Visited the Iron King mine - Jack Pierce in Colorado. Jay Allison in Prescott. Several men working in mill. Bob Harding, supt. FTJ WR 11-21-69

Interviewed Jack Pierce at Shattuck Denn office. He is trying to develop means of alleviating dust from the tailings. FTJ WR 1-23-70

The Iron King Mill was being reactivated during this quarter. They mill the old tailings and expect to do custom milling. FTJ QR 1-16-70

Interview with Jack Pierce at Shattuck Denn office. He is trying to develop means of alleviating dust from the tailings. Interview with R. J. Hardy, res. mgr. for Silver Jay. 20 are employed with 35 expected when maximum capacity is reached. They intend to use 1/3 of capacity of the mill and hope to have a stockpile of 12,000 tons before reaching full capacity. FTJ WR 1-23-70

To Iron King. Interview with Jack Pierce who said Silver Jay was having difficulties - management and financial. FTJ WR 3-20-70

The Iron King mine was milling tailings and mining some ore from underground during this quarter. FTJ QR 4-3-70

Visited with Jack Pierce - Iron King - idle. FTJ WR 5-22-70

The Iron King operated by Silver Jay Mining Co. a short time and was idle at the end of June. Shattuck Denn were making a soil supplement from the Iron King tails. FTJ Annual Report 6-30-70

The Silver Jay Mining Co., operating company operating the Iron King, was idle due to financial difficulties. FTJ QR 7-1-70

Iron King Mine will open today under new operators - McFarland-Hullinger of Tooele, Utah.
Clipping - Arizona Republic - 3-5-68

Interview with Jack Pierce - McFarland & Hullinger developing ore. 85 men employed. They may do custom milling although mill would need revamping. Mr. W. D. Nelson is mine supt. - Erickson, mill supt., neither were at the mine. Pat Sayre is night foreman. FTJ WR 3-22-68

Active Mine List Nov. 1967 - 206 men
Active Mine List April 1968 - 8 men

Interviewed Pat Sayre, night foreman at Iron King. They are mining developed ore and trying to develop more. FTJ WR 5-24-68

Interview with W. D. Nelson at Iron King mine. They are milling 500 tpd and doing some development work. The fertilizer plant is shut down, with the warehouse filled with sacked fertilizer. 122 people employed by McFarland & Hullinger at Iron King. They do not take custom ore. FTJ WR 7-26-68

Visited Mr. Nelson at Iron King mine. Operating at same rate 500 tpd. FTJ WR 9-20-68

Visited the Iron King mine - interview with Pat Sayre - said mine would probably shut down before the first of the year. FTJ WR 11-22-68

Active Mine List Oct. 1968 - 112 men

On Dec. 2 M&H went from production into salvage underground on cost plus 20% basis. They used about 24 men in the mining department salvaging simultaneously from both shafts on two shifts, reducing such manpower in steps toward the end. On Dec. 20 the night shift and crew were dropped and they completed salvage at the end of day shift Dec. 22. A broken hoisting cable in the man-materials compartment of No. 7 shaft early in the month caused a serious delay in surfacing equipment and materials and contributed to the leaving of some pipe, track and power cable that may otherwise have been recovered. The Mill was finally shut down at 3 p.m. Dec. 5 with all bins empty. About 8 men worked 6 days and 4 men another 5 days on the mill cleanup operation.
Mine Report for Dec. 1968 - 1-22-69

Visit Iron King Mine - interviewed Jack Pierce. The fertilizer plant operates as needed. Iron King soil supplement is marketed through Occidental Chemical Co. FTJ WR 1-24-69

Visited Iron King. Jack Pierce not in. Rehabilitation of equipment continues. No sale anticipated - equipment sold as is on the spot. McFarland & Hullinger examining Copper Queen for possible source of ore for Iron King mill. FTJ WR 3-21-69

The Iron King continues at their regular rate although ore is slightly lower in grade.
FTJ QR 7-8-66

Visited Iron King and had interview with Bill Sloan and their new geologist, Olaf Sund. Mining is becoming more difficult and ore is lower grade. They have a larger exploration budget and are actively looking for properties throughout the west and Mexico.
FTJ WR 7-22-66

Stand Metals Corp. announced that Thomas Newell will be the resident engineer and Frank Garrett, mine superintendent at its Silverton, Colorado operations. Both Newell and Garrett were previously associated with Shattuck Denn Mining Corp. Newell as vice pres. of exploration and Garrett as mine supt. at Iron King. Curtis R. Sundeen, gen. mgr. of Iron King, has been elected vice president of Shattuck Denn. Mining Congress Journal 7-1966

Visited U.S. Mine out of Skull Valley. Mine is idle. Vernard Jordon and Joe Pierce both of Skull Valley cleaned the mine to the 400' level and shipped about 350 tons of Pb, Zn ore to Iron King. FTJ WR 10-21-66

Interview with Mr. Sundeen at Iron King mine. They have discontinued all exploration activities. Mr. Sund, geologist, was gone. Mr. Sundeen said they have shut down their fertilizer plant until sale of material stockpiled is sold. Interviewed Bill Sloan, mine supt. He is leaving Iron King and will work for Miami Copper Co. at Miami.
FTJ WR 11-18-66

Visited Iron King Mine - Jack Pierce is manager and Russell Williams is mine supt. No indication of mining results or future. FTJ WR 1-20-67

Interview with Mr. Richard, comptroller at Iron King. He said outlook is somewhat improved regarding ore reserves. Sinking from the 26 level to 27 level is anticipated.
FTJ WR 3-24-67

The Iron King operated at about the same rate as last period. FTJ QR 4-5-67

Interview with Jack Pierce at the Iron King. They are mining from the 2500' and 2600' levels and are also sinking the shaft from the 2600' to the 2700' level. FTJ WR 5-19-67

Interview with Jack Pierce at Iron King. Milling 1050 tpd. The inclined shaft from 2600 level is completed as of July. FTJ WR 9-22-67

Interview with Mr. Richardson at Iron King. They are hopeful some company will take over the property. If not, they will mill ore that is broken, then shut down. FTJ WR 1-19-68

Information revealed that Iron King is drilling both north and south of the mine to determine if the Iron King mineralization will extend in either or both directions. They also expressed the view that the magnetite placers could comprise a great land "grab" which would exceed the gold placer "grab". Art Still is doing some work for Iron King. LAS Prescott Conf. 4-24-62

Western Equities, Inc. (formerly Western Gold & Uranium, Inc.) has granted two leases on its Brown-Henderson claims located on the strike of the Iron King veins near Prescott, Arizona. The deep lease is to Shattuck Denn Mining Corporation which operates the Iron King mine and proposes to explore the veins, in depth, for continuation of ore shoots now being mined by Shattuck Denn. The upper lease has been granted to Montan Phosphate Products Co., the U.S. subsidiary of Canada's Consolidated Mining and Smelting Co., on a perpetual profit-sharing basis. Shallow diamond drilling several years ago by Western indicated strike continuation of the Iron King structure, and mineralization. Western operated the Orphan uranium mine on the south rim of the Grand Canyon. Mining World June 1962 p. 44

Production 1962 - 6,629 tons lead; 20,234 tons zinc. FPK Note "Ore Bin" 10-1964

Active Mine List Oct. 1963 - 225 men

Visited Iron King mine and office. Interviewed Curtis Sundeen now General Mgr. and W. F. Sloan, Supt. Learned that Don Kentro, former General Mgr., has gone to Molybdenum Corp.'s Questa mine in Questa, New Mexico. Elmer Tomkinson, former Assistant General Mgr. has gone to the Chief Cons. Mining Co., at Park City, Utah. J. D. McGregor, purchasing agent, was retired. As yet no replacements have been made for assistant manager, chief engineer, or purchasing agent. They now have 160 men in the mine, 25 in the mill and 4 in the fertilizer plant. EGW WR 7-28-64

Interviewed W. F. Sloan, supt. at Iron King mine. EGW WR 9-19-64

Visited Iron King mine. Bill Sloan, mine supt., said the company has 1 core drill working on the surface and 1 core drill working underground. FTJ WR 5-21-65

Visited Iron King. Two core drills, 1 on surface, 1 underground continue to explore. Results are disappointing, according to Bill Sloan. The company is looking at other prospects in the area. FTJ WR 7-23-65

Visited Bill Sloan, mine supt., Iron King. Was informed that underground drilling failed to come up with encouraging results. They are continuing to drill from surface. Also met Glen Thatcher, Diamond Drill Contractor, 351 W. Pennsylvania, Tucson, who is drilling for Iron King. FTJ WR 11-19-65

Visited Iron King. Talked with Bill Sloan, mine supt., who said they are still drilling. FTJ WR 1-21-66

I attended a dinner-meeting of the Yavapai Subsection, AIME on October 3, 1960. 19 in attendance. Bee R. Waples, Jr., Mechanical Engineer for the Iron King mine of Shattuck Denn Mining Corp., was the speaker of the evening. The subject of his talk was the performance record of the Alimak raise climber now in use in the Iron King Mine. The talk which was illustrated by color slides, is the one he will give at the American Mining Congress show in October. Also, it will appear as a paper in the November issue of the American Mining Congress Journal.

Mr. Waples reported that three raises have been driven with the Alimak climber and a fourth is in progress. The first three were 142' long inclined at 78% from the vertical, the fourth (present job) is a vertical raise.

The company is eminently satisfied with the performance and the economics achieved and will soon have a second climber in use. Mr. Waples noted that there are some 150 climbers of this make in use in the world, of which 11 are in use in the U.S. Similar climbers by other manufacturers have appeared on the market. Among the important advantages noted at Iron King are the saving of approximately \$1200 per raise for timber (none is used), reduction of total labor shifts per raise by nearly one-half and increase of the speed of raise advance by nearly 2.4 times. Safety is another very important advantage. There was much discussion followint the talk. The manufacturer claims that a maximum raise length of 1200' can be practically driven, perhaps more, from the one set up and they point to an actual length of 600' reached in one case. Raises can be run on an incline as low as 55° from vertical. No ore chute is needed, or stulls or ladders. At Iron King the broken material on the floor of the drift is removed by a slusher. Cost of the climber to Iron King was lsightly under \$11,000 and with extra guide rails, etc. the total cost for the equipment was approximately \$15,000.

Memo TPL 10-5-60

Clevenger, Galen W., Met. Engr. replacing A. W. Jeffers, Iron King Mine.
TPL Memo 1-3-61

Visited the Iron King Mine. Idle account of strike with supervisory personnel performing maintenance work in the mine and mill. Talked with J. D. McGregor, purchasing agent, also Walter Stater, Assayer. TPL WR 10-28-61

Visited the Iron King mine and talked with Mine Supt. Elmer Tomkinson, B. Waples, Chief Engineer and J. J. McGregor, Purchasing Agent. The project was still strike bound with no "approachment" in sight. Union demands include 25¢ per hr. "across the board" but the principal hitch seems to hinge in interpretation of "Management Rights" regarding working places, work to be done and number of employees to be used in such working places. A Union meeting had been held the evening before but no information was available at the time of my visit. TPL WR 12-2-61

Active Mine List Feb. 1962 - 225 men working

Visited the Iron King Mine. Operations are normal with tonnage at about 1000 tpd and grade of ore approximately the same as for recent months. Most of the ore is coming from levels 17, 18 & 19. The 2000' level is advancing at 500' north from the main shaft (No. 6). Also development of the 21 level is starting off from the shaft.

At the time of visit Dan Kentro was in conference negotiating with representatives of the Steel Workers Union. Since the union contract was to expire that day (Sept. 30) this final meeting was considered very critical for the company.

The company is drilling a portion of the DeSoto mine (not the main workings) under an agreement with the owner, S. B. Owens. I learned also that Dick Chilson of Tucson, is planning a leaching operation in the old workings. TPL WR 10-3-59

Visited Iron King mine. The operations were at the normal rate. I obtained information regarding the analysis and volume of the tailings currently going out of the mill. This information is for Jim Stevens (J. L. Stevens, 3442 N. 16th Drive, Phoenix) in connection with his survey of the possibilities for using certain copper mill tailings with high iron and sulfur content to make an agricultural soil conditioner. I learned that Dalton has resumed shipments of "Soil Til" (tailings from the Antlers Mine). This has been a very lucrative business but is coming to an end because of exhaustion of the tailings pile. Mr. Dalton has persuaded Iron King to make a scavenger iron concentrate for him for blending with other material to produce soil conditioners. Dalton apparently works closely with American Guano Corp. Iron King has made and is holding for him 100 tons of concentrates with contents approximately as follows:

| | |
|----------|----|
| 0.12 oz. | Au |
| 1.7 oz. | Ag |
| 46.0% | S |
| 38.5% | Fe |
| 1.5% | Pb |
| 4.9% | Zn |

No arsenic assay is available but it was stated that this would probably be under .5%. Current mill tailings (about 800 tpd) assay about as follows:

| | |
|---------|--------------------|
| .05 oz. | Au |
| .68 oz. | Ag |
| 15.70% | Fe |
| 14.70% | S ----Probably low |
| .58% | Pb |
| 1.70% | Zn |
| .10% | Cu |

TPL WR 1-9-60

Visited the Iron King Mine and talked with Dan Kentro, Elmer Tomkinson, Al Jeffers, McGregor and others. Operations are continuing at the normal rate. The company is using an "Alimak Raise Climber" in one of its development raises. This is the new Swedish platform for driving raises faster, safer and more cheaply. It is described in Mining World for Sept. 1959. The Iron King people speak well of it after driving 100' of raise (the work is continuing). However, it was necessary to work out a considerable number of "bugs" at the beginning.

TPL WR 3-26-60



Washington, D.C.
Oct. 1, 1943

SUBJECT: Oil Burner, Iron King, Shattuck Denn.

Please tell Hap Mills that we have his change house oil burner
priority approved OK and that a notice has gone out.

Bill Broadgate

COPY

Nov. 7, 1942

Hon. Sidney Osborn, Governor,
State of Arizona
Phoenix

My dear Governor:

It has come to my notice thru the papers that some criticism has been made of excess reserves held by the Industrial Commission. I have felt that this was the case for some time, and in trying to get a clear picture of where all the premiums finally end up, a condition is apparent which is neither fair nor equitable to the small operator of the state. It is so hard to get actual figures from the Commission that I am forced to say that what follows is only my impression of what may be facts.

While we operated as the Iron King Mining Company, because of high premiums we left the State fund for one year, insuring for this period under Lloyds. Because of some differences of opinion on one case we had, we went back to the State under the impression that the savings in the mining classification would be distributed as dividends to each policyholder in the proportion that their saving bore to the total saving. This condition would make each mine more or less self rating as far as final costs are concerned. The beginning of this year, rates were advanced to the point at which they were not only burdensome, but high enough so that only a few cases would cost more than their premiums, so that theoretically the plan was more self rating than ever. I now find that only 45%-55% of the savings are distributed back to the operator, the balance going into some reserve. The operator has already been charged a loading charge to cover administration and for the catastrophe fund, and I see no reason why the entire saving of the classification should not be returned as a dividend.

The inequity lies in the fact that a self-rater is charged a premium which is about 124% of actual cost. Notice that the loading charge is based on costs, not on premium. This is a proper method. However, none of his premium goes into this reserve into which half of the savings of the small mines go. I have no axe to grind in this matter, as it is probable that we will go self rating about the first of next year, effecting a probable saving of about 40% on our present rates, perhaps much more, as our costs have been only a little over 3% before loading charges and we are paying 10.0%.

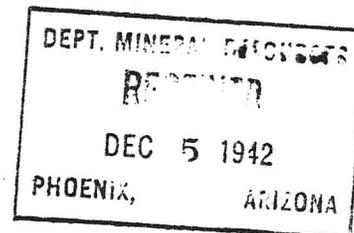
The burden of payroll taxes and Industrial Insurance are serious when imposed on the present high labor costs. You are in a position to verify my impressions given above, and if verified, something should be done to adjust the matter.

Yours very truly

Signed. H. F. MILLS

COPY

Humboldt, Arizona
November 24, 1942



Miss Grace Sparkes,
Prescott, Arizona

Dear Grace:

In trying to get some figures to qualify ourselves as a self rater for Industrial Insurance, I found a condition which I believe is against the best interests of the small operators. It is so hard to get information from the Commission that I had to take a shot in the dark. I wrote the Governor as per copy enclosed, and have had a very decent reply from him. It seems that heretofore he had no control of the situation, but that with the new appointees he will have. He has turned my letter over to his new appointees and asked for a report from them on the matter, copy of which will be sent to me.

Regards,

Signed.
H. F. MILLS

November 2, 1942

Mr. H. F. Mills, General Mgr.
Iron King Mine
Humbolt, Arizona

Dear Mr. Mills:

We have a memorandum from Mr. W. C. Broadgate in which he states that consideration for the authorization of your quota is extremely favorable.

This information is of a confidential nature and we hasten to notify you for your own satisfaction only.

Very truly yours

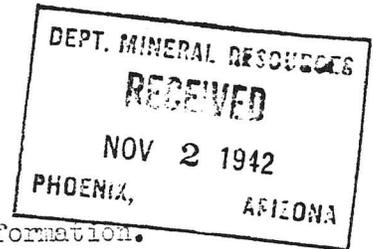
Earl F. Hastings
Assistant Director &
Projects Engineer

EFH:BA

Washington, D.C.
Oct. 30, 1942

H.

SUBJECT: Premium Price,
Increase in quota to meet costs
Iron King Mine
Coupal's memo Oct. 24



I have been working on this and today have definite information.

However, it is off the record, and have no right really, to give it to you at all, so be very careful not to put it in writing, though you can tell Mills personally.

The Iron King has been granted a zero quota after some opposition by the OPA group in the Quota Committee.

You will understand that this is entirely unofficial, as the matter still has to collect several signatures around the WPB before it becomes authorized.

My tail will be in a sling if it gets out that I have given this information, as it is always barely possible, though extremely unlikely, that a change may be made before final authorization.

Bill Broadgate

F.H.

October 29, 1942

Mr. H. F. Mills
Iron King Mine
Humbolt, Arizona

Dear Hap:

I have just had a memorandum from Bill Broadgate regarding the question of a change in your quota in order to permit you to increase production in view of the increased costs.

I will quote part of Bill's letter which is as follows and which will let you know that he is at work on your problem.

