



CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
<http://www.azgs.az.gov>
inquiries@azgs.az.gov

The following file is part of the W. H. Crutchfield, Jr. Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

Schoder, Jacob and Allsman, Paul
T., 1939, Mining and Milling
Methods and Costs at the
Tennessee-Schuylkill Corporation
Mine, Chloride, Arizona: U.S.
Bureau of Mines, I.C. 7077, 20 p.

I. C. 7077

JUNE 1939

7077

UNITED STATES
DEPARTMENT OF THE INTERIOR
HAROLD L. ICKES, SECRETARY

BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

MINING AND MILLING METHODS AND COSTS AT THE
TENNESSEE-SCHUYLKILL CORPORATION MINE,
CHLORIDE, ARIZ.

Library

JUL 26 1939



BY

JACOB SCHODER AND PAUL T. ALLSMAN

AFTER THIS REPORT HAS SERVED YOUR PURPOSE AND IF YOU HAVE NO FURTHER NEED FOR IT, PLEASE RETURN IT TO
MINES, USING THE OFFICIAL MAILING LABEL ON THE INSIDE OF THE BACK COVER.

I.C. 7077.
June 1959.

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

**MINING AND MILLING METHODS AND COSTS AT THE
TENNESSEE-SCHUYLKILL CORPORATION MINE, CHLORIDE, ARIZ.^{1/}**

By Jacob Schoder^{2/} and Paul T. Allsman^{3/}

CONTENTS

	<u>Page</u>
Introduction	2
Acknowledgments	2
Situation and climate	2
History and production	3
Geology	4
Buildings and surface equipment	5
Mining	6
Physical characteristics of ore and en- closing rocks	6
Exploration	7
Sampling and ore estimation	7
Development	8
Stopping	9
Transportation	10
Drainage	10
Ventilation	11
Mine labor	11
Mine power	12
Mining costs	12
Milling	12
Ore treated	14
Crushing and grinding	14
Flotation	15
Concentrate handling	16
Tailing disposal and water supply	16
Sampling and mill control	17
Mill labor	17
Metallurgical data	17
Mill power	18
Milling costs	19

^{1/} The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7077."

^{2/} One of the consulting engineers of the Bureau of Mines and manager, Tennessee-Schuykill Corporation, Chloride, Ariz.

^{3/} Associate mining engineer, Metal Mining Methods Section, Mining Division, Bureau of Mines, Salt Lake City, Utah.

HISTORY AND PRODUCTION

Most of the mines of the Cerbat Mountains were discovered between about 1863 and 1905. Gold, silver, and lead were the only metals sought. Rich silver chloride, lead sulphide, and native gold ores were exploited at first. With cheaper transportation, smelting facilities, and improved milling methods lead-zinc ores became more important.

The Tennessee mine is said to have been discovered in 1894 by A. M. McDuffee and operated intermittently up to 1912. From 1913 to 1917 the mine was operated by the Needles Mining & Smelting Co., a subsidiary of the United States Smelting, Refining & Mining Co. A smelter was erected at Needles, Calif. to treat a jig-mill concentrate. During this period the mine made its greatest production. The largest annual production was in 1937.

After a period of inactivity the Monarch Lead Co. in 1928 combined the Tennessee and adjoining Schuylkill mines under one management. A 150-ton flotation mill designed to produce a lead and a zinc concentrate was erected but was never operated by that company.

In 1936 the Tennessee-Schuylkill Corporation was formed. The mine was unwatered, cleaned out, and made ready for production. This company has operated continuously at near capacity from 1936 to date (November 1938).

The property now includes about 131 acres, of which about 86 acres are patented lode claims, 5 acres comprise a patented millsite, and the remainder is unpatented land.

Table 1 gives the production of the Tennessee and Schuylkill mines from 1901 to 1938.

I.C. 7077

TABLE 1. - Gold, silver, copper, lead, and zinc recovered from ores at the Tennessee-Schuykill mine, Chloride, Ariz., from 1901 to 1938^{1/}