"I know a member of the Quota Committee who is also in the Zinc Branch and will take the opportunity to discuss the Iron King with him as soon as possible for Mills. Give Mills my best regards when you see him. Many such adjustments are being made."

With best wishes and kindest regards, I am

Very truly yours

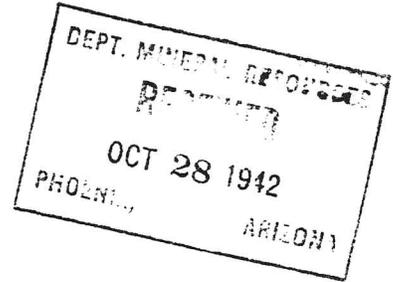
J. S. Coupal, Director

JSC:BA

Washington, D.C.
Oct. 26, 1942

H.

SUBJECT: Premium Price,
Increase in quota to meet costs
Iron King Mine
Coupal's memo Oct. 24



I have noted the memo and report attached.

As a matter of convenience these matters are usually handled by the WPB branch interested in the metal the largest % of which shows in a complex ore.

C ✓

In this case zinc predominates.

I know a member of the Quota Committee who is also in the Zinc Branch and will take the opportunity to discuss the Iron King with him as soon as possible for Mills.

Give Mills my best regards when you see him.

Bill Broadgate

Many such adjustments are being made.

SUBJECT:

Phoenix, Oct. 24, 1942.

Premium price
To step up production.
Iron King Mine.

TO:- W. C. Broadgate:

FROM:- J. S. Coupal.

Hap Mills was in the office a few days ago and we discussed the possible increase in production from his property IF he could get a quota reduction so as to meet his mounting labor costs.

I am enclosing a copy of a brief on this subject which Hap Mills has sent to Washington.

If we are to step up production on the operating properties each one of these individual cases may have to be taken up and adjusted on their merits.

This is a particular case with which you are quite familiar.

Dunning

June 7, 1945

Mr. H. F. Mills
Humboldt, Arizona

Dear Hap:

I may try to work in a few photos in the coming annual report. If so, I would like to have one of the Iron King. If I used such a photo I would do it without definite identification but merely as an "example" of something.

If you have something along that line that you could send, it would be appreciated.

Yours sincerely,

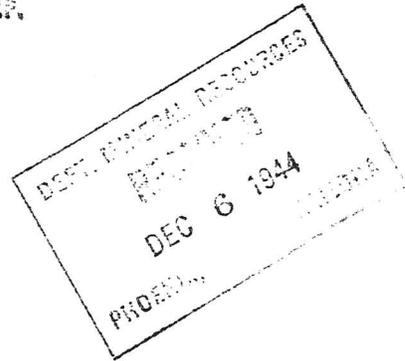
Chas. H. Dunning
Director

CHD:LP

SHATTUCK DENN MINING CORP.

HUMBOLDT, ARIZ.

Dec. 5, 1944.



Mr. Julian Conover, Secretary,
American Mining Congress,
Washington, D.C.

Dear Mr. Conover:-

The Iron King branch of the Shattuck Denn Mining Corporation has been and is working open shop, our men are not organized and there is no collective bargaining agency.

While we do not presume to ask for a legal opinion from you, the points in question which follow are so common to operating mines that perhaps you may be able to refer us to a court decision which may clarify the matter. We have found nothing in Prentice-Hall or C.C.H. which relates directly to common underground contracts. Certainly the letting of development and stoping contracts is still in use to such an extent that we feel that there must be either a court decision covering overtime on these contracts or there is an accepted practice of applying overtime.

We have in general, five types of incentive systems, the perhaps the last three are of one general type. These are:

1- A general production bonus based upon ton per man from stopes and which is paid to everyone on the payroll except those engaged in another type of bonus contract. The amount of bonus is figured from tons per man on stopes and is a fixed amount per hour given to all eligible regardless of daily rate or classification. This plan presents no particular overtime problem, for the result is the same whether the percent of bonus is added to the straight rates and the overtime computed on the increased rate, or if the bonus is added to the straight time plus overtime.

2- A block leasing system inaugurated in an attempt to clean up isolated small ore bodies and stope remnants. Under these leases the men are carried on the company payroll at regular rates subject to overtime. The lease is treated as a separate operating unit for the purpose of determining earnings of the lease, and the lessees, in addition to receiving wages and overtime, are given a percentage of this profit. We have not considered the additional earnings as being subject to overtime.

The next three classes are:

- 3- Straight development contracts at a certain figure per foot.
- 4- Straight stoping contracts at a certain figure per cubic foot.
- 5- Bonus drift contracts in which the contractor, receives in addition to his wages a bonus earned by advance in excess of a fixed daily base.

SHATTUCK DENN MINING CORP.

HUMBOLDT, ARIZ.

(2)

In all five of these the men are guaranteed a minimum daily wage plus overtime, and in addition, the earnings of the contract, if any, in excess of the paid wages.

It is my opinion that these earnings above the regular time and overtime are not subject to overtime, yet I have been confronted with the opinion that the total earnings under a footage contract should be divided by the actual number of hours worked to establish a new hourly rate upon which overtime will be calculated. Of course, the result of this would be to make a drift contract let at \$8.00 per foot actually cost between nine and ten dollars per foot, making it impossible to contract development work at a known cost. This increased cost per foot sometimes occurs when the contractor fails to make expected footage and is paid off company account, but these occasions are indeed rare.

From the standpoint of the operator, I believe our position is just. We have no argument with our men, with the Labor Board, nor anyone else. However the decisions of the Labor Board are often what is not expected, and the penalties for failure to pay proper overtime are severe. We do not wish to discontinue our contracts, as a proper incentive system seems to be our proper solution of the man shortage, but we do not wish to expose ourselves to a severe retroactive penalty for failure to do something beyond what we are doing.

Again, while I do not ask you to give us your opinion on the matter, we hope that you may be able to refer us to a proper decision. Because of the time and expense involved, I do not want a friendly test case instituted.

Thanking you for your kind consideration of this matter, which involves not only us, but perhaps a great part of the mining operations, I am,

Yours very truly,

H.F. Mills.

Mgr.

cc Wm Broadgate.

May 23, 1944

Mr. H. F. Mills
Humboldt, Arizona

Dear Hap,

The following memoranda were just received from W. C. Broadgate in Washington:

"Subject: Shattuck Denn Compressor.

"Referring now to the wire from Mills which I sent to the office so you could report. Mills should have the approved priority by now."

"Subject: Continental Ore Company - refusal of fluorspar contracts.

"The fluorspar industry is generally in pretty good shape. It is getting to the point where shipments from out of the way areas are not in demand. The market will be soft all summer. It might stiffen this winter a little, but this is not to be depended on.

"Coast outlets are the only real outlook for Arizona fluorspar in the long run.

"Due to the easy conditions, specifications are being stiffened back to or approaching-prewar levels.

"Even with the 10-15% cut due to the draft expected, (in the fluorspar areas) there may be little demand from isolated, small properties.

"I have often wondered why Hap Mills outfit went into fluorspar, especially on the down-grade side of the market. I believe I told him so a long time ago.

"I am asking the WPB Fluorspar section to give me a memo next week outlining the situation and giving a list of possible takers for Arizona product."

Yours very truly,

Chas. H. Dunning, Director

CHD:LP

SHATTUCK DENN MINING CORPORATION

120 BROADWAY
NEW YORK 5, N. Y.

March 17, 1944

THOMAS BARDON
PRESIDENT



Mr. J. S. Coupal, Director
Department of Mineral Resources
State of Arizona
304 Home Builders Building
Phoenix, Arizona

Dear Mr. Coupal:

I appreciate very much your letter of February 29th and the copy of Mr. Holt's report on the possibilities of a custom mill in Mohave county. The report to which you referred to the effect that we are contemplating installing a zinc reduction plant in Arizona is hardly true or at least much exaggerated. We are aware of the handicaps which the lack of such a plant imposes upon the efforts of anyone who is attempting to mine zinc. The high freight and treatment charges are a serious obstacle to the development if the State's zinc resources.

We would like to be of some service in overcoming such handicaps, but we would hardly contemplate the operation of an ordinary zinc smelter or the reduction plant, as such an operation is something which is too extensive and difficult to be attempted by a company of our size or type. We are much interested in the problem, however, and I hope that you will, as stated in your letter, discuss it with Mr. Mills at our Iron King mine. He is the man in our organization who is the most familiar with it.

Yours very truly,

President

TB:JF

cc: Mr. H. F. Mills
Humboldt, Arizona

February 29, 1944

Mr. Thomas Bardon, President
Shattuck Denn Mining Corporation
120 Broadway
New York 5, New York

Dear Mr. Bardon:

Thank you for your letter of February 23 and I am glad to know you are interested in the Holt report on possibilities of a custom mill in Mohave County. I am sending under separate cover a copy of that report.

I have heard that your company plans, or is contemplating, a zinc reduction plant for Arizona. I worked faithfully on such a project for two or three years but was unable to get results. I have had some very interesting discussions with Mr. Percy B. Butler of 1259 South Beverly Glenn Blvd., Village Station, Los Angeles, regarding the methane process in use with a continuous retort for zinc reduction. I believe this process is now being tested out by the Bureau of Mines. I have also written to your manager at the Iron King property in Humboldt, Hap Mills, and hope to discuss this with him the next time I get chance to see him.

We are vitally interested in any plan for a zinc reduction plant to handle Arizona ores without the long freight hauls and if we can be of any service to you, would welcome the opportunity.

Very truly yours,

J. S. Coupal, Director

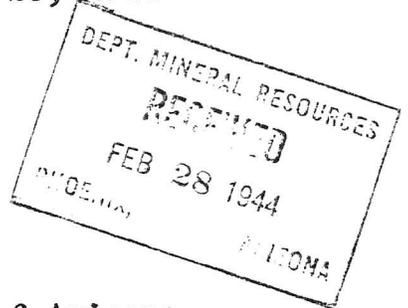
JSC:LP

SHATTUCK DENN MINING CORPORATION

120 BROADWAY
NEW YORK 5, N. Y.

THOMAS BARDON
PRESIDENT

February 23, 1944



Mr. J. S. Coupal, Director
Department of Mineral Resources, State of Arizona
413 Home Builders Building
Phoenix, Arizona

Dear Mr. Coupal:

I have read a report made to you by Mr. Elgin B. Holt entitled "Report on Potential Tonnage for a Custom Mill in the Chloride District, Mohave County, Arizona."

The report was very interesting, but it was only lent to me, and I would like very much to have a copy for my files.

If you have a copy which you can spare, I would appreciate your sending it to me.

Yours very truly,

President

TB:JF

February 15, 1944

Mr. Hap Mills
Iron King Mine
Humboldt, Arizona

Dear Hap:

I understand that Shattuck Deann is considering a zinc reduction plant for Arizona ores.

While I was working on the plans for a zinc plant at Boulder, I was in contact with Mr. Percy B. Butler, 1259 South Beverly Glenn Boulevard, Los Angeles (24), California, and we discussed in detail the Methane process for zinc reduction on which he held the patents. He is a zinc expert and has been very active. The U. S. Bureau of Mines have taken over development work on the erection of one of the continuous vertical retorts for zinc to be used on the Methane process. At present, buildings have all been erected but the actual plant construction has been delayed due to priorities for the alloy metals required for the erection of the test retorts.

If your concern is contemplating going into a zinc reduction plant, I suggest that you contact Mr. Percy Butler, whom I have known for a great many years having first met him when operating in Parral in 1910. I would also suggest that you contact the U. S. Bureau of Mines so as to keep posted on the results obtained from their Methane gas continuous zinc retort.

We are very much interested in any project which will give Arizona an outlet for its zinc concentrates without the expensive freight haul to Texas and the Middle West and I feel sure that someday in the very near future Arizona will have a zinc reduction plant for its ores.

Very truly yours,

J. S. Coupal
Director

JSC:JES

| YEAR | Tons Milled | Tons Zinc Concentrate | Pounds Zinc In Concentrate | Tons Lead Concentrate | Pounds Lead In Concentrate | Tons Tailing Impounded |
|-------|-------------|-----------------------|----------------------------|-----------------------|----------------------------|------------------------|
| 1957 | 300,729 | 33,792 | 40,652,345 | 25,420 | 13,356,361 | 241,517 |
| 1958 | 314,266 | 36,603 | 46,021,974 | 25,092 | 16,113,228 | 252,571 |
| 1959 | 299,981 | 36,523 | 45,683,826 | 21,786 | 15,037,674 | 241,672 |
| 1960 | 304,485 | 41,215 | 49,077,680 | 20,094 | 14,670,250 | 243,159 |
| 1961* | 235,885 | 30,263 | 35,973,046 | 13,620 | 10,166,888 | 191,868 |
| 1962 | 271,171 | 33,495 | 40,468,950 | 16,970 | 12,416,872 | 220,488 |
| 1963 | 280,807 | 30,151 | 36,125,662 | 13,534 | 10,199,316 | 237,122 |
| 1964 | 314,163 | 29,997 | 32,922,407 | 15,226 | 10,653,937 | 268,940 |
| 1965 | 333,743 | 29,064 | 32,055,680 | 15,792 | 10,669,482 | 288,883 |
| 1966 | 318,830 | 24,649 | 26,903,760 | 14,193 | 9,468,760 | 279,988 |

APPROXIMATE ANALYSIS OF ORE AND PRODUCTS

| Material | Au Oz./ton | Ag Oz./ton | Pb Percent | Zn Percent | Cu Percent | Fe Percent | S Percent | AS Percent | Sb Percent | Cd Percent | Se Percent |
|--------------|------------|------------|------------|------------|------------|------------|-----------|------------|------------|------------|------------|
| Mill Heads | 0.10 | 3.00 | 2.2 | 7.0 | .17 | 16 | 20 | | | 0.02 | 0.02 |
| Zinc Concts. | .08 | 2.30 | 1.6 | 56.0 | .23 | 6 | 32 | 0.38 | | 0.20 | 0.03 |
| Lead Concts. | 1.20 | 52.30 | 38.0 | 10.0 | 2.00 | | 35 | 1.30 | 0.1 | | 0.1 |
| | .04 | .52 | 0.3 | 0.6 | .04 | 16 | 15 | insolubles | 45% | | 0.01 |

Lead Concentrate 10%

SUMMARY OF THE GEOLOGY OF THE IRON KING MINE

LOCATION

The Iron King Mine lies about one mile west of the village of Humboldt in Yavapai Co., Arizona.

PRODUCTION

Production has grown over the years to its present rate of 30,000 tons per month, and a total of just over 5 million tons have been mined to date.

GENERAL GEOLOGY

The country rocks are predominantly Yavapai Schists of older Precambrian age and consist of a series of rocks which apparently represent metamorphosed andesite and rhyolitic pyroclastic deposits with interbedded shale and pebbly sandstone (Figure 1). The whole assemblage resembles eugeosynclinal rocks in post-Precambrian belts.

STRUCTURE

The schists strike at 25 degrees (Azimuth) and dip to the west at about 40 degrees. (Figure 1). The rocks in the mine area are thought to occupy the overthrust western limb of a large recumbent syncline and, consequently, the ore deposits occur on, or near, the top of the predominantly rhyolitic volcanic rocks with which they are associated.

ORE DEPOSIT

The ore deposit consists of a series of more or less overlapping lenses with an en echelon arrangement (Figures 2 and 3). These lenses have the same strike and dip as the host rocks and plunge to the north at 60 degrees (Figures 1 and 3). The largest orebody, termed the I Series, lies on the contact between the meta-rhyolite and stratigraphically younger meta-andesite, whereas the smaller orebodies of the Footwall Series lie within the meta-andesite.

The ore lenses consist of massive sulphides and "north end quartz noses" composed of banded to massive greenish grey quartz containing coarse galena, sphalerite, pyrite and tetrahedrite. (Figure 4). Individual beds of massive sulphides grade to the south into pyritic quartz schists which, in turn, change to quartz-sericite schist. (Figure 4). The principal metallic mineral in the massive sulphides is pyrite, accompanied by recoverable amounts of sphalerite, galena and chalcopyrite. Gold and silver are present, especially in the massive quartz.

The orebody at the Iron King Mine resembles a group of deposits which are being viewed by an increasing number of workers as products of sub-aqueous volcanism.

IRON KING GEOLOGY

EXPLANATION OF FIGURES

Figure 1---Surface geological map at the Iron King Mine.

Figure 2---Vertical longitudinal section of the Iron King.

Figure 3---Plan of a portion of the I Series on the 2200 level.

Figure 4---(a) Plan of the 2200 level foreshortened along strike in order to emphasize some of the lithological and structural features of the deposit.

(b) Simplified version of 4 (a).