Year	Ore, tons	Concentrate, tons	Gold, ounces	Silver, ounces	Copper, pounds	Lead, pounds	Zinc, pounds
1901..	25,805	-	8.87	2,469	-	4,421,678	-
1902..	7,567	-	85.89	29,448	-	1,619,640	-
1903..	1,090	-	15.26	4,360	-	279,468	-
1907..	154	-	23.89	2,047	235	90,960	-
1910..	70	10	3.22	127	-	6,654	-
1911..	998	328	78.63	2,638	1,837	97,572	87,486
1912..	1,358	988	266.67	13,127	2,361	459,771	260,966
1913..	29,486	14,360	1,370.29	136,924	16,568	4,740,278	4,233,642
1914..	22,081	12,671	739.15	74,748	11,981	3,657,302	4,932,108
1915..	47,633	22,187	2,191.60	172,366	45,000	6,034,998	8,351,839
1916..	47,013	19,777	1,564.30	135,158	32,285	5,086,177	7,517,627
1917..	41,133	21,347	1,914.00	150,981	55,300	5,039,156	8,352,860
1926..	164	71	12.71	319	435	32,024	32,697
1929..	53	29	4.41	307	183	15,142	13,008
1935..	12,233	3,239	2,870.00	40,850	24,300	1,433,000	1,000,000
1937..	59,990	12,084	10,437.00	138,360	100,000	4,553,000	3,414,000
1938..	54,092	11,340	9,622.55	127,720	86,500	3,792,450	5,419,656
Total	350,925	118,431	31,257.55	992,349	376,985	41,359,270	45,645,389

^{1/} Compiled by C. N. Gerry, Division of Mineral Production and Economics, Bureau of Mines, Salt Lake City, Utah.

GEOLOGY

The geology of the Cerbat Mountains has been discussed recently by Hernon^{4/} and that of the Tennessee-Schuykill by Garrett.^{5/} Other^{6/} earlier writers have contributed to the geologic discussion of the region.

The Cerbat Range is made up of pre-Cambrian crystalline rocks, later crystalline rocks of unknown age, and volcanic rocks probably of Tertiary and Quaternary age. The crystalline rocks form a complex predominantly of granite with diorite and gabbro, all generally gneissic and intruded by pegmatite, granite, diabase, granite porphyry, and lamprophyric dikes. Small blocks of amphibolite occur locally.

^{4/} Hernon, Robert M., Cerbat Mountains; Some Arizona Ore Deposits: Arizona Bureau of Mines Bull. 145, 1938, pp. 110-117.

^{5/} Garrett, S. K., Tennessee-Schuykill Mine; Arizona Ore Deposits: Arizona Bureau of Mines Bull. 145, 1938, pp. 117-119.

^{6/} Schrader, F. C., Mineral Deposits of the Cerbat Range, Black Mountains, and Grand Wash Cliffs, Mohav County, Ariz.: Geol. Survey Bull. 397, 1909, pp. 27-42.

Bastin, E. S., Origin of Certain Rich Silver Ores Near Chloride and Kingman, Ariz.: Geol. Survey Bull. 750, 1924, pp. 17-39.

ILLUSTRATIONS

<u>Fig.</u>		<u>Following page</u>
1.	Geologic cross section through Tennessee shaft, Tennessee-Schuykill mine, Chloride, Ariz.	4
2.	Longitudinal projection, Tennessee-Schuykill mine, Chloride, Ariz.	6
3.	Longitudinal projection and cross section of square-set method of stoping at Tennessee-Schuykill mine, Chloride, Ariz.	8
4.	Flow sheet of the Tennessee-Schuykill mill, Chloride, Ariz.	12
5.	Flow sheet of selective flotation, Tennessee-Schuykill mill, Chloride, Ariz.	12

INTRODUCTION

This is one of a series of papers published by the Bureau of Mines on mining and milling methods and costs.

The Tennessee-Schuykill Corporation, Chloride, Ariz., mines and mills a lead-zinc ore containing gold, silver, and a small amount of copper. The mill products are lead and zinc concentrates that are shipped to smelters. The company was the second largest producer of lead and zinc in Arizona in 1937 and was seventh in gold production.

Operations discussed are those being conducted at the mine in October 1938 and are representative of the complete operating period from 1936 to date.

ACKNOWLEDGMENTS

The authors wish to thank R. L. D'Arcy, mine superintendent, B. M. Lee, mill superintendent, F. B. Eichelberger, assistant secretary and treasurer, and S. K. Garrett, geologist and engineer, for their assistance in accumulating data for this paper. Production statistics were compiled by C. N. Gerry of the Mineral Production and Economics Division, Bureau of Mines, Salt Lake City, Utah (T. H. Miller, supervising engineer).

SITUATION AND CLIMATE

The mines and mill of Tennessee-Schuykill Corporation are at the western foot of the Cerbat Mountains about 1 mile east of Chloride in the Wallapai mining district, Mohave County, Ariz. The Cerbat Mountains form a typical desert range that extends about 30 miles north from Kingman, a town about 60 miles southeast of Boulder Dam. Peaks attain altitudes of 5,000 to 7,000 feet and rise sharply for 1,500 to 3,500 feet above detritus-filled desert valleys.