File

TABLE 1--Production of recoverable metals, Iron King mine,
Humbolt, Arizona

| Year | Tons | Gold (ounces) | Silver (ounces) | Lead (pounds) | Zinc (pounds) | Copper (pounds) |
|----------------------|-----------|------------------|--------------------|------------------|------------------|--------------------|
| 1906-38 ¹ | 78,452 | 15,690 | 313,808 | 3,138,080 | 6,276,160 | 470,700 |
| 1938 ² | 13,477 | 2,317 | 45,938 | 404,300 | 1,078,160 | 67,400 |
| 1939 | 70,227 | 9,911 | 272,604 | 1,872,680 | 5,854,020 | 351,120 |
| 1940 | 65,812 | 9,239 | 266,497 | 1,891,060 | 7,220,440 | 329,060 |
| 1941 | 69,159 | 9,720 | 331,746 | 2,320,040 | 7,617,100 | 345,800 |
| 1942 | 88,200 | 11,659 | 392,458 | 3,540,100 | 10,585,560 | 441,000 |
| 1943 | 73,721 | 9,167 | 307,465 | 3,164,380 | 10,095,300 | 220,720 |
| 1944 | 99,164 | 9,460 | 308,567 | 3,611,660 | 13,623,860 | 423,820 |
| 1945 | 117,287 | 13,068 | 436,506 | 5,259,640 | 16,156,180 | 455,280 |
| 1946 | 115,615 | 13,065 | 467,387 | 5,734,280 | 16,875,320 | 485,780 |
| 1947 | 122,368 | 15,298 | 533,642 | 6,194,880 | 16,925,320 | 411,820 |
| 1948 | 145,823 | 17,036 | 540,548 | 6,854,120 | 19,048,100 | 453,020 |
| 1949 | 175,111 | 21,432 | 737,925 | 8,414,680 | 23,547,440 | 546,660 |
| 1950 | 203,063 | 27,289 | 904,284 | 10,645,040 | 28,220,800 | 686,460 |
| 1951 | 202,581 | 27,135 | 764,731 | 9,528,680 | 26,075,380 | 657,100 |
| 1952 | 197,747 | 23,430 | 730,280 | 10,203,740 | 29,306,000 | 672,000 |
| 1953 | 190,735 | 26,703 | 730,515 | 10,528,000 | 27,008,000 | 610,000 |
| 1954 | 180,512 | 28,106 | 745,514 | 11,372,000 | 30,074,000 | 722,000 |
| 1955 | 222,909 | 31,296 | 884,949 | 12,170,000 | 32,902,000 | 758,000 |
| 1956 | 253,956 | 35,452 | 992,968 | 14,476,000 | 37,992,000 | 914,000 |
| 1957 | 300,729 | 38,644 | 1,118,712 | 16,540,000 | 47,696,000 | 1,082,000 |
| 1958 | 314,266 | 39,629 | 1,147,071 | 18,038,000 | 53,236,000 | 1,194,000 |
| 1959 | 299,981 | 38,728 | 1,124,929 | 17,338,000 | 51,476,000 | 1,140,000 |
| 1960 | 304,485 | 34,285 | 1,020,025 | 16,442,000 | 52,980,000 | 1,158,000 |
| 1961 | 235,885 | 22,857 | 702,937 | 11,700,000 | 39,912,000 | 1,038,000 |
| 1962 | 271,171 | 28,066 | 854,189 | 13,776,000 | 44,635,000 | 1,138,000 |
| 1963 | 280,807 | 27,463 | 901,390 | 12,468,000 | 39,200,000 | 1,010,000 |
| 1964 | 314,163 | 30,348 | 917,356 | 13,132,000 | 39,522,000 | 1,320,000 |
| 1965 | 333,743 | 25,738 | 713,930 | 12,518,376 | 38,135,352 | 1,254,987 |
| 1966 | 318,830 | 24,100 | 663,179 | 11,023,904 | 32,009,890 | 1,159,239 |
| 1967 | 273,737 | 21,586 | 569,741 | 9,869,966 | 25,988,296 | 961,727 |
| 1968 | 100,196 | 5,537 | 184,712 | 3,263,855 | 7,098,752 | 177,995 |
| 06-68 | 6,033,912 | 693,454 | 20,626,053 | 287,433,461 | 838,370,430 | 22,655,688 |

Gross value shipped to Smelters
Net value (after frt. & treatment)

± \$ 120,200,000
± \$ 68,500,000

1. (production before milling)

2. (last 3 months of milling)
(mill in operation Oct., Nov., Dec 1938)

TABLE 1--Production of recoverable metals, Iron King mine,
Humbolt, Arizona

| Year | Tons | Gold (ounces) | Silver (ounces) | Lead (pounds) | Zinc (pounds) | Copper (pounds) |
|----------------------|-----------|------------------|--------------------|------------------|------------------|--------------------|
| 1935-35 ¹ | 78,452 | 15,690 | 313,808 | 3,138,080 | 6,276,160 | 470,700 |
| 1936 ² | 13,477 | 2,317 | 45,938 | 404,300 | 1,078,160 | 67,400 |
| 1939 | 70,227 | 9,911 | 272,604 | 1,872,680 | 5,854,020 | 351,120 |
| 1940 | 65,812 | 9,239 | 266,497 | 1,891,060 | 7,220,440 | 329,060 |
| 1941 | 69,159 | 9,720 | 331,746 | 2,320,040 | 7,617,100 | 345,800 |
| 1942 | 88,200 | 11,659 | 392,458 | 3,540,100 | 10,585,560 | 441,000 |
| 1943 | 73,721 | 9,167 | 307,465 | 3,164,380 | 10,095,300 | 220,720 |
| 1944 | 99,164 | 9,460 | 308,567 | 3,611,660 | 13,623,860 | 423,820 |
| 1945 | 117,287 | 13,068 | 436,506 | 5,259,640 | 16,156,180 | 455,280 |
| 1946 | 115,615 | 13,065 | 467,387 | 5,734,280 | 16,875,320 | 485,720 |
| 1947 | 122,368 | 15,298 | 533,642 | 6,194,880 | 16,925,320 | 411,820 |
| 1948 | 145,823 | 17,036 | 540,548 | 6,854,120 | 19,048,100 | 453,020 |
| 1949 | 175,111 | 21,432 | 737,925 | 8,414,680 | 23,547,440 | 546,660 |
| 1950 | 203,063 | 27,289 | 904,284 | 10,645,040 | 28,220,800 | 686,460 |
| 1951 | 202,581 | 27,135 | 764,731 | 9,528,680 | 26,075,380 | 657,100 |
| 1952 | 197,747 | 23,430 | 730,280 | 10,203,740 | 29,306,000 | 672,000 |
| 1953 | 190,735 | 26,703 | 730,515 | 10,528,000 | 27,008,000 | 610,000 |
| 1954 | 180,512 | 28,106 | 745,514 | 11,372,000 | 30,074,000 | 722,000 |
| 1955 | 222,909 | 31,296 | 884,949 | 12,170,000 | 32,902,000 | 758,000 |
| 1956 | 253,956 | 35,452 | 992,968 | 14,476,000 | 37,992,000 | 914,000 |
| 1957 | 300,729 | 38,644 | 1,118,712 | 16,540,000 | 47,696,000 | 1,082,000 |
| 1958 | 314,266 | 39,629 | 1,147,071 | 18,038,000 | 53,236,000 | 1,194,000 |
| 1959 | 299,981 | 38,728 | 1,124,929 | 17,338,000 | 51,476,000 | 1,140,000 |
| 1960 | 304,485 | 34,285 | 1,020,025 | 16,442,000 | 52,980,000 | 1,158,000 |
| 1961 | 235,885 | 22,857 | 702,937 | 11,700,000 | 39,912,000 | 1,038,000 |
| 1962 | 271,171 | 28,066 | 854,189 | 13,776,000 | 44,635,000 | 1,138,000 |
| 1963 | 280,807 | 27,463 | 901,390 | 12,468,000 | 39,200,000 | 1,010,000 |
| 1964 | 314,163 | 30,348 | 917,356 | 13,132,000 | 39,522,000 | 1,320,000 |
| 1965 | 333,743 | 25,738 | 713,930 | 12,518,376 | 33,135,352 | 1,254,987 |
| 1966 | 316,830 | 24,100 | 663,179 | 11,023,504 | 32,009,890 | 1,159,239 |
| 1967 | 273,727 | 21,586 | 569,741 | 9,669,966 | 25,938,296 | 961,727 |
| 1968 | 100,176 | 5,537 | 184,712 | 3,203,055 | 7,093,752 | 177,995 |
| 0-1968 | 6,033,912 | 693,454 | 20,626,053 | 287,438,461 | 838,370,430 | 22,655,666 |

(1) value shipped to Smelters
(2) value (after prt. & treatment)
(3) production before milling)

± \$ 120,000,000
± \$ 60,000,000

2. (last 3 months of milling) Dec 1968]

TABLE 1--Production of recoverable metals, Iron King mine,

Humbolt, Arizona

| Year | Tons | Gold (ounces) | Silver (ounces) | Lead (pounds) | Zinc (pounds) | Copper (pounds) |
|----------------------|-----------|---------------|-----------------|---------------|---------------|-----------------|
| 1906-38 ¹ | 78,452 | 15,690 | 313,808 | 3,138,080 | 6,276,160 | 470,700 |
| 1938 ² | 13,477 | 2,317 | 45,938 | 404,300 | 1,078,160 | 67,400 |
| 1939 | 70,227 | 9,911 | 272,604 | 2,872,680 | 5,854,020 | 351,120 |
| 1940 | 65,812 | 9,239 | 266,497 | 2,851,800 | 7,220,440 | 329,060 |
| 1941 | 69,159 | 9,720 | 331,746 | 2,320,040 | 7,617,100 | 345,800 |
| 1942 | 88,200 | 11,659 | 392,458 | 3,540,100 | 10,585,560 | 441,000 |
| 1943 | 73,721 | 9,167 | 307,465 | 3,164,380 | 10,095,300 | 220,720 |
| 1944 | 99,164 | 9,460 | 308,567 | 3,611,660 | 13,623,860 | 423,820 |
| 1945 | 117,287 | 13,068 | 436,506 | 5,259,640 | 16,156,180 | 455,280 |
| 1946 | 115,615 | 13,065 | 467,387 | 5,734,280 | 16,875,320 | 485,780 |
| 1947 | 122,368 | 15,298 | 533,642 | 6,194,880 | 16,925,320 | 411,820 |
| 1948 | 145,823 | 17,036 | 540,548 | 6,854,120 | 19,048,100 | 453,020 |
| 1949 | 175,111 | 21,432 | 737,925 | 8,414,680 | 23,547,440 | 546,660 |
| 1950 | 203,063 | 27,289 | 904,284 | 10,645,040 | 28,220,800 | 686,460 |
| 1951 | 202,581 | 27,135 | 764,731 | 9,528,680 | 26,075,380 | 657,100 |
| 1952 | 197,747 | 23,430 | 730,280 | 10,203,740 | 29,306,000 | 672,000 |
| 1953 | 190,735 | 26,703 | 730,515 | 10,528,000 | 27,008,000 | 610,000 |
| 1954 | 180,512 | 28,106 | 745,514 | 11,372,000 | 30,074,000 | 722,000 |
| 1955 | 222,909 | 31,296 | 884,949 | 12,170,000 | 32,902,000 | 758,000 |
| 1956 | 253,956 | 35,452 | 992,968 | 14,476,000 | 37,992,000 | 914,000 |
| 1957 | 300,729 | 38,644 | 1,118,712 | 16,540,000 | 47,696,000 | 1,082,000 |
| 1958 | 314,266 | 39,629 | 1,147,071 | 18,038,000 | 53,236,000 | 1,194,000 |
| 59 | 299,981 | 38,728 | 1,124,929 | 17,338,000 | 51,476,000 | 1,140,000 |
| 60 | 304,485 | 34,285 | 1,020,025 | 16,442,000 | 52,980,000 | 1,158,000 |
| 1961 | 235,885 | 22,857 | 702,937 | 11,700,000 | 39,912,000 | 1,038,000 |
| 1962 | 271,171 | 28,066 | 854,189 | 13,776,000 | 44,635,000 | 1,138,000 |
| 1963 | 280,807 | 27,463 | 901,390 | 12,468,000 | 39,200,000 | 1,010,000 |
| 1964 | 314,163 | 30,348 | 917,356 | 13,132,000 | 39,522,000 | 1,320,000 |
| 1965 | 333,743 | 16,120 | 632,963 | 11,397,000 | 34,691,280 | 801,540 |
| 1966 | 318,830 | 14,329 | 595,798 | 10,008,500 | 29,008,900 | 605,360 |
| 1967 | 370,000 | 15,000 | 472,000 | 12,000,000 | 32,000,000 | 500,000 |
| 1968-66 | 5,659,979 | 646,942 | 19,723,252 | 272,162,860 | 798,838,320 | 20,607,640 |
| | 5,928,775 | 6,579,442 | 20,195,252 | 280,162,860 | 816,838,320 | 20,787,640 |

(1 Production before milling.)
 (2 Last 3 months of milling.)

PHOENIX (Special)

Twenty-four years ago the Iron King mine at Humboldt, Arizona, was purchased under tax sale for a few hundred dollars. Its assessed valuation today is \$2,519,377, and the U. S. Bureau of Mines recently reported that in 1959 this mine produced 73 percent of Arizona's zinc output, 70 percent of her lead, was her largest silver producer, and ranked third in gold production.

Shattuck-Dem Mining Corporation purchased the Iron King property in 1942, and its development of the mine to its present capacity of 1,000 tons of ore per day has been an outstanding accomplishment, according to Frank P. Knight, Director, Department of Mineral Resources, Phoenix, who has supplied the following history from department records:

Originally located about 1880, the Iron King mine was first put into production in 1906-7 by a Reverend Blanchard. During World War I, George Calvocoresses leased it for production of what proved to be unsatisfactory flux for his Humboldt smelter, the stack of which still stands near the Black Canyon highway.

The first real production effort was by the purchaser at the tax sale, Fred Gibbs, a mining engineer at Prescott, and associates, under the name of Iron King Mining Company. In 1938 they built a mill to treat 140 tons of ore per day and increased it to 225 tons in 1939. In 1940 they added a plant to extract gold from the tailings with cyanide, and in 1942 sold out to Shattuck-Denn.

Shattuck-Denn continued the expansion. Twice they were forced to do so to permit the more efficient, larger tonnage operation necessary in order to live; once, following the cessation of the premiums of World War II; and again, to survive in competition with the war financed, low cost foreign production, which in recent years has closed all but a few of Arizona's lead-zinc mines.

The Iron King mine has yielded in excess of 3 million tons of ore. A total of 225 employees currently mine and concentrate its ores at the rate of 330,000 tons annually. Its mining operations now are at about 2,000 feet below the surface and are headed deeper. The vein and ore persist with depth, and the management, money, and courage which have made the mine, can be expected to continue in operation this important cog in Arizona's economy.

Arizona Department of Mineral Resources.

August, 18, 1960

COPIED FROM:

BRIEF ON ICC HEARING TO ABANDON MAYER RAILROAD - 8-6-57

Page 2

WITNESS SHERWOOD B. OWENS, Mine Owner and Operator during the past 15 years, with mining interests over entire State of Arizona, testified (316-17), in substance:

Presently, is the owner of the De Soto Mine in the Big Bug District about $12\frac{1}{2}$ miles from Blue Bell siding (317-18-45-6). Said mine is being developed under lease arrangement by the De Soto Copper Corp., which was formed in December 1956, and actual work began about January 15, 1957 (318-19).

The De Soto was first operated in about 1890. It produced slightly in excess of 300,000 tons of pretty good grade ore until 1926 (342-3).

The present management appropriated \$250,000, aside from money I previously expended, to determine the ore reserve (319). After preliminary investigation of ten months, conclusion was reached that there was better than a 50-50 chance of developing a six million plus tons ore body of one percent copper (320-25).

From January 15 to May 31, 1957, slightly more than \$70,000 were expended (321), leaving roughly \$180,000 of private money still on hand (348).

The witness described the methods being used in developing the mine; the first stage of the work has been completed, and 350 to 400 samples taken which practically completes the sampling on the 600-foot level. While it has cost a lot of money, the management is more than satisfied (320-1).

Open-pit operation is proposed with a mill to produce 2,000 tons of concentrates daily which will be shipped to El Paso (325). The open-pit possibilities have not been completely explored but they will be determined by drilling and sampling the mine. Presently, sufficient quantity of good grade ore justifies underground operation (326). In the event it develops that open-pit operation is not feasible, lesser tonnage of high grade ore, ranging from 2,000 to 2,500 tons per month, will be produced by underground mining (325), employing 25 to 30 people (336).

Page 3

Under present conditions, our engineering estimates overall costs of placing the property and mill in operation will be between $6\frac{1}{2}$ and 7 million dollars, of which the 2,000-ton mill will cost approximately $3\frac{1}{2}$ million dollars, of which the 2,000-ton mill will cost approximately $3\frac{1}{2}$ million dollars (332). The effects of the present development work in the De Soto Mine must be obtained not later than May 1, 1958, (336-7).

The Blue Bell Mine, four and one half miles from end of track at Blue Bell, owned by the witness, Sherwood B. Owens, has opened up outstanding area of direct smelting ore (326-7). Exploration work has developed 35,000 to 40,000 tons of high-grade siliceous ore running 2.5 to 2.9 percent copper. As the witness is furnishing fluxing ores for American Smelting and Refining Company, he is in position to ship this ore. Qualified engineer has made complete study of the mine. There is no question but that it can be substantial producing mine by further expenditure of \$50,000, which is going to be made (327-8).

Flux is simply low grade ore which is of value to smelter because of content of other metal (341).

In the past, the Blue Bell Mine produced and shipped over one million tons of commercial ore over the two loading ramps at Blue Bell which are still there, thus making perfect loading situation (329).

During World War II it shipped about 20,000 to 25,000 tons of ore (350).

The plans of the owners for the development of both the De Soto and Blue Bell Mines took into consideration availability of railroad service from Blue Bell (229). Cost of trucking to Humboldt, instead of to Blue Bell, would be approximately 96 cents per ton compared with rail charge of 28 to 30 cents per ton (330). Continuation of rail service from Blue Bell is absolutely vital to successful operation of the De Soto and Blue Bell Mines not only for the outbound movement of ore and concentrates, but for the inbound movement of machinery and supplies (331).

The Iron King and Blue Bell Mines were formerly owned by the Consolidated Arizona Smelting Co., which owned the former smelter at Humboldt, which company went broke (333-42-43). The Iron King Mine was reopened in 1942 by the Shattuck Denn Mining Corporation since which time it has been continuously in operation, and presently making a small profit, although the price of zinc is much depressed (333-34).

While the De Soto and Blue Bell Mines were previously shut down, it was not because the metals therein were exhausted (353-4).

It would require 12 bob-tail trucks to haul the ore or concentrates to Humboldt because of the longer distance, while only three such trucks can perform the same service to Blue Bell (354-55).

Other principal producing mines tributary to the line between Iron King and Blue Bell, incl., are the Bing Hampton, Copper Queen, Hackberry, Butternut, Minor, Stoddard, Golden Turkey and Silver Cord (376-7-8-9-80-).

The Nipponese Mining Co., Ltd., which is Canadian capital, has an option on the Bing Hampton and Copper Queen Mines. During three or four months in 1956, the properties were being diamond drilled to determine the size of the ore bodies and the grades thereof (382-3).

The Hackberry Mine has a good long-range chance; not in the next three years, unless the price of lead and zinc increases. Then there might be considerable activity, depending more on economic conditions (391-2).

The Minor Mine is in the exploration phase. It has good ore indications, but its operation will be further removed than in the case of the De Soto (391).

The Bing Hampton and Copper Queen Mines have a large outcrop of an iron-stained shear carrying small amounts of copper, lead and zinc that have never been explored prior to the work performed in 1956 (392).

WITNESS JOE STARNICK, engaged in the mining business about 35 years and presently Superintendent of the U. S. Consolidated Mines, known as Minor properties, 5 miles east of Mayer, testified (409-10), in substance:

That the Minor Mine has both milling and shipping grades of copper and zinc ores. It has done development work such as diamond drilling and presently is at the point where it can go ahead. It is further planning to drive a 700-foot drift (410).

In the near future we will ship ore. We have ore and are exploring, but we still have to run our drift to determine how much ore we will ship. It is hard to say when and what will develop. It could be 2,000 or 200 tons a day. There could be some shipping ore as well as milling ore. We might ship some and blend the ore (411-12).

The high grade ore is definitely shipping ore, while the low grade siliceous ores, which the smelters want, would be more profitably milled and blended with high grade ores. To start, we contemplate erection of a mill with capacity of 200 tons per day (411-12).

The Iron King Mine has zinc, gold, silver and lead, and the Minor Mine has copper, zinc, gold and silver ores (412).

We struck ore at the 200-foot level. Ore was shipped out of the Minor Mine during World War II, and six carload trial shipments have recently been made (412-13).

We were going to ship from Mayer but since the line is out of operation, we have to truck the ore to and ship from Humboldt. We must call the Iron King in order to get a place to load and then go and see the station agent at Mayer to order a car. We can move the ore on the Iron King ramp if it is not busy. If Iron King is using the ramp, we must wait until the car is spotted for loading (414).

The additional cost of trucking the ore to Humboldt is \$1.50 a ton higher than the cost of trucking it to Mayer (414-15-16-17). Illustrating the importance of \$1.50 additional trucking cost to Humboldt over Mayer, if we were shipping 200 tons a day, the additional operating cost to us would be \$300 a day, which is sufficient to mean a profit or a loss (418).

We have shipped 5 carloads of test ore from Humboldt since January 1, 1957. We expect to ship a few cars during the next six months or a year (420-421).

In operating a mine, every foot you penetrate has to be developed (421). We expect to be in production within six months to a certain degree. Development and operation go hand in hand. The proposed mill, close to the mine, should be in operation inside of a year. The concentrates from the mill will move by rail to El Paso (422-23). I could not be definite about the date; might be before a year or a little thereafter. I am sure that within a year we will have the mill on the property ready to operate (425).

WITNESS EUGENE FREDERICK, President and General Manager of the U. S. Consolidated Mine, Inc., and in charge of the Minor properties, testified that \$125,000 cash has been spent in development of the mine since work began in August 1955 in exploration, purchase of new machinery and hoist (426-7-30).

WITNESS M. L. HECKLTHORN, practical mine operator, who owns the Oro Fine Mine 18 miles southwest of Mayer, and has a lease on the Stoddard Mine, and is driving a shaft on the St. Anthony Mine testified (421), in substance:

I am not developing a large mine. I am an independent operator and obtain my living by putting up my own money and services for producing ore from various mining properties (437).

Shipped ore from the Stoddard and Half Moon Mines from Mayer in 1956.

| <u>HEADS</u> | <u>Au</u> | <u>Ag</u> | <u>Pb</u> | <u>Cu</u> | <u>Zn</u> |
|--------------|-----------|-----------|-----------|-----------|-----------|
| 1943 | .1151 | 4.211 | 2.340 | .270 | 7.397 |
| 1944 | .0964 | 3.204 | 1.917 | .285 | 7.023 |
| 1945 | .1095 | 3.647 | 2.251 | .222 | 7.273 |
| 1946 | .1135 | 4.017 | 2.492 | .214 | 7.427 |
| 1947 | .1261 | 4.360 | 2.539 | .172 | 6.952 |
| 1948 | .1172 | 3.708 | 2.373 | .157 | 6.543 |
| 1949 | .1236 | 4.215 | 2.422 | .162 | 6.754 |
| 1950 | .1345 | 4.455 | 2.635 | .173 | 6.978 |
| 1951 | .1341 | 3.780 | 2.365 | .166 | 6.410 |
| 1952 | .1286 | 3.693 | 2.577 | .169 | 7.407 |
| 1953 | .1400 | 3.828 | 2.756 | .159 | 7.084 |
| 1954 | .1557 | 4.134 | 3.147 | .200 | 8.332 |
| 1955 | .1404 | 3.970 | 2.726 | .171 | 7.377 |
| 1956 | .1396 | 3.910 | 2.849 | .180 | 7.476 |
| 1957 | .1285 | 3.720 | 2.755 | .178 | 7.929 |
| 1958 | .1261 | 3.655 | 2.866 | .185 | 8.474 |
| 1959 | .1291 | 3.752 | 2.893 | .1881 | 8.581 |
| 1960 | .1126 | 3.348 | 2.702 | .1930 | 8.696 |
| 1961 | .0969 | 2.984 | 2.479 | .2244 | 8.459 |
| 1962 | .1035 | 3.145 | 2.544 | .2147 | 8.228 |
| 1963 | .0978 | 3.209 | 2.218 | .1767 | 6.976 |
| 1964 | .0966 | 2.920 | 2.087 | .2091 | 6.290 |
| 1965 | .0771 | 2.139 | 1.875 | .1880 | 5.713 |
| 1966 | .0756 | 2.080 | 1.729 | .1818 | 5.020 |
| 1967 | .0789 | 2.081 | 1.803 | .1757 | 4.747 |

| <u>TAILS</u> | <u>Au</u> | <u>Ag</u> | <u>Pb</u> | <u>Cu</u> | <u>Zn</u> |
|--------------|-----------|-----------|-----------|-----------|-----------|
| 1943 | .0474 | 1.241 | .734 | .0796 | 2.537 |
| 1944 | .0528 | .965 | .552 | .0980 | 2.714 |
| 1945 | .0521 | .964 | .471 | .0520 | 1.998 |
| 1946 | .0481 | 1.188 | .544 | .0640 | 1.689 |
| 1947 | .0567 | 1.234 | .567 | .0590 | 1.844 |
| 1948 | .0542 | .906 | .480 | .0450 | 1.410 |
| 1949 | .0580 | 1.013 | .496 | .0478 | 1.298 |
| 1950 | .0525 | .962 | .431 | .0544 | 1.194 |
| 1951 | .0502 | .715 | .342 | .0497 | .966 |
| 1952 | .0537 | .806 | .448 | .0477 | 1.247 |
| 1953 | .0621 | .764 | .518 | .0356 | 1.071 |
| 1954 | .0665 | .861 | .715 | .0768 | 2.068 |
| 1955 | .0582 | .816 | .635 | .0643 | 1.941 |
| 1956 | .0485 | .764 | .539 | .0742 | 1.429 |
| 1957 | .0471 | .814 | .431 | .0701 | 1.457 |
| 1958 | .0455 | .864 | .376 | .0633 | 1.434 |
| 1959 | .0472 | .830 | .480 | .0488 | 1.200 |
| 1960 | .0395 | .671 | .368 | .0557 | .801 |
| 1961 | .0406 | .565 | .399 | .1005 | 1.025 |
| 1962 | .0412 | .502 | .312 | .0566 | .943 |
| 1963 | .0383 | .519 | .266 | .0407 | .644 |
| 1964 | .0413 | .460 | .269 | .0633 | .678 |
| 1965 | .0333 | .280 | .194 | .0785 | .596 |
| 1966 | .0349 | .241 | .181 | .0811 | .536 |
| 1967 | .0336 | .296 | .162 | .0741 | .574 |
| 1968 | .0350 | .367 | .320 | ---- | 1.150 |

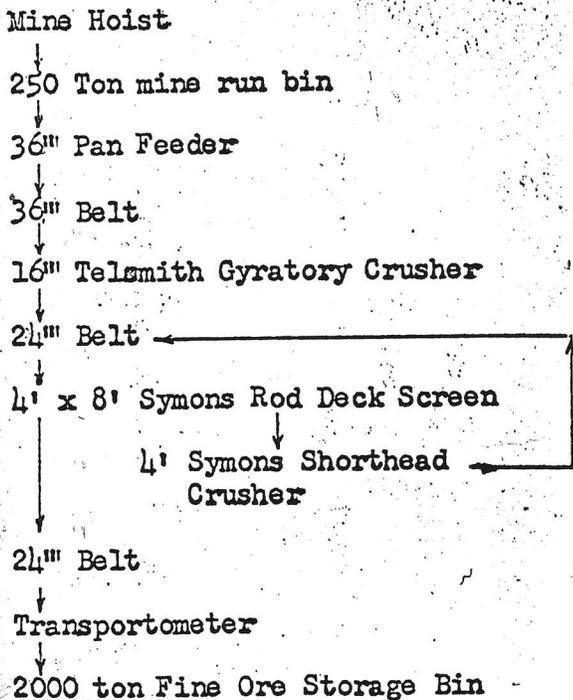
4 m tons

SHATTUCK DENN MINING CORPORATION

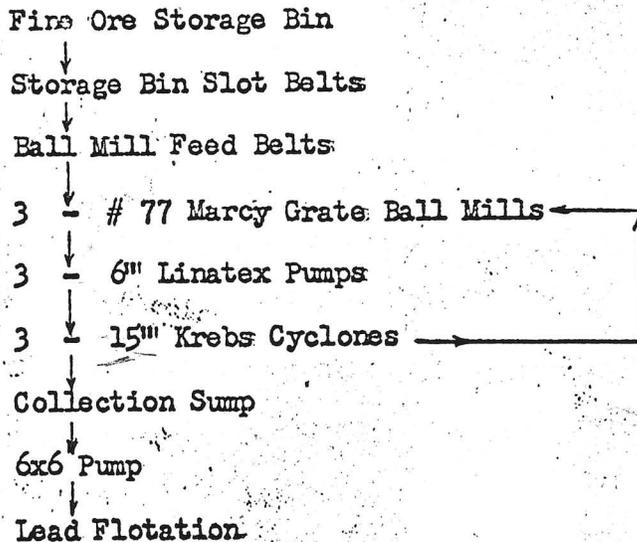
IRON KING BRANCH
Humboldt, Arizona

Flow Sheet
1200 Ton Pb-Zn Mill

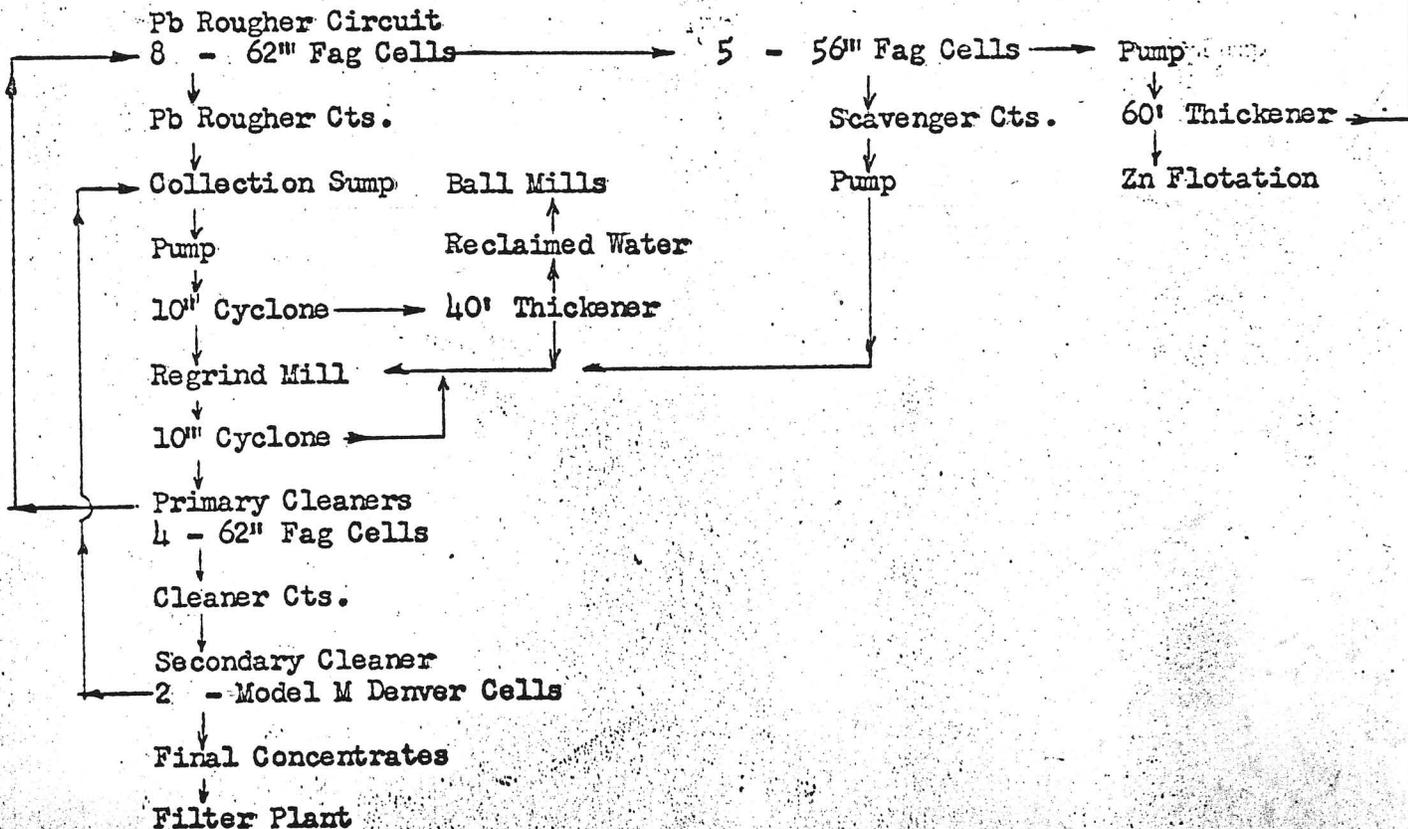
Crushing Circuit



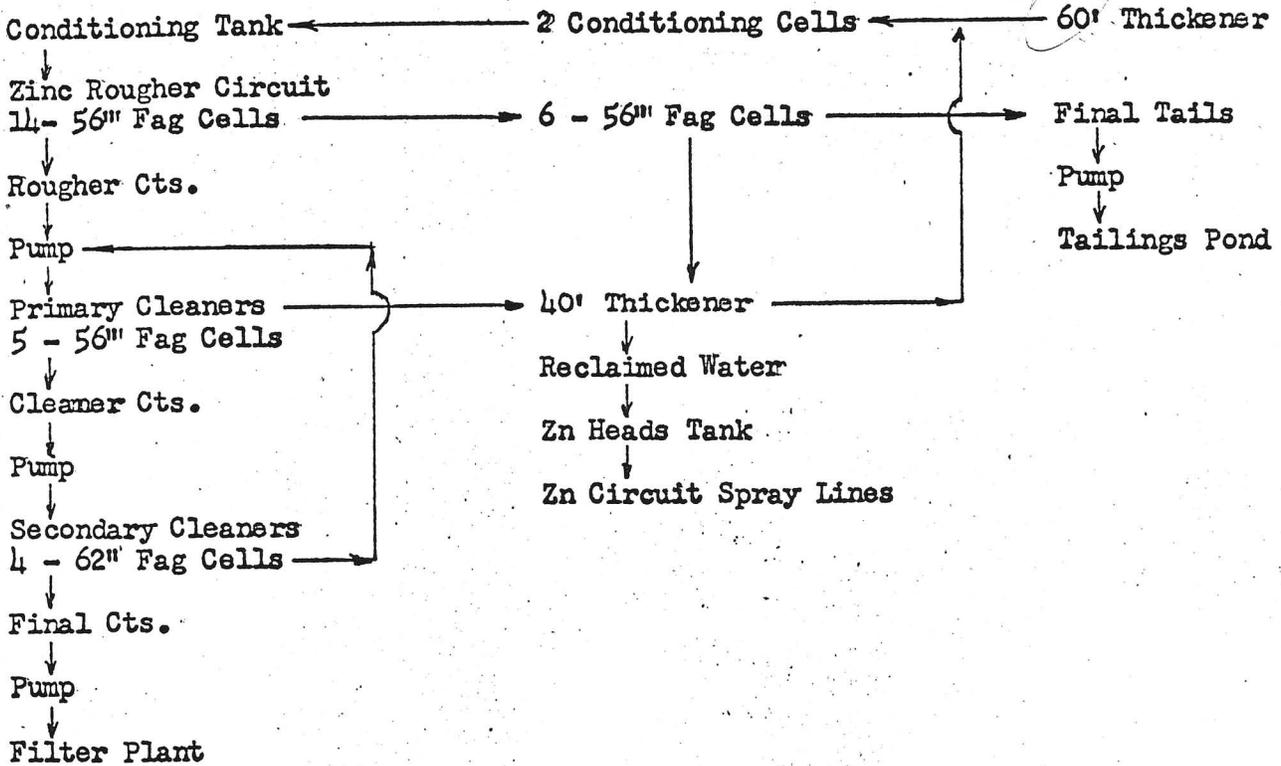
Grinding Circuit



Lead Flotation

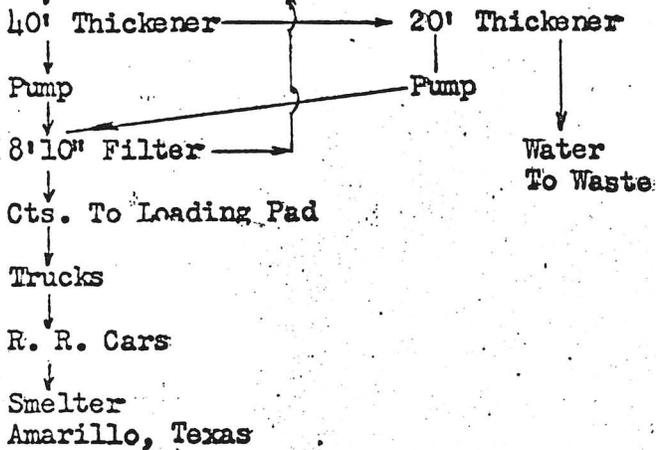


ZINC FLOTATION

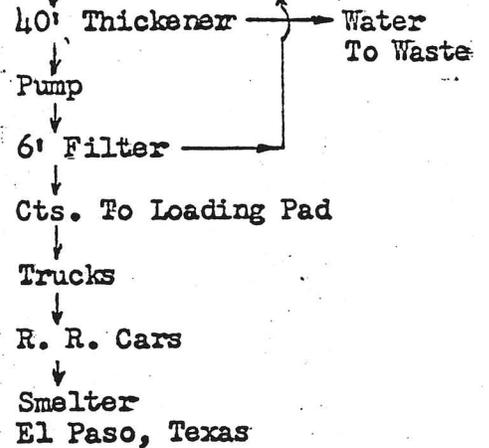


FILTER PLANT

Final Zn Concentrates



Final Lead Concentrates



HES
3/20/65

SHATTUCK DENN MINING CORPORATION

Iron King Branch
Humboldt, Arizona

Reagent Consumption In Pounds Per Ton Ore

| <u>Reagent</u> | <u>Total</u> | <u>Ball Mills</u> | <u>1st Pb Ro. Bank</u> | <u>2nd Pb Ro. Bank</u> | <u>Pb Scavenger Bank</u> | <u>Pb Regrind Mill</u> | <u>Pb Primary Cleaner</u> |
|--------------------------|--------------|-------------------------|------------------------------|----------------------------|------------------------------|------------------------------|-------------------------------|
| Zinc Sulphate | 0.1895 | .1762 | | | | .0133 | |
| Sodium Cyanide | .0477 | .0453 | | | | .0024 | |
| Aero Promoter # 404 | .0466 | .0466 | | | | | |
| Aero Xanthate # 301 | .0243 | | .0224 | | | | .0019 |
| Aerofloat Promoter # 208 | .0057 | .0057 | | | | | |
| Cresylic Acid | .0392 | | .0251 | .0055 | .0086 | | |
| | | <u>60 Thickener</u> | <u>Zinc Conditioning</u> | <u>1st Zn Ro. Bank</u> | <u>2nd Zn Ro. Bank</u> | <u>Zn Scavenger Bank</u> | <u>Zinc Filter</u> |
| Hydrated Lime | 3.6691 | .5504 | 3.1187 | | | | |
| Copper Sulphate | .8944 | . | .8586 | | | .0358 | |
| Hydroxyacetic Acid | .0849 | | .0815 | | | .0034 | |
| Pine Oil | .0246 | | .0123 | | .0123 | | |
| Aero Xanthate # 303 | .1008 | | .0897 | | .0045 | .0066 | |
| Aerofroth # 71 | .0048 | | | | .0048 | | |
| Sipex #123 | .0096 | | | | | | .0096 |
| # 2 Burner Oil | .0731 | | | | | | .0731 |