Chloride may be reached over paved highway U.S. 93, 21 miles north from Kingman, Ariz., or 60 miles south from Boulder Dam.

The climate is typical of the arid, semimountainous, desert region of the Southwest. Seasons are open, and rainfall is scant.

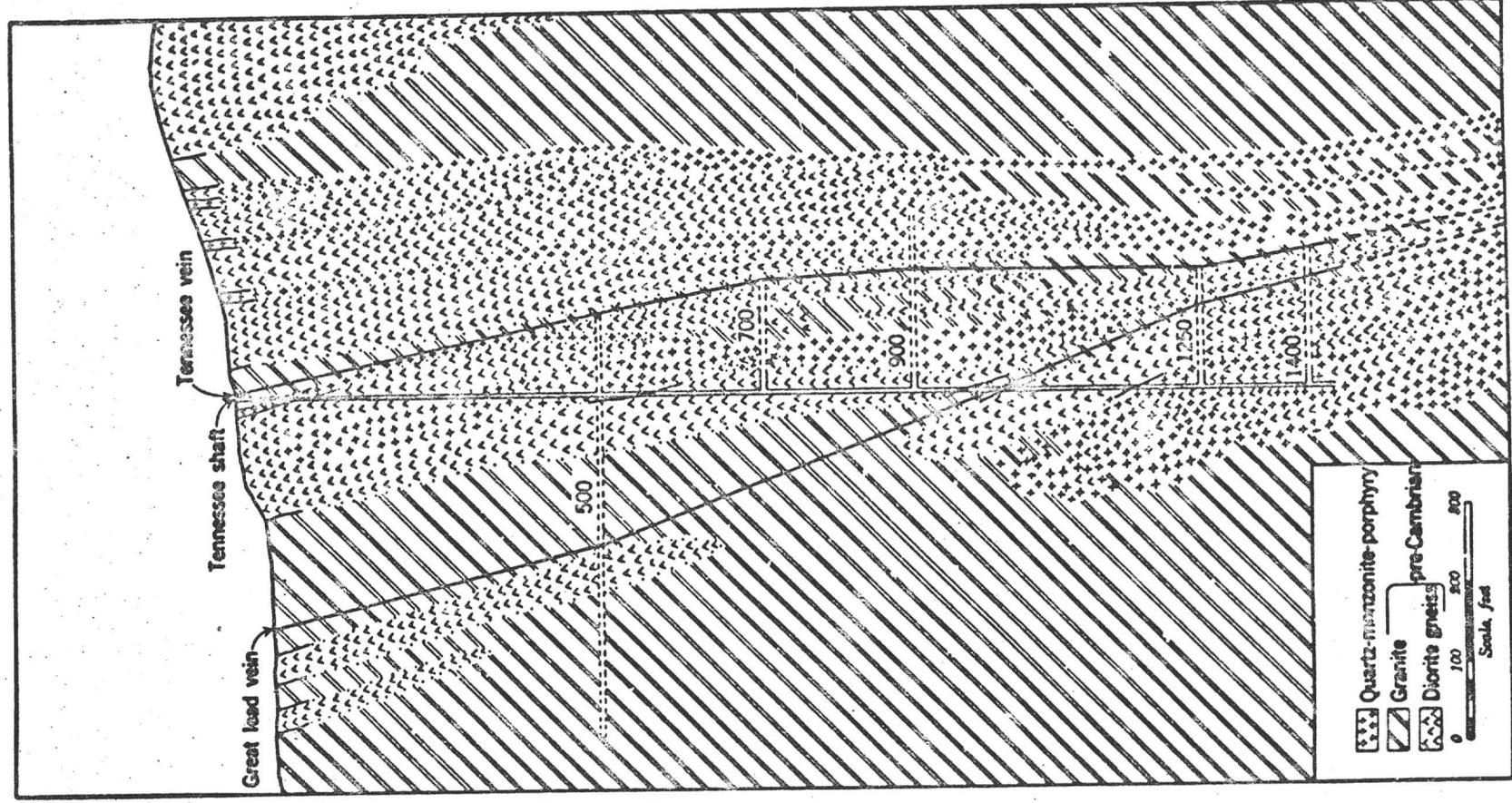


Figure 1.—Geologic cross section through Tennessee shaft, Tennessee-Schuykill mine, Chloride, Ariz. (after Garrett).

The rocks of the Wallapai mining district may be grouped as diorite gneiss, granite, quartz-monzonite porphyry, rhyolite, and diabase. The oldest rock, diorite gneiss, has been intruded by granite, and both the diorite gneiss and the granite have been intruded by quartz-monzonite porphyry. The rhyolite and diabase occur as dikes, some of which occupy the same fissures with the veins.