HES

3/20/65

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine Iron King

Date September 15, 1958

District Big Bug District, Yavapai County

Engineer Travis P. Lane

Subject: Visit to property

The property is owned by Shattuck Denn Mining Corp.

| | | |
|-------------------|---|-------|
| Resident Manager: | Dan M. Kentro <input checked="" type="checkbox"/> | |
| Metallurg. Supt.: | A. W. Jeffers <input checked="" type="checkbox"/> Replaced by GALEN W. CLEVINGER 1-1961-TPL- | |
| Mine Supt.: | Elmer Tomkinson <input checked="" type="checkbox"/> | Memo. |
| Mill Supt.: | Thomas L. Hoskins <input checked="" type="checkbox"/> | |
| Chief Eng.: | L. Bombardieri <input checked="" type="checkbox"/> | |
| Mech. Eng.: | B. Waples, Jr. <input checked="" type="checkbox"/> | |

The plant was visited on Sept. 9th, and the operations were discussed with Mr. Kentro, Mr. Hoskins and Mr. Tomkinson.

Production was at a normal rate i.e. around 1000 TPD with grade of ore and mill recoveries about as follows:

| | <u>Head Assay</u> | <u>Recovery</u> |
|----|-------------------|-----------------|
| Zn | 8.0 - 9.0% | 85% |
| Pb | 2.8 - 3.2% | 87% |
| Ag | 3.5 - 4.0 oz. | 85% |
| Au | 0.11- 0.12 oz. | 80% |
| Cu | 0.16- 0.20 % | 65% |

The mill process is flotation with cyanidation of the flot tails. Two concentrates are made, one being a zinc concentrate assaying about 59% zinc, and the other a lead concentrate assaying around 30% lead. The copper recovery is made in the lead concentrate, also a good part of the silver and some of the gold. Additional recovery of precious metals is made in the CCD cyanide circuit following flotation.

The mining method is cut and fill. All the ore production is coming from north of the shaft on levels Nos. 14, 15 and 17. Principal development projects are drifting north on the 19th level and sinking the main shaft. The 19 North drift picked up the ore on its downward rake (45°N) at about 450 ft. from the shaft and drifting at the time of this visit was in progress ~~in~~ at about 1200 ft. north from the shaft. The shaft is sinking at about 2450 ft. with the sinking hoist set on the No. 17 level and transfer pocket below the level. The areal section of the shaft is 200 square feet. Sinking is not being pushed vigorously. A complete cycle of drilling, mucking and timbering is 18 days for 30 feet advance. A Riddell mucker is used in this work. The shaft crew comprises 3 men per shaft, and 2 shifts per day are working.

Total water consumption is estimated at about 2 tons per ton of ore. No tailings water recovery is practiced.

SUMMARY OF THE GEOLOGY OF THE IRON KING MINE

LOCATION

The Iron King Mine lies about one mile west of the village of Humboldt in Yavapai Co., Arizona.

PRODUCTION

Production has grown over the years to its present rate of 30,000 tons per month, and a total of just over 5 million tons have been mined to date.

GENERAL GEOLOGY

The country rocks are predominantly Yavapai Schists of older Precambrian age and consist of a series of rocks which apparently represent metamorphosed andesitic and rhyolitic pyroclastic deposits with interbedded shale and pebbly sandstone (Figure 1). The whole assemblage resembles eugeosynclinal rocks in post-Precambrian orogenic belts.

STRUCTURE

The schists strike at 25 degrees (Azimuth) and dip to the west at about 80 degrees. (Figure 1). The rocks in the mine area are thought to occupy the overturned western limb of a large recumbent syncline and, consequently, the ore deposits occur on, or near, the top of the predominantly rhyolitic volcanic rocks with which they are associated.

ORE DEPOSITS

The ore deposit consists of a series of more or less overlapping lenses with an en echelon arrangement (Figures 2 and 3). These lenses have the same strike and dip as the host rocks and plunge to the north at 60 degrees (Figures 1 and 3). The largest orebody, termed the I Series, lies on the contact between the meta-rhyolite and stratigraphically younger meta-andesite, whereas the smaller orebodies of the Footwall Series lie within the meta-andesite.

The ore lenses consist of massive sulphides and "north end quartz noses" composed of banded to massive greenish grey quartz containing coarse galena, sphalerite, pyrite and tetrahedrite. (Figure 4). Individual beds of massive sulphides grade to the south into pyritic quartz schists which, in turn, change to quartz-sericite schist. (Figure 4). The principal metallic mineral in the massive sulphides is pyrite, accompanied by recoverable amounts of sphalerite, galena and chalcopyrite. Gold and silver are present, especially in the massive quartz.

The orebody at the Iron King Mine resembles a group of deposits which are being viewed by an increasing number of workers as products of sub-aqueous volcanism.

IRON KING GEOLOGY

EXPLANATION OF FIGURES

Figure 1---Surface geological map at the Iron King Mine.

Figure 2---Vertical longitudinal section of the Iron King.

Figure 3---Plan of a portion of the I Series on the 2200 level.

Figure 4---(a) Plan of the 2200 level foreshortened along strike in order to emphasize some of the lithological and structural features of the deposit.

(b) Simplified version of 4 (a).

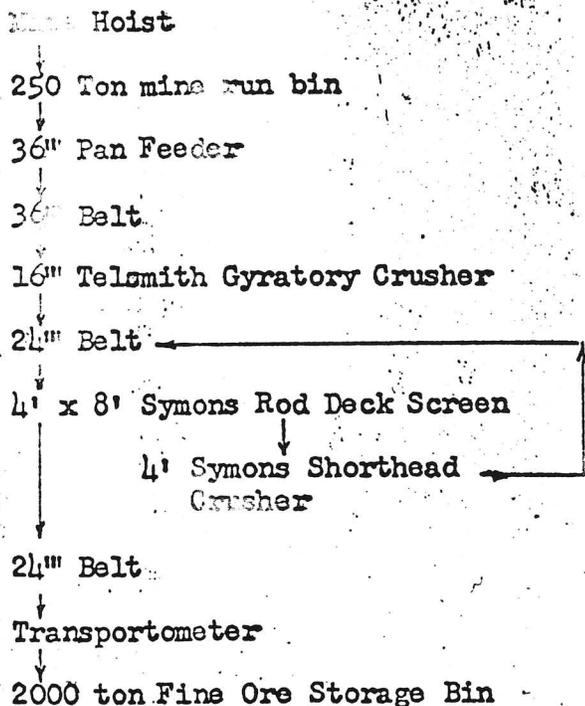
SHATTUCK DENN MINING CORPORATION

IRON KING BRANCH

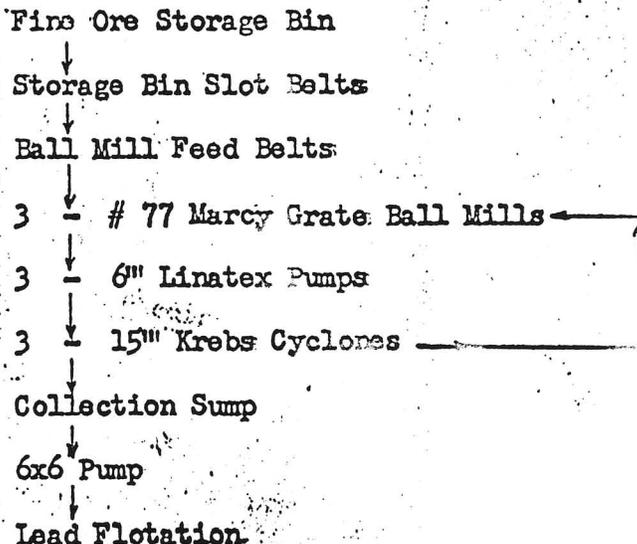
Humboldt, Arizona

Flow Sheet
1200 Ton Pb-Zn Mill

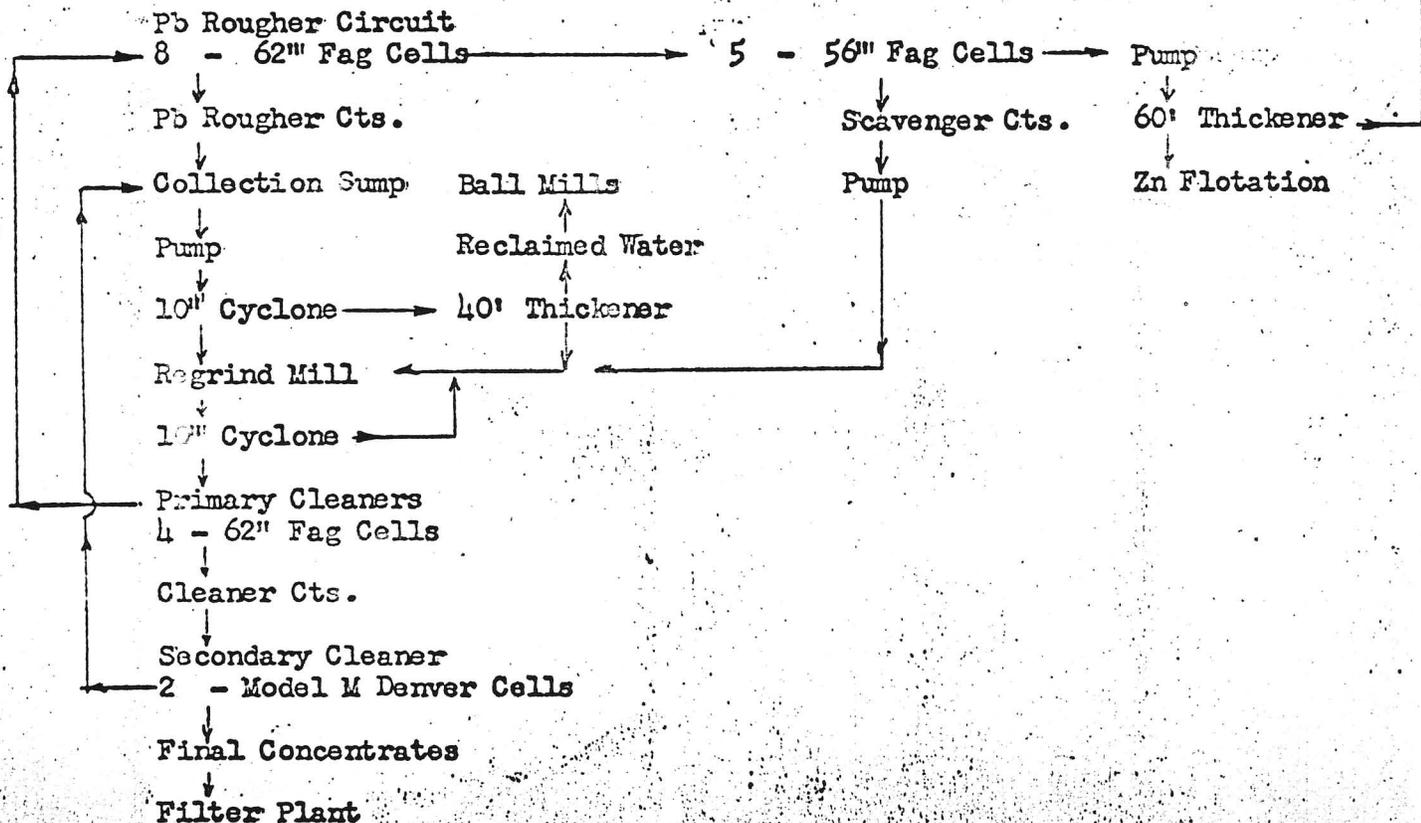
Crushing Circuit



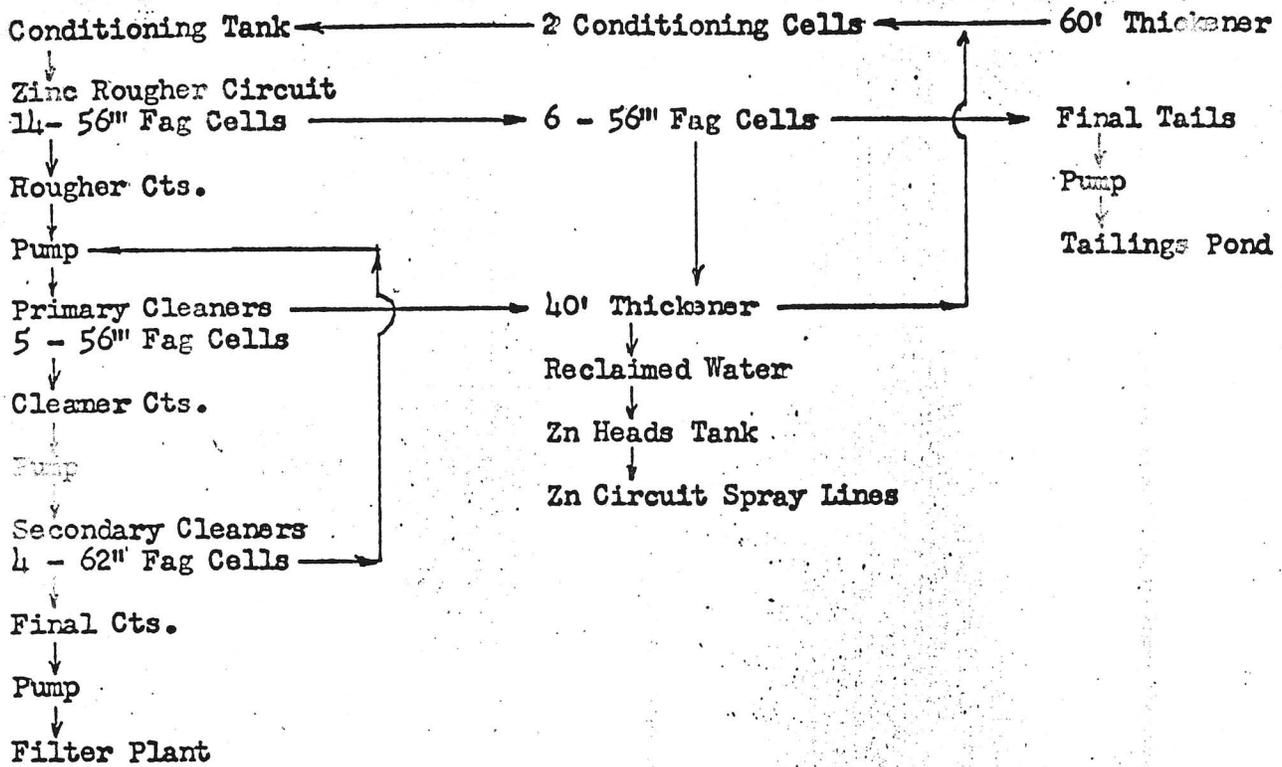
Grinding Circuit



Lead Flotation

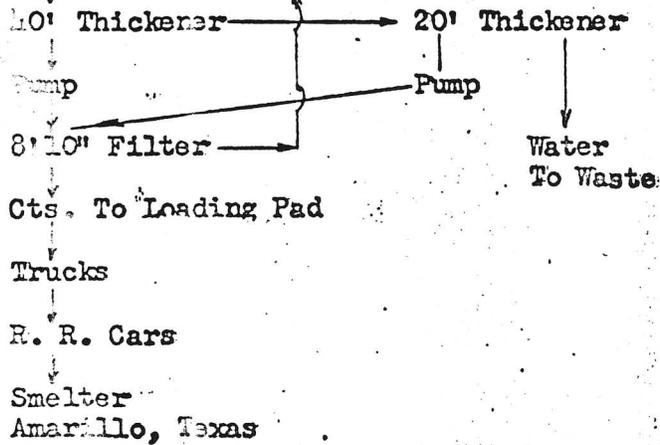


ZINC FLOTATION

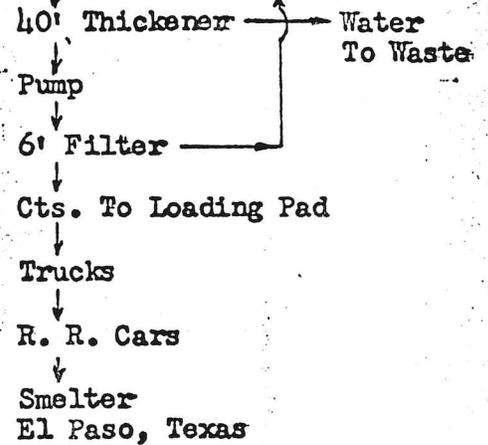


FILTER PLANT

Final Zn Concentrates



Final Lead Concentrates



HES
3/20/65

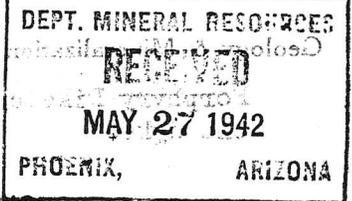
SHATTUCK DENN MINING CORPORATION
 Iron King Branch
 Humboldt, Arizona

Reagent Consumption In Pounds Per Ton Ore

| <u>Reagent</u> | <u>Total</u> | <u>Ball Mills</u> | <u>1st Pb Ro. Bank</u> | <u>2nd Pb Ro. Bank</u> | <u>Pb Scavenger Bank</u> | <u>Pb Regrind Mill</u> | <u>Pb Primary Cleaner</u> |
|--------------------------|--------------|--------------------------|------------------------------|----------------------------|------------------------------|------------------------------|-------------------------------|
| Zinc Sulphate | 0.1895 | .1762 | | | | .0133 | |
| Sodium Cyanide | .0477 | .0453 | | | | .0024 | |
| Aero Promoter # 404 | .0466 | .0466 | | | | | |
| Aero Xanthate # 301 | .0243 | . | .0224 | | | | .0019 |
| Aerofloat Promoter # 208 | .0057 | .0057 | | | | | |
| Cresylic Acid | .0392 | | .0251 | .0055 | .0086 | | |
| | | <u>60' Thickener</u> | <u>Zinc Conditioning</u> | <u>1st Zn Ro. Bank</u> | <u>2nd Zn Ro. Bank</u> | <u>Zn Scavenger Bank</u> | <u>Zinc Filter</u> |
| Hydrated Lime | 3.6691 | .5504 | 3.1187 | | | | |
| Copper Sulphate | .8944 | . | .8586 | | | .0358 | |
| Hydroxyacetic Acid | .0849 | | .0815 | | | .0034 | |
| Pine Oil | .0246 | | .0123 | | .0123 | | |
| Aero Xanthate # 303 | .1008 | | .0897 | | .0045 | .0066 | |
| Aerofroth # 71 | .0048 | | | | .0048 | | |
| Sipex #123 | .0096 | | | | | | .0096 |
| # 2 Burner Oil | .0731 | | | | | | .0731 |

HES
 3/20/65

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT



✓
Mine Iron King Mine

District Big Bug

Former name Iron King

✓
Owner Iron King Mining Co.

Operator Iron King Mining Co.

✓
President W. A. Gardiner

✓
Mine Supt. Clide Betes

Principal Metals Gold, Silver, Lead, Zinc

Production Rate 250 tons per day

Power: Amt. & Type Electric 300,000 K.W.H.

Date May 20th 1942,

Engineer A. C. Nebeker

Location ~~Humboldt~~ Prescott

Address Humbolt

Address Humbolt

✓
Gen. Mgr. H.F. Mills

✓
Mill Supt. A.L. Tessin

Men Employed 105

Mill: Type & Cap. Flotation and Cyanide
250 ton per day

Operations: Present Consists of mining by the Shrinkage method, and carrying on prospecting and development work for future mining. Ores are being hoisted through the old shaft and are hauled to the mill bin by trucks a distance of approximately 300 yards. A new 3 compartment shaft is now down 450 feet and is being equipped with machinery and bins and will have a belt conveyor to carry the ores from the shaft to the mill bins.

Operations Planned A regrind unit for the mill is being planned for the mill so a larger tonnage and better extraction will be made.

Number Claims, Title, etc. A large acreage of mining ground is held and title in good standing so I am informed.

Description: Topog. & Geog. The mine is about one mile west of Humboldt townsight. The hills are the low rolling type with very little vegetable growth.

Mine Workings: Amt. & Condition At this visit I did not go into the mine workings to observe how the working are keep up, but the report goes that everything is in very good condition.

MEMORANDUM

To: John H. Jett, Director
From: Mike Greeley, Field Engineer
Subject: Iron King mine, Yavapai Co., Az.
Date: October 11, 1978

The enclosed letter, dated Aug 14, 1978, was sent to me by Mr. Jack C. Pierce who was the Mine Manager for the Shattuck Denn Co. at the Iron King until its closure in 1968. A conversation with Mr. Pierce on Aug 15, 1978 produced the following additional information:

Average Grade of Ore Produced at the Iron King Mine
(average is a visual estimate, of yearly averages, made by Mr. Pierce)

| Year | Au (oz/ton) | Ag (oz/ton) | Pb (%) | Zn (%) | Cu (%) |
|----------------------------|----------------|----------------|-----------|-----------|-----------|
| Prior to 1964 (1938?-1963) | .12 | 3.5 | 2.5 | 8.0 | .16 |
| 1964-1968 | .076 | 2.2 | 1.9 | 5.6 | |
| 1964 | | | | | .2091 |
| 1965 | | | | | .1880 |
| 1966 | | | | | .1818 |
| 1967 | | | | | .1757 |
| 1968 | | | | | .1720 |

When shut down in 1968, Mr. Pierce estimated 750,000 tons of probable (and proven) ore on six levels of the mine.

Shattuck Derrn was bought out (and dissolved as a separate company) by the Brown Co., effective May 28, 1973.

Most of the mining claims at the Iron King were sold to a land development group in California.

The tailings and 60 acres were sold to Mr. Arthur Still (Tucson consulting geologist); tails average .046% Au/ton, 0.8% Ag/ton, 1.17% Zn, and 0.5% Pb.

The Fred Gibbs family of Prescott, Az., bought surface rights, including mine buildings and two shafts at mine site, totaling 56 acres. This family also owns the mineral rights of the entire mine area below 200 feet.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Date 10-10-1939

✓
Mine IRON KING

Engineer

District Big Bug

Location Humboldt, Arizona

Former name Same

✓
Owner Iron King Mines, Inc.

Address Humboldt, Arizona

Operator Same

Address

✓
President Burnham

Gen. Mgr. H. F. Mills

✓
Mine Supt. Clyde Betes

Mill Supt. G. E. Jarpe

Principal Metals Gold, silver, zinc

Men Employed 65

Production Rate 180-250 tons

Mill: Type & Cap. 250 ton
Flotation-Fahronwald Cells.

Power: Amt. & Type Purchased electric 500 HP

Operations: Present Mining & Milling

Operations Planned

Number Claims, Title, etc. 20 patented

Description: Topog. & Geog. Rolling Hills

Mine Workings: Amt. & Condition 25 shafts - 300' - 500' deep. 750' apart.
developed along 1500'.

Geology & Mineralization Strike N 21 E Dip 75 W Schist - series lenses overlapping horiz. & vertically - highly silicified-sulphides Pyrite, Chalcopurite, Galena. Sphalerite, Arsenopyrite.

10-10-1930

Ore: Positive & Probable, Ore Dumps, Tailings 2 years ore developed

Mine, Mill Equipment & Flow Sheet

I-R Imperial Compressor

Crusher, Cone Crusher, Ball Mill, Dorr Class, Jigs

24 Fahrenwald Cells - Dorrco Filter.

230 tons capacity

Road Conditions, Route

Good

Water Supply

Agua Fria River

Brief History Old location. 35 years ago supplied iron to Valverde Smelter - purchased at tax sale by Fred Gibbs. Prod. \$100,000 to 1930.

Special Problems, Reports Filed

Remarks Differential zinc separation

If property for sale: Price, terms and address to negotiate.

Signed CARL H. BARTH, JR.

Use additional sheets if necessary. Separate sheets on each problem.

Mills
DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

✓
Mine *Iron King*
District *Big Bug*
Former name *Same*
Owner ✓ *Iron King Mines Inc*
Operator *Same*
President ✓ *Burnham*
Mine Supt. ✓ *Clyde Betes*
Principal Metals *Gold, Silver Zinc*
Production Rate *180 - 250 tons*
Power: Amt. & Type *Purchased electric 500 HP*
Operations: Present

Date *Oct. 10, 1939*
Engineer ~~*Carl S. Beck*~~
Location *Humboldt, Ariz*
Address *Humboldt*
Address
Gen. Mgr. *H. F. Mills*
Mill Supt. *G. E. Jarpe*
Men Employed *65*
Mill: Type & Cap. *250 ton.
Flotation - Frothwald
Cells.*

Mining & Milling

Operations Planned

✓

Number Claims, Title, etc.

20 patented

Description: Topog. & Geog.

Rolling hills

Mine Workings: Amt. & Condition

*25 shafts - 300' - 500' deep. 750' apart.
developed along 1500'*

Geology & Mineralization

DEPARTMENT OF MINERAL RESOURCES

Strike N 71° E Dip 75° W.

Schist - several lenses overlapping
horiz. & vertically - highly silicified - sulphides
Pyrite, Chalcopyrite, Galena, Sphalerite, Arsenopyrite
Ore: Positive & Probable, Ore Dumps, Tailings

2 years ore developed.

Mine, Mill Equipment & Flow Sheet

1-R. Imperial Compressor.
Crusher, Cone Crusher, Ball Mill, Dorr Class., Jigs
24 Fabrenwald Cells - Dorrco Filter.
230 Tons capacity

Road Conditions, Route

Good.

Water Supply

Agua Fria River

Brief History

Old location. 35 years ago supplied iron to
Valverde Smelter - purchased at Tax Sale by
Fred. Gibbs. Prod. \$100,000 to 1930.

Special Problems, Reports Filed

Remarks

Differential Zinc separation

If property for sale: Price, terms and address to negotiate.

Signed Curt S. Burth Jr

Use additional sheets if necessary. Separate sheets on each problem.

DEPARTMENT OF MINERAL RESOURCES

TO ALL PRODUCERS OF COPPER, LEAD and ZINC IN ARIZONA:

This department and others are making strenuous efforts to bring about legislation which will help ameliorate the restrictions and difficulties faced by the producers of copper, lead and zinc, and other strategic minerals.

To assist in these efforts it is advisable that we have an authentic survey of the results of the President's veto of the Allen Bill, and the results that would take place if a new bill, such as the Russell Bill, were passed by Congress. The Russell Bill includes all strategic minerals.

While we have all learned to love questionnaires just as we love stomach ulcers, will you please give the answers in your best judgment to the following questions:

1. What was your approximate production in pounds per month for the period preceding the President's veto of the Allen Bill?

(Copper 22,580 Lbs.) (Lead 361,000 Lbs.) (Zinc 854,000 Lbs.)

2. What has been your average production per month since that veto has affected your price?

(Copper 30,200 Lbs.) (Lead 517,000 Lbs.) (Zinc 1,120,000 Lbs.)

3. What is your estimate of your production per month for the first few months of 1948 if prices remain as they are now and no premiums are in effect? *Same as now*

(Copper _____ Lbs.) (Lead _____ Lbs.) (Zinc _____ Lbs.)

4. What is your estimate of production per month if some incentive plan such as the Russell Bill were in effect? *No change*

(Copper _____ Lbs.) (Lead _____ Lbs.) (Zinc _____ Lbs.)

5. General remarks: Increase of mill capacity
was principal factor affecting production.

An addressed envelope is enclosed for your convenience, but you will have to help with the stamp.

Yours very truly,

Chas. H. Dunning

Chas. H. Dunning
Director

NAME OF COMPANY Shattuck Dana Mng. Corp

NAME OF MINE Iron King Branch

(1) Production - January 1st to June 30, 1946, inclusive.

Producers shipping ore direct to smelters or to custom mills use Column No. 1; producers operating their own mill use Column No. 2.

| COLUMN NO. 1 | | | | COLUMN NO. 2 | | | |
|--------------|------|------|------|--------------|------|------|------|
| Tons | % Cu | % Pb | % Zn | Tons | % Cu | % Pb | % Zn |
| Crude Ore | | | | Copper Conc. | | | |
| | | | | Lead Conc. | 4479 | 1.50 | 22.8 |
| | | | | Zinc Conc. | 6716 | .48 | 3.27 |
| | | | | | | | 83 |
| | | | | | | | 47.4 |

(2) Average Price Received for Metals in Above Production

This to be the total of the ceiling price plus premiums.

| | | | |
|--------|-------|------------------------------|-------------------|
| Copper | 10.25 | ¢/lb. Conn. Valley as base | 5.65 + 4.6¢ |
| Lead | 9.00 | ¢/lb. N.Y. as base | 7.16 + 1.84 Prem. |
| Zinc | 10.15 | ¢/lb. East St. Louis as base | 8.25 + 1.90 Prem. |

(3) What do you estimate your production would have been, January 1st to June 30, 1946, if the metal price had been:

Cu 14 3/8¢/lb. Conn. Valley; Lead 8.25¢/lb. N.Y.; Zinc 8.25¢/lb East St. Louis (with no premiums)

| COLUMN NO. 1 | | COLUMN NO. 2 | |
|--------------|------|-------------------------------------|------|
| Crude Ore | Tons | Copper Conc. <i>Same because of</i> | Tons |
| | | Lead Conc. <i>limitation mill</i> | Tons |
| | | Zinc Conc. <i>capacity</i> | Tons |

(4) What do you estimate your production would have been, January 1st to June 30, 1946, if the metal prices had been:

Cu 16¢/lb. Conn. Valley; Lead 11¢/lb. N.Y.; Zinc 9.50¢/lb. East St. Louis (with no premiums)

| COLUMN NO. 1 | | COLUMN NO. 2 | |
|--------------|------|--------------------------|------|
| Crude Ore | Tons | Copper Conc. <i>Same</i> | Tons |
| | | Lead Conc. | Tons |
| | | Zinc Conc. | Tons |

(5) If a metal Conservation Price Plan, similar to the present Premium Price Plan, were made permanent for at least five years,

- What would your yearly production of ore or concentrates be: *Up 40%*
- Would such a plan cause you to expand your exploration-development program? If so, how much? *50% increase*
- What effect would such a plan have in increasing your ore reserves?
- In view of low tariffs, how would such a plan promote a healthy mining industry?

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Iron King

Date March 30, 1957

District Big Bug

Engineer Mark Gemmill

Subject: Present Status

It is owned and operated by the Shattuck Denn Mining Corp. Union Bldg. Prescott. Dan M. Kentro is acting Manager.

It is reported that recent improvements in the mine and mill facilities will enable the company to increase production to about 1000 tons per day. It is also reported that improvements in metallurgical practises will result in substantial increase in overall recovery.

Information from MINE INSPECTOR'S OFFICE - August 15, 1957

IRON KING MINE, Humboldt, Ariz. (22 claims) McCabe Dist., YAVAPAI CO. 7-27-57

Owner - Shattuck Denn Corp.

Operator - "

Pres: Thomas Bardon, 120 Bdy, New York

Sec: John A. Moss " "

Supt - Elmer Thomkinson, Prescott, Ariz.

Gen. Mgr. - A. J. Zink

L - Z - C 30,000 tons month - 201 men

L.A.S.

SHATTUCK-DENN CORPORATION, Humboldt, Arizona

IRON KING MILL

YAVAPAI COUNTY
BIG BUG DIST.

⁹⁰⁰
90 T/d flotation mill, lead-zinc, copper -

Operating

September, 1957

B. J. SQUIRES, Field Engineer

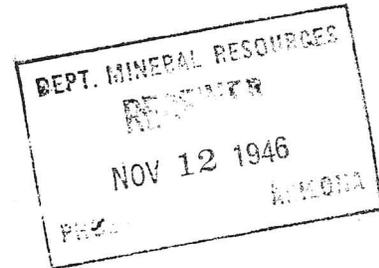
SHATTUCK DENN MINING CORPORATION

IRON KING BRANCH
HUMBOLDT, ARIZONA

Nov. 8, 1946.

H. F. MILLS
MANAGER

Mr. C.H. Dunning, Director,
Department of Mineral Resources,
304 Home Builders Bld.,
Phoenix.



Dear Chuck:

I am returning herewith the questionnaire covering metal prices.

It appears to me that there might be some difficulties experienced with the idea that Mr. Sales has propounded. As far as we are concerned I would appreciate an opportunity to sell our products in a free market without premiums if ceiling prices were removed. I am in favor of the idea of paying a premium above open market prices so that high cost producers can get by temporarily. If we are protected by suitable tariffs, the time will come, and not too remotely, when metal prices will reach a level so that production will reach consumption needs. The question comes up whether this relatively small amount of metal produced under subsidy will be enough to interfere with a prompt reaching of equilibrium between production and consumption, by a tendency to depress the price. It takes only a very small amount of a product sold at a cut price to upset a stable market, but in this case I believe there is little to fear.

It appears to me too that once production developed by fair open market prices is sufficient to meet our needs, then it is useless to continue subsidies to high cost producers unless they are in a development stage with fair chances of getting into production later at costs at which they can survive under market prices.

This letter is an attempt to answer the last two questions.

Yours very truly,


H.F. Mills.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine IRON KING

Date Sept. 28th, 1942

District BIGBUG

Engineer A. C. NEBEKER

Subject: PRODUCTION POSSIBILITIES

This property is located about $1\frac{1}{2}$ miles east of Humboldt, Arizona.

The metals produced are zinc, lead, some copper, gold and silver.

The main production is concentrates of zinc and lead.

Mr. Mills, Mgr., informs me they are mining around 6000 tons per month, making 550 tons zinc concentrates running 49% zn, and 260 tons lead concentrates of 30% lead.

They are mining $6\frac{1}{2}$ tons per man per shift, for all men employed in the operations, or 20 tons per man per shift for miners.

The handicap to increased production is the increased costs of labor and supplies, and the payment of time and half, and double time for over-time work.

Mr. Mills thinks if the double time for Sundays was done away with during the duration, and a zero quota given, which would help balance the increased costs they could increase production by a large per cent.

The men have got over the fear of the freezing order and that order will give no serious problems.

They are now working 90 men, but could work some twenty more men if they were available.

The men are asking for increase of wages, so Mr. Mills has asked the men to appoint a committee to meet with him and work this problem out, which they were to discuss tonight. He has worked out a bonus system which all men will share in, and through which the men will really earn more money per week than they are now earning, and he feels that it will be approved by the men themselves.

I asked Mr. Mills, if it were not against the policy of the company to write us the set up on this bonus system, if it is approved.

A. C. NEBEKER

mountain states mineral enterprises inc.

P. O. BOX 17960, TUCSON, ARIZONA 85731

TELEX: 66-6490

CABLE: MONSTAT

PHONE: (602) 792-2800

August 14, 1978

Mr. Mike Greeley
Arizona Dept. of Mineral Resources
415 West Congress
Tucson, Arizona 85701

Dear Mike:

Here are copies of summary statements I worked up on the Iron King Mine
in Yavapai County, Arizona.

Yours Truly,

Jack C. Pierce
Jack C. Pierce

JCP/tk

Enclosure



IRON KING MINE

Humboldt, Arizona 80 miles north of Phoenix 20 miles southeast of Prescott

The original location of some of the Iron King mining claims was in 1880 when outcrops containing minor amounts of copper, gold and silver were discovered.

The earliest recorded production was in 1906-07 when a few shipments of hand-sorted ore were made to distant smelters.

During World War I some low-grade fluxing ore was shipped to the nearby Humboldt Copper Smelter.

In 1936 the property was purchased under tax sale by a group of individuals who developed some ore near surface, formed the Iron King Mining Company in 1938 and erected a 140-ton (per day ore intake capacity) mill. The progress of mining and development of the vein system down to 200-300 feet justified an expansion of the mill to 225 tons per day in 1939.

Shattuck Denn Mining Corporation purchased the property in mid-1942, at which time it was evident the operations of the Iron King Mining Company had exposed the uppermost section of a major lead-zinc orebody.

In stages Shattuck Denn increased the capacity of the mine and mill to 1200 tons per day, at which level the Iron King Mine ranked among the top 6 U. S. mines in the production of zinc and among the top 12 in the production of lead.

In 1963 the orebody deteriorated appreciably (about 2400 feet in depth below surface) and the economic battle of survival began. The costs of labor, supplies and services were increasing as the grade of ore was decreasing and by the end of 1967 it was no longer possible to operate profitably. The property was leased to a partnership of individuals who operate from a low overhead base with a high level of know-how in 1968 and within the year they also were forced to suspend operations. At that point the operation was suspended indefinitely, the mine and mill equipment sold and the property has since been in the present liquidation stage.

The Iron King orebody was mined to a depth from surface of 3250 feet over a horizontal length averaging about 1600 feet and with an average vein width of 9 feet. There were excavated some 40 miles of shafts, drifts, crosscuts, raises and winzes to develop and exploit the orebody.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Iron King Mine Tailings
District Big Bug, Yavapai County
Subject: Activities by Metex

Date July 3, 1979
Engineer Ken A. Phillips *KAP*

Heinz Schley, 4310 North 69th Place, Phoenix, Arizona 85251, phone: 994-3461, and Dr. Edgar Puffe, West Germany, were in to discuss the Iron King Mine mill tailings. Mr. Schley reported he was agent for Metex and Dr. Puffe a consultant working for the firm. They reported that Metex has acquired rights to the tailings and is evaluating them for reprocessing. The tailings have been drilled and sampled at one foot intervals along the depth of each hole. The sampling provided the following average for the dump:

| | | |
|----------|----|--------------------------------|
| Quantity | -- | Approximately 4,000,000 Tonnes |
| Gold | -- | 1.6 gm/Tonne |
| Silver | -- | 20 gm/Tonne |
| Zinc | -- | 1.4 % |
| Lead | -- | 1.0 % |
| Size | -- | 75 % minus 200 mesh |

Original mill recovery appears to have extracted about 1/2 the gold and slightly over 1/2 the silver. Hazen Research has run lab tests on floatation, chlorination and cyanidation. A preliminary flowsheet being evaluated is floatation followed by cyanidation, and is expected to recover 50% of the value of gold, silver and zinc. The gold was reported to be very fine with 54% minus 5 microns.

If pilot studies confirm the preliminary flowsheet, plans are to construct a plant capable of handling 1000 tons per day and expandable to 3000 tons per day.

KAP:mw

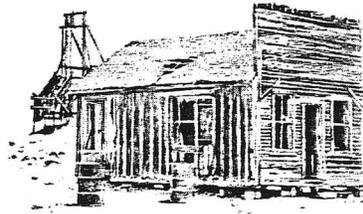
1987, there has been a moratorium on issuing new mineral leases and renewing existing ones. The uncertainty regarding the future royalty rate has been the cause of consternation for the mining industry, as well as the Department, but there is optimism that the situation will soon be resolved.

Oil and gas rental income has dropped markedly during the past 5 years as a result of the industry slump. If oil or gas were ever discovered on State land, the Trust would receive a minimum of 12 1/2 percent of the market value of the oil or gas produced.

Mineral-material royalties have grown steadily during the past 5 years. Resources in this category include sand, gravel, rock, building stone, riprap, cinders, decomposed granite, topsoil, and any other mineral material used in the construction industry. After the Land Department receives an application to purchase mineral materials, it conducts an appraisal and the material is sold at public auction to the highest bidder. Revenue is guaranteed on each lease be-

cause the company must pay an annual minimum royalty. Rentals from mineral-material operations greatly increased in 1987-88 when the department began basing the rental figure on a percentage of land value. Total revenue from the sale of mineral materials during the past 5 years is only slightly less than that received from mineral-lease royalties.

Total revenues from subsurface leasing for the current fiscal year are expected to surpass those received in 1987-88. The continuing high price of copper has allowed several companies to increase production. This is excellent news for the industry, as well as the beneficiaries of the State Trust.



NEW AZGS PUBLICATION

The following publication may be purchased from the Arizona Geological Survey (AZGS), 845 N. Park Ave., #100, Tucson, AZ 85719. For price information on this and other publications, contact the AZGS office at (602) 882-4795.

Welty, J.W., and Schnabel, Lorraine, 1989, Bibliography for metallic mineral districts in Gila, Maricopa, Pinal, and Yavapai Counties, Arizona: Open-File Report 89-1, 123 p.

This report is the fourth in a series of county bibliographies for metallic mineral districts in Arizona. The others, Circulars 24, 25, and 26, were published by the AZGS in 1986. Nearly 1,600 citations are included in this compilation. The report has been open-filed to permit timely access to the public. After editing and printing, it will be released as a circular.

AZGS Accepts BOM Diamond- Drill Core

In early March 1989, the Arizona Geological Survey accepted a donation of nearly 32,000 feet of diamond-drill core from the U.S. Bureau of Mines (BOM). The core comes from 13 separate properties across the State (Table 1). The core was shipped from the BOM Twin Cities Research Center, where it had been stored, by the Minnesota Air Guard to Davis-Monthan Air Force Base in Tucson and then trucked to the Mission Unit of ASARCO Inc., where it remains in temporary storage. We thank members of the Minnesota Air Guard; Davis-Monthan personnel; Robert Willard, BOM Twin Cities Research Center; Michael Greeley, BOM State mineral specialist; and James Litchenthian, mine superintendent at the Mission Unit; for their generosity in enabling the AZGS to accept and store this drill core. Information about the geologic setting and logs for each drill hole can be found in the references listed in Table 1. For localities with no listed references, no published information is available. Please call our office (602-882-4795) to make an appointment if you wish to examine any of this core.

Table 1. Listing of BOM diamond-drill core localities.

| Mineral District | Mine Name | Commodity Sought | Total Footage ¹ | Number of Holes | Reference ² |
|------------------|---------------|------------------|----------------------------|-----------------|----------------------------|
| Ajo | Copper Giant | Cu | 1,400 | 2 | Romslo and Robinson (1952) |
| Apache Iron | Apache Iron | Fe | 1,200 | 15 | Stewart (1947) |
| Artillery Peak | Maggie Canyon | Mn | 3,700 | 69 | Kumke and others (1957) |
| Big Bug | Iron King | Cu | 600 | 4 | n.a. |
| Christmas | Christmas | Cu | 3,700 | 7 | Tainter (1948) |
| Cochise | Keystone | Cu, Zn | 10,800 | 18 | Romslo (1949) |
| Helvetia | King in Exile | Cu | 100 | 1 | n.a. |
| Hualapai | Antler | Cu, Zn | 2,100 | 6 | Romslo (1948) |
| Lakeshore | Lakeshore | Cu | 200 | 1 | Romslo (1950) |
| Pima | Esperanza | Cu | 1,450 | 3 | Tainter (1947) |
| Tiger | Crown King | Cu | 1,400 | 3 | n.a. |
| Wallapai | Cerbat | Pb, Zn | 2,800 | 8 | n.a. |
| Wallapai | Civitation | Cu | 3,400 | 6 | n.a. |

¹ Total footage is rounded off to the nearest 100 feet drilled.

² "n.a." indicates that no references are available for this core.

References

- Kumke, C.A., Ross, C.K., Everett, F.D., and Hazen, S.W., Jr., 1957, Mining investigations of manganese deposits in the Maggie Canyon area, Artillery Mountain region, Mohave County, Arizona: U.S. Bureau of Mines Report of Investigations RI 5292, 87 p.
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LEAD-ZINC QUESTIONNAIRE

October 8 1957.

Do you approve of the Emergency Lead-Zinc Committee's seeking relief for the lead-zinc industry and has it your authorization to speak for you? Yes

What Arizona Mines and Mills in the lead-zinc class do you control?

(1) Iron King Mine, Humboldt, Arizona

(2) _____

Which ones are operating? (1) Iron King (2) _____

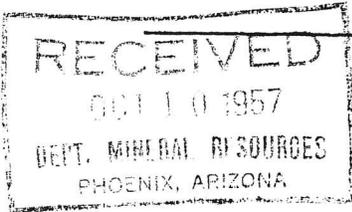
If not operating, when shut down? (1) _____ (2) _____

Number employed, prior to shut-down, in mine, mill or sections thereof producing lead or zinc ores? (1) _____ (2) _____

Number so employed on January 1, 1957? (1) 220 (2) _____

Number so employed on October 1, 1957? (1) 205 (2) _____

Remarks _____



SHATTUCK DENN MINING CORPORATION
Iron King Branch

By: [Signature]
Company
Signature

Please fill in NOW, tear off, and mail to:

Arizona Department of Mineral Resources
Mineral Building, Fairgrounds
Phoenix, Arizona

October 4, 1943

Mr. H. F. Mills
Iron King Mine
Humboldt, Arizona

Dear Hap:

I have just received the following memorandum from Bill Broadgate:

"Subject: Oil Burner, Iron King, Shattuck Denn.

"Please tell Hap Mills that we have his change house oil burner priority approved O.K. and that a notice to him has gone out."

Yours very truly,

J. S. Coupal, Director

JSC:LP

April 4, 1942

Iron King Mine

Mr. H. F. Mills,
Iron King Mine,
Humboldt, Arizona.

Dear Hap:

Monday, the first day I arrived in Washington, I had an interview with Dr. Wilbur Nelson and he told me at that time they had not reissued your serial number. I explained to him your situation and he said he would check into it, but that you should make application. I told him it was ridiculous that a mine producing as much zinc and lead as that mine was producing should have to through so much red tape to do business. I then went over to the Zinc Division, WPB, and raised heck with them. They said they would see to it that you immediately got your number back. They promised me they would go after it right away. In fact they called up Nelson's Department while I was there and raised heck about it, so you should have received your serial number about Wednesday or Thursday of last week, and if you did not, I would appreciate being advised.

Incidentally, when you were in here a couple of weeks ago you said you were going to send us a check for the defense fund, but I note that none has arrived. It looks as though you got so busy you forgot it.

With kindest personal regards, I am

Yours very truly,

CHARLES F. WILLIS
State Secretary

XXXXXXXXXXXXXXXXXXXX

413 Home Builders Bldg.

May 12, 1942

Honorable Carl Hayden
United States Senate
Washington, D. C.

Dear Senator:

I am much obliged for your letter of May 6 enclosing the letter from Dr. Wilbur A. Nelson of April 30 regarding the custom mill situation in Yavapai County.

Excepting for the Iron King the developments Dr. Nelson mentions are very recent, in fact since our original correspondence.

I entirely agree with Dr. Nelson that under the circumstances and providing these mills do get into operation as we hope and expect, the custom milling situation will be thoroughly covered in Yavapai County.

However, it might be well to point that this custom milling situation will only be satisfactory if these custom mills are able to handle the bonus payments to their clients in a reasonable and expeditious fashion. To this date the Iron King Mining Company, which has been milling some ore for small properties in the neighborhood, finds it nearly impossible, if not impossible, to handle the bonus payments to their clients under the present setup.

I hope to be able to discuss this matter with your good self and Dr. Nelson in person in the very near future.

With kindest personal regards, I am

Yours very sincerely,

W. C. Broadgate, Assistant Director

WCB:LP

CC: Miss Grace M. Sparkes

XXXXXXXXXXXXXXXXXXXXXXXXXX

413 Home Builders Bldg.

May 15, 1942

Mr. H. F. Mills
Iron King Mining Co.
Humboldt, Arizona

Dear Hap:

I have your letter of May 7 and we have taken up with the Metals Reserve Company the problem of adjusting the situation to handle just such cases as yours. You are entirely right in your connection on the fellow who loafed last year cashing in this year, and it is one of the injustices of the program which was supposed to be taken care of in the fixing of the quotas, but unfortunately it was not done very equitably.

I do think that we can get something worked out on handling milling plants taking custom ores so that additional production can be stimulated. Bill Broadgate is going to make that problem a special order of business when he gets to Washington.

With kindest personal regards, I am

Yours very truly,

Chairman, Board of Governors
Department of Mineral Resources

CFW:LP

IRON KING MINING CO.

HUMBOLDT, ARIZONA

May 7, 1942

Mr. Charles Willis,
512 Title & Trust Bld.,
Phoenix Arizona.

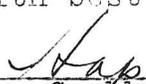
Dear Charles:-

Thanks a lot for your letter of yesterday and your effort toward solution of a tough nut to crack. I had a letter from Brent Rickard also in regard to the same matter. Evidently there is a lot of agitation for a quick solution. Congratulations on the appointment, you can do a lot of good.

I am still crabbing about the cut off point for premium metal at the end of February. Perhaps my kick is not the point of cut-off but the point of beginning. Instead of an appreciable amount of bonus payment zinc for February, we had a deficit which we have not yet been able to overcome, whereas actually we should have a surplus carried forward. I can see some justification for a new producer starting with February production, but where one's production has been so constant as ours has it makes it tough. However a general rule cannot be applied without hurting some innocent bystander or participant. I agree with you now, more than ever, that if the price for all the metal had been raised about one cent the procedure would have been simple. As it is, the general New Deal Policy is being followed. The fellow who loafed last year has an excellent chance to cash in on premium metal prices, where with us, we were doing all we could last year and it is with difficulty that we can participate to any extent in the gravy. Costs have gone up out of all proportion to the advantages of the program to us.

Furthermore, labor is getting so scarce, not so much thru army inductions, but because of the wages being paid on government projects, that it is now impossible to exceed last year's quotas. So called jack hammer men at Flagstaff are getting up to \$350 per month. We cannot pay wages high enough to compete and stay in business. Our men seem to be satisfied with their bosses, their working conditions and their wages, but between this construction and perhaps the wanderlust occasioned by this fine spring weather, I am cultivating a fine crop of thinning grey hair.

With best regards,


Crabbing Mills.

May 6, 1942

Mr. H. F. Mills,
Iron King Mining Co.,
Humboldt, Arizona.

Dear Hap:

I have your letter of May 1 and I can assure you that one of our first jobs is going to be to straighten out the difficulty of getting bonus payments by shippers to custom mills. I feel that it can be done by a simple method.

I talked to H. DeWitt Smith on the telephone and I am submitting the whole thing to Harry Hamilton who is handling it for WPB. I hope that I can get an early answer.

It may interest you to know that I have just been appointed Public Relations Counsellor for Metals Reserve Company and my job is to see what can be done to iron out just such things as yours. Also, it is jobs like this that Bill Broadgate will work on in Washington. I am sure that we will find the answer in the near future.

With kindest regards, I am

Yours very truly,

CHARLES F. WILLIS, Chairman
Board of Governors

CFW:MH

Washington, D.C.
My 29, 1942

W

SUBJECT: Premium metal payments
Custom Mill Shippers
Iron King Mining Company

Harry Hamilton of the metals Reserve, feels that the use of the new form MR-18, as instructed in the new instruction sheet recently issued out-line procedure for ore-buying agencies, will also solve the custom milling problem to a great extent.

He would like the Iron King to try out this method and see if it is satisfactory, and please write H. F. Mills to that effect. I pointed out the great necessity for the Iron King, being in a complex district, to be able to function smoothly to help small shippers get into production, and that similar situations existed in Mohave County and elsewhere.

Hamilton feels that the custom miller has many loopholes by which he could gyp the metals Reserve on bonuses, and that he does not want to place the custom miller in the same position as a smelter, unless a last resort.

I told Hamilton that the Department of Mineral Resources had resolved not to present in Washington any but the most solid, worthy cases, well prepared, and hence we would not recommend such action but with a substantial outfit.

I explained to Hamilton the position of the Iron King and he said that if the proposed procedure is not satisfactory, we can get together and he will consider placing Mills in the same position relative to his shippers as a smelter now is relative to theirs. I used the Iron King as an example to discuss the contents of Willis' letter of May 20th.

Bill
W. C. Broadgate

May 6, 1942

Mr. Harry Hamilton,
Metals Reserve Company,
RFC Building,
Washington, D. C.

Dear Mr. Hamilton:

During the past week I have been advised of two instances affecting copper, lead, or zinc production delivered through custom milling plants, which makes a problem to solve as to a method of handling custom ores and paying bonus prices thereon through custom milling plants. The present system does not work.

The first of these instances was the Republic mine, Mr. Hooten, which has been shipping 50 tons a day of good copper ore to the Peru Mining Company plant at Deming, New Mexico. The company cannot figure how to get the bonus payments to Mr. Hooten as bonus payments are made to the shipper to the smelter which, in this case, is the Peru Mining Company. Mr. Hooten is a new producer entitled to bonus on all of his production and he has kept his shipments right up because the production was needed, but he has now reached a point where he cannot finance further shipments waiting for bonus payments as he already has a lot of money tied up. We assisted him in making a deal with the bank to help him out temporarily, but the only real solution is a method of getting bonus payments to him promptly.

The other case, Iron King Mining Company, Humboldt, Arizona, H. F. Mills, manager, is a company that we urged to take custom ores to utilize their excess milling capacity and in the interest of getting out more production. We are now advised that they are going to have to stop taking any custom ore because the custom smelters insist on full bonus prices (justly, of course) and there is no routine whereby the shipper can be assured of getting them for the producer. Furthermore, there is a drag on ore received by the mill which has not passed through and ultimately gotten to the smelter in time to get into the affidavits for the month; yet the producer expects settlement more promptly. Mr. Mills writes as follows:

"The smelters are going to cut off on the last car received each month. Some custom ore might go out in the last car received by the smelter for the month, and the cons from the same lot may in part go out in the first car of the following month. Unless each float cell and all bins were cleaned out and the product kept separate, there is no way by which one could be reasonably safe in executing an affidavit. The small batches of ore received would not make enough concentrates for a separate shipment.

IRON KING MINING CO.
HUMBOLDT, ARIZONA

Bam

May 1, 1942.

Mr. Charles Willis,
Phoenix Arizona.

Dear Mr. Willis:-

I have written Jimmy Douglas and DeWitt Smith about the difficulty of making an attempt to prepare affidavits of production from small prospectors, ore which is merged with ours in going thru the mill.

The smelters are going to cut off on the last car received each month. Some custom ore might go out in the last car received by the smelter for the month, and the cons from the same lot may in part go out in the first car of the following month. Unless each float cell and all bins were cleaned out and the product kept separate, there is no way by which one could be reasonably safe in executing an affidavit. The small batches of ore received would not make enough concentrates for a separate shipment.

So until such time as I get permission from the WPB to merge custom products with our own, we shall have to refuse outside ore. This is not right when critical minerals are needed so badly and we have excess capacity.

Yours very truly,

H. F. Mills
H. F. Mills

SHATTUCK DENN MINING CORPORATION
IRON KING DIVISION

HUMBOLDT, ARIZONA

CONVERTING FROM CUT-AND-FILL TO SUB LEVEL STOPING

Presented at

MINING CONGRESS - Portland, Oregon
September, 1964

by

Curtis R. Sundeen

The Iron King Mine is located about 18 miles southeast of Prescott, Arizona near Humboldt, along Highway No. 69. This area is known as the Big Bug Mining District.

HISTORY

The mine was operated intermittently from 1906 to 1936. At this time it was taken over by Iron King Co. and operated until 1942. Shattuck Denn Mining Corporation bought it in 1942 and it has operated continuously since that time. Approximately 5,000,000 tons have been mined since it was first opened.

GEOLOGY

Geologically, the Iron King ore body consists of a vein system oriented en echelon and localized along a shear zone in Pre-Cambrian, tuffaceous andesitic and rhyolitic rocks. It is a typical concordant, massive sulphide ore body made up of a series of narrow veins dipping 80 degrees west and plunging 60 degrees north. Most of the veins are only 2 feet to 4 feet in width and up to 400 feet in economic length. These individual veins, however, are closely spaced (or even in contact with each other) and thus are mineable as a unit varying in width from 8 feet to 20 feet. The total mineable length on a level is approximately 1600 feet. Recovered metals in order of importance are zinc, lead, silver, gold, copper, and cadmium.

EARLY MINING

During the early days, much of the mining was done by shrinkage and open stope methods as wall rocks were firm and dilution and safety were no problem. As mining progressed to lower levels and stopes remained open, concern developed over a possible air blast from sudden caving. Accordingly, it was decided to fill the stopes to eliminate this possibility. A gob system was started by caving schists above the 600 level. This gob system is still being used and caving has extended to surface. The waste material from underground development is returned to this cave by conveyor, providing gob fill for stopes. This was supplemented by bulldozing the conglomeratic and gravel overburden into the cave. However, it now becomes less important as cut and fill mining is abandoned in favor of sub level stoping. No attempt is made to gob stopes, but rather, the stope is allowed to gob itself by caving from the hangingwall and old gobbed stopes above.

The system of open cut and fill was continued to the 1800 level with occasional square sets being used in faulted areas and as mining approached a level above. From the 1800 level down, the amount of timbered stopes increased, due to bad ground which resulted in a corresponding increase in mining costs. From drilling, it was evident there would be a decrease in ore values below

the 2100 level, and this fact, plus increased mining costs, made it evident that a cheaper method of extraction must be developed. It was decided to try sub level stoping and immediately plans were underway to develop the 2200 level for this method. This was done, and the level was brought into production in July of 1963.

MAIN LEVEL DEVELOPMENT

Development of a main level consists of driving a footwall drift the entire length of the ore vein, a distance of approximately 1600 feet. This drift is 40 to 50 feet distant from the footwall contact of the ore vein. In the past, these drifts were driven 15 to 30 feet from the ore vein, but due to incompetent rock near the ore zone it resulted in excessive drift maintenance - either bolting or timbering. The increased distance provides a greater pillar and more competent rock. Cross-cuts are driven normal to the ore vein on 110 foot intervals, extending into the hangingwall far enough to provide the desired tail room for cars. When the footwall drift and cross-cuts have advanced 300 to 400 feet along strike, the ore drift is started, and is driven 10 feet wide by 13 feet high along the ore vein. Steel sets, made of 8" x 8" wide flange beams, are installed, forming a slusher drift thru which the ore is drawn from the stoping operation. Driving of the drifts is done in the conventional manner with jumbos and mucking machines.

STOPE DEVELOPMENT

Stope development is started as soon as the ore drift has progressed to the second cross-cut. The initial raise between levels is driven with the Alimak raise climber, cutting sub levels at 53 feet and 106 feet. The raise is holed through to the level above and drifting on the sub level is started. Two sub levels are driven equi-distant from the main level, leaving a 15 ft. to 18 ft. crown pillar below the upper level, and are designated "A" for the upper sub, and "B" for the lower sub. Sub level drifting crews consist of 2 men on each sub level.

Raises are drilled out with long hole machines which are located on each of the sub levels. A pattern of five 5-inch holes and four 2-3/4-inch holes is drilled thru the ore pillar from one sub level to the next, a distance of approximately 40 feet. By loading one of the 5-inch holes and the four 2-3/4-inch holes, it is possible to put the raise thru in a single blast. The size of the raise is approximately 3 feet by 4 feet, large enough to pass sub level development muck, and later it is used for traveling and ventilation. When larger raises are required, additional holes are necessary. Four to five man shifts are required to develop one 40' raise.

"B" sub level development is 100' to 200' ahead of "A" sub level, in order to provide separate muck-handling raises for each drift.

EQUIPMENT

Driving of sub levels is done with stopers, jacklegs, and electric slushers. The stopers are used to drill a toe cut off the back of the 12' high drift while jacklegs are used for the lower holes.

The long hole equipment for stoping and raises consists of a hydraulic drill boom mounted on an Eimco 630 crawler track. This piece of equipment is assembled in the mine shop. Drills used are Ingersoll Rand 475's with remote controls. It is particularly important that the rotation controls be remote when handling sectional drill steel.

Main level drilling jumbos are made up in a similar manner to those used on sub levels. Two automatic drill booms are mounted on a 631 Eimco track base. The 631 base is longer than the 630 base and offers greater stability for the longer booms.

STOPING

When development has progressed 300 feet along strike of the ore body, stoping is started at the initial raise. From this stage on, we have both development and production crews working in the area at the same time. Production crews consist of one long hole driller on each sub and one blaster for the stope - a total of three men.

The standards as set up by the industrial engineering depart-

ment indicate that 210 feet of 2-3/4" hole can be drilled in one man shift. This is based on 40 foot hole lengths. Production records indicate footage of 200 feet to 250 feet per man shift.

The location and angles of holes to be drilled are determined by the Geological Department and are recorded on the walls of the sub levels for use by the long hole drillers. The blocks between Sub A&B and Sub B and main level below are drilled out well in advance of stope blasting. Burden on the holes is approximately 4 feet. Blasting is then started on the lower block, using ammonium nitrate with primacord and initiating dynamite. One to two rows of three holes are blasted at a time. The lower block is advanced ahead of the upper block a distance sufficient to keep a clear, open face for blasting. Withdrawal of the ore from the lower block is started immediately, providing room for ore to be blasted from the upper block and, also, maintaining a clear face in the lower block. The ore is withdrawn through the slusher drift below, being scraped into cars and trammed to the shaft.

The 15 to 18' crown pillar eventually crushes and caves into the stope. This caving occurs 300 feet to 400 feet behind stoping operations, so it does not allow gob to dilute the ore near active faces. In most cases the crown pillar is recovered in the regular draw of the stope.

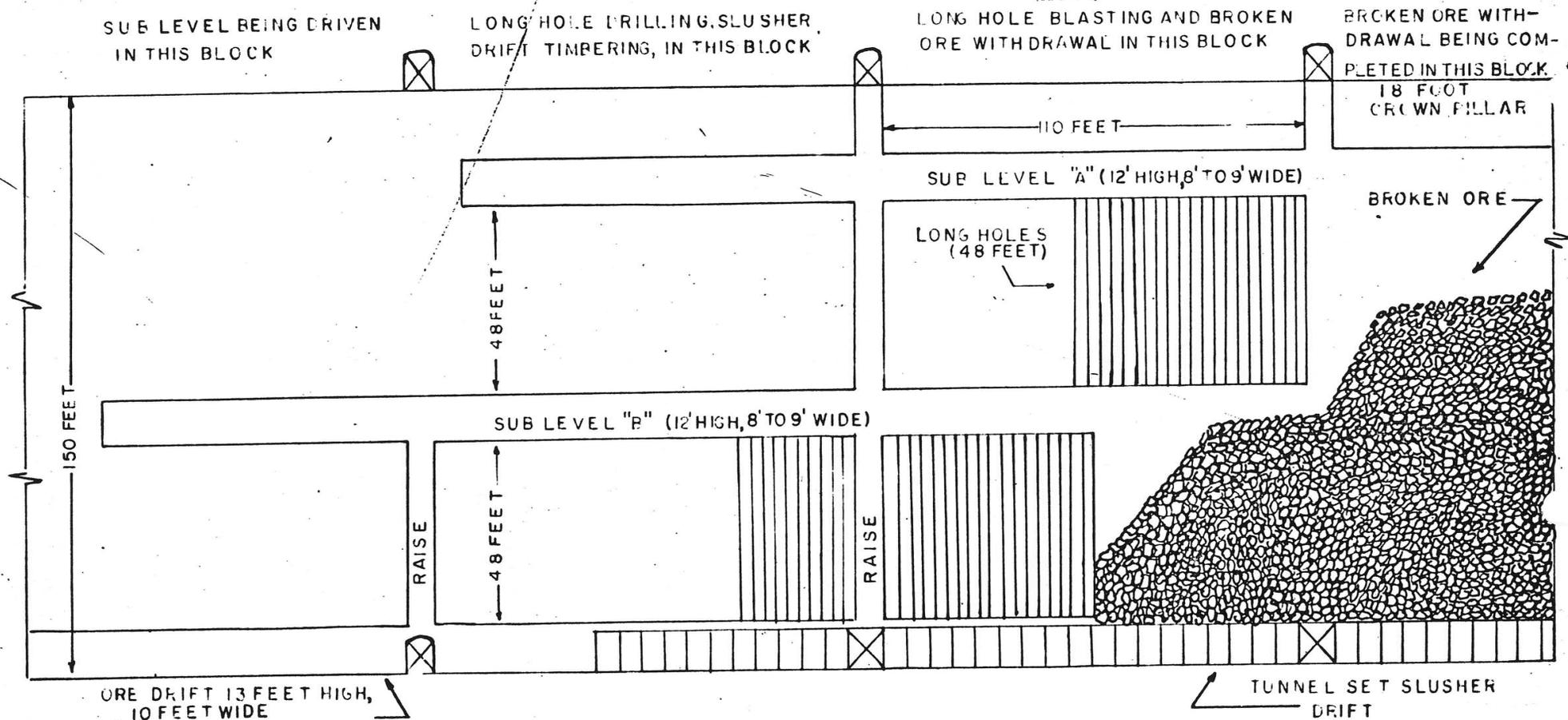
During initial consideration of changing to this type of mining it was recognized that dilution would be a problem. However,

from previous observation it was known that there seemed to be a period of delay of a month or more, after a stope had been opened, before caving action caused serious dilution. The rate of mining was predicated on these facts, and if mining is conducted with speed, dilution is held to a minimum. Where the rate of mining lagged, it was necessary to leave small pillars in order to arrest caving action in the hangingwall. These pillars crushed sometime later and in most cases were recovered. Based on the last 8 blocks mined, there was an indicated overdraw of 13% on tonnage. This, of course, was due to dilution. The hangingwall material did carry values; consequently it was not as bad as one might think. From experience it has been found that when 100-110 per cent of draw is attained there is a marked drop in assay value.

Efficiencies attained have offset the drop in grade due to dilution. Stopping by the old method produced approximately 6-7 tons per man shift. Sub level stopping now produces approximately 16 tons per man shift. This latter figure includes stope preparation and all other services charged to stopping, such as tramming, machine shop, and electric shop. As we gain experience, we expect to improve our efficiencies considerably.

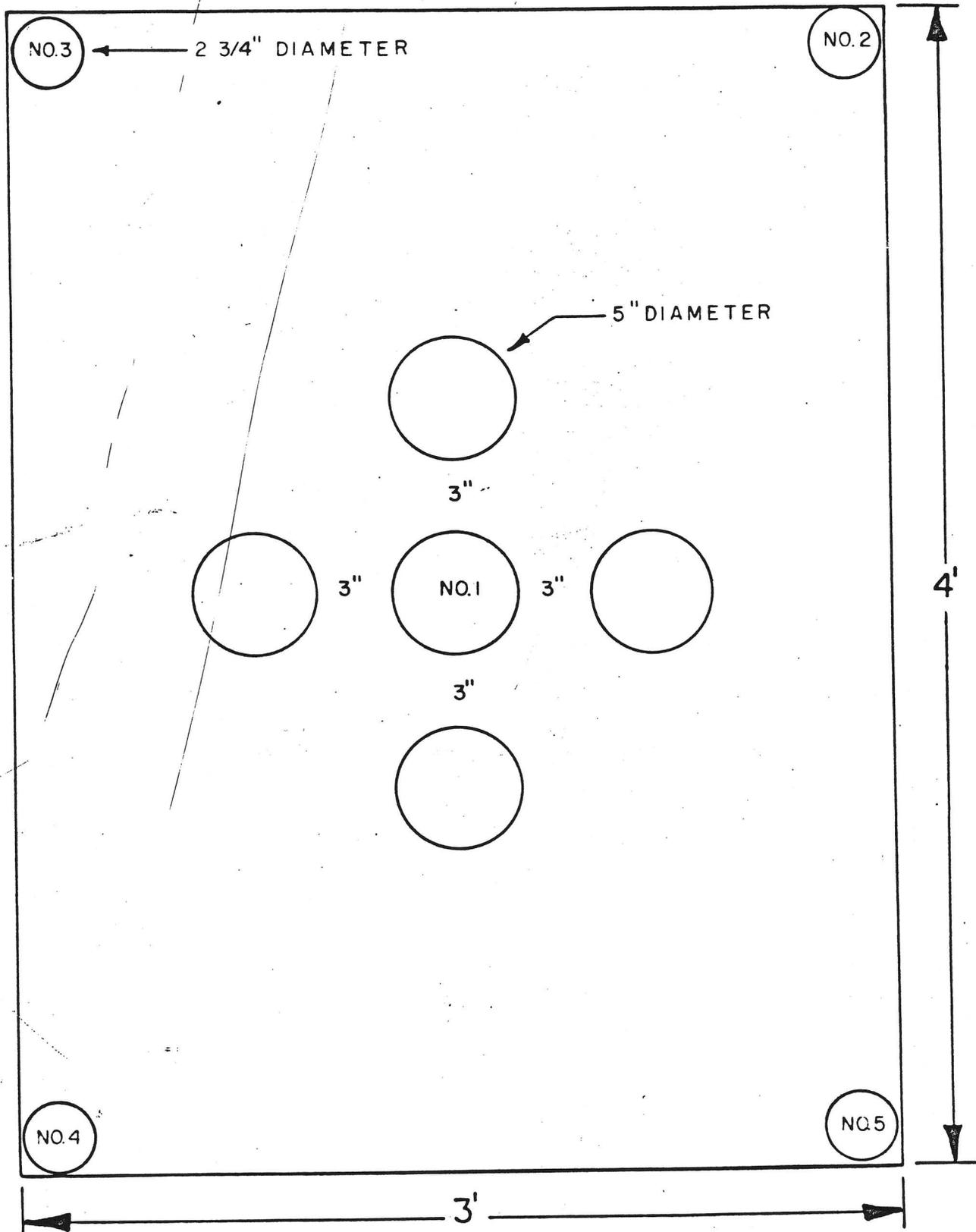
The two most important factors contributing to the success of sub level stopping at Iron King is speed of getting ore broken and fragmentation. Good fragmentation contributes to speed of withdrawal and reduced secondary blasting.

To date, sub level stoping has worked well at Iron King,
and we are looking forward to continued improvement which will
assure many more years of production.



SEQUENCE:

1. FOOT WALL DRIFTS AND CROSS CUTS ARE DRIVEN
2. ORE DRIFT FOLLOWS 300 FEET BEHIND CROSS CUTS
3. AS ORE DRIFT PASSES ONE CROSS CUT, RAISE STARTED IN CROSS CUT 100 FEET BACK
4. SUB LEVELS ARE DRIVEN ON THE VEIN, RAISES ARE DRILLED WITH LONG HOLE MACHINE AND COMPLETED WITH ONE BLAST.
5. LONG HOLE DRILLING, SLUSHER DRIFT TIMBERING, BLASTING, ORE WITHDRAWAL AS ABOVE
6. AFTER ORE WITHDRAWAL IS COMPLETED, OPENING WILL BE SELF FILLED BY WALL ROCK AND GOB FROM STOPES ABOVE.



HOLE PATTERN FOR
LONG HOLE RAISE

SCALE: 2" = 1'

OCTAVE MINING COMPANY

COST SHEET-MINING

Working Place.....

Month of 19.....

No. 24633--The McNeil Co. Printers, Phoenix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | |
|--------------------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|
| Breaking | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mucking & Trimming | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Supplies | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Timbering & Timber | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hoisting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Pumping | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| General Expense | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Tons Mined | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Value per Ton | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Value | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Margin per Ton | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total Margin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Tons for Month Average Value \$ **Remarks:**
 Cost per Month \$ Total Value - \$
 Cost per Ton \$ Margin per Ton \$