Fissure veins near Chloride may be grouped in two classes according to strike. One group strikes nearly north, while the second strikes N. 25° W.; the dips change progressively from 35° E. at the western foot of the range to 85° W. near the crest. The progressive steepening of dips suggests that fissures were formed by overthrusting stresses.

The Tennessee-Schuykill fissure vein is traceable for nearly 2 miles; it strikes N. 5° W., dips 85° N.E., and cuts the complex of diorite gneiss, granite, and quartz-monzonite porphyry. The average width is 5 feet. At abrupt changes in strike some "horsetailing" of the fissure has taken place but no cross fissuring has ever been found. Figure 1 is a geologic cross section through the Tennessee shaft.

Vein filling comprises a strong gouge on both the hanging wall and foot wall, between which occur galena, fine-grained gold-bearing pyrite, and sphalerite in a gangue consisting chiefly of quartz and soft, altered fragments of wall rock. The ore also contains small amounts of crystalline pyrite and arsenopyrite. A rough banding of sulfide minerals and gangue is often apparent. Some supergene mineralization occurs to a depth of about 80 feet, but it is of little importance.

The character of the wall rocks has had no apparent influence on extent or grade of ore deposits. The only recognizable influence is due to a change in strike or dip. The four ore shoots of the Tennessee-Schuykill occur where the vein has changed to a more than average northwesterly strike. Shoots are wider on steep dips than on flat dips.

BUILDINGS AND SURFACE EQUIPMENT

The following buildings are situated convenient for operations on the surface:

Building	Type of construction	Size, feet
Staff house	Wood	65 by 30
Residence	do.	30 by 20
Do.	do.	65 by 20
Mill	Corrugated iron	70 by 30
Machine shop	do.	56 by 20
Concentrate building	do.	40 by 25
Assay office	do.	30 by 17
Powder magazine	Masonry	20 by 15
Chargehouse	Corrugated iron	35 by 35
Blacksmith shop	do.	30 by 20
Compressor house	do.	67 by 37
Holsthause (Tennessee)	do.	30 by 28
Transformer house	do.	28 by 25
Oilhouse	Wood	10 by 10
Warehouse	Corrugated iron	25 by 15
Office	Wood	35 by 20
Holsthause (Schuykill)	Corrugated iron	80 by 25

I.C. 7077

The following tanks are used for the purpose designated:

Number	Type of construction	Diameter by height, feet	Use
1	Galvanized iron	10 by 6	Mill-water storage.
2	do.	10 by 8	Domestic water.
2	do.	10 by 4-1/2	Fuel oil.
1	do.	6 by 3	Stove oil.
1	Wood stave	20 by 10	Tailing thickener.
1	do.	13 by 10	Mill-water storage.
1	do.	18 by 12	Do.
1	do.	14 by 10	Do.
2	do.	12 by 10	Do.
1	do.	10 by 8	Do.

The following table gives the major items of equipment installed on the surface:

Place	Equipment
Machine shop	Milling machine, 6-foot lathe, 16-foot lathe, drill press, draw saw, hand breast drill, and 7-1/2-horsepower motor with starter for power.
Timber shed	2-1/2-foot cut-off saw, 12-inch ripsaw, and 10-horsepower motor.
Blacksmith shop	Sullivan steel sharpener and oil furnace.
Hoisthouse (Tennessee)	Ottumwa 2-drum, counterbalanced electric hoist, 100-horsepower slip-ring motor, and switch panel.
Hoisthouse (Schuylkill)	2-cylinder, 1-drum, 5-foot-diameter air hoist.
Compressor house	1,000-cubic-foot-per-minute I.R.-type 10 air compressor, 400-cubic-foot-per-minute Sullivan air compressor (in reserve), 150-horsepower motor, and 75-horsepower motor.
Miscellaneous	40-foot timber head frame with 4-foot-diameter sheave wheel at Schuylkill; 60-foot steel head frame with 2 5-foot-diameter sheaves at Tennessee. 3 150-k.v.-a. transformers, 44,000 to 440 volts. 5 5-k.v.-a. transformers, 440 to 220 and 110 volts. 3-1/2- by 4- by 9-foot bailer.

MINING

Physical Characteristics of Ore and Enclosing Rocks

The wall rocks of diorite gneiss, granite, and quartz-monzonite porphyry generally are hard and stand well in stopes; however, locally the foot- and hanging-wall gouge and occasional fractured slabs tend to slough badly. The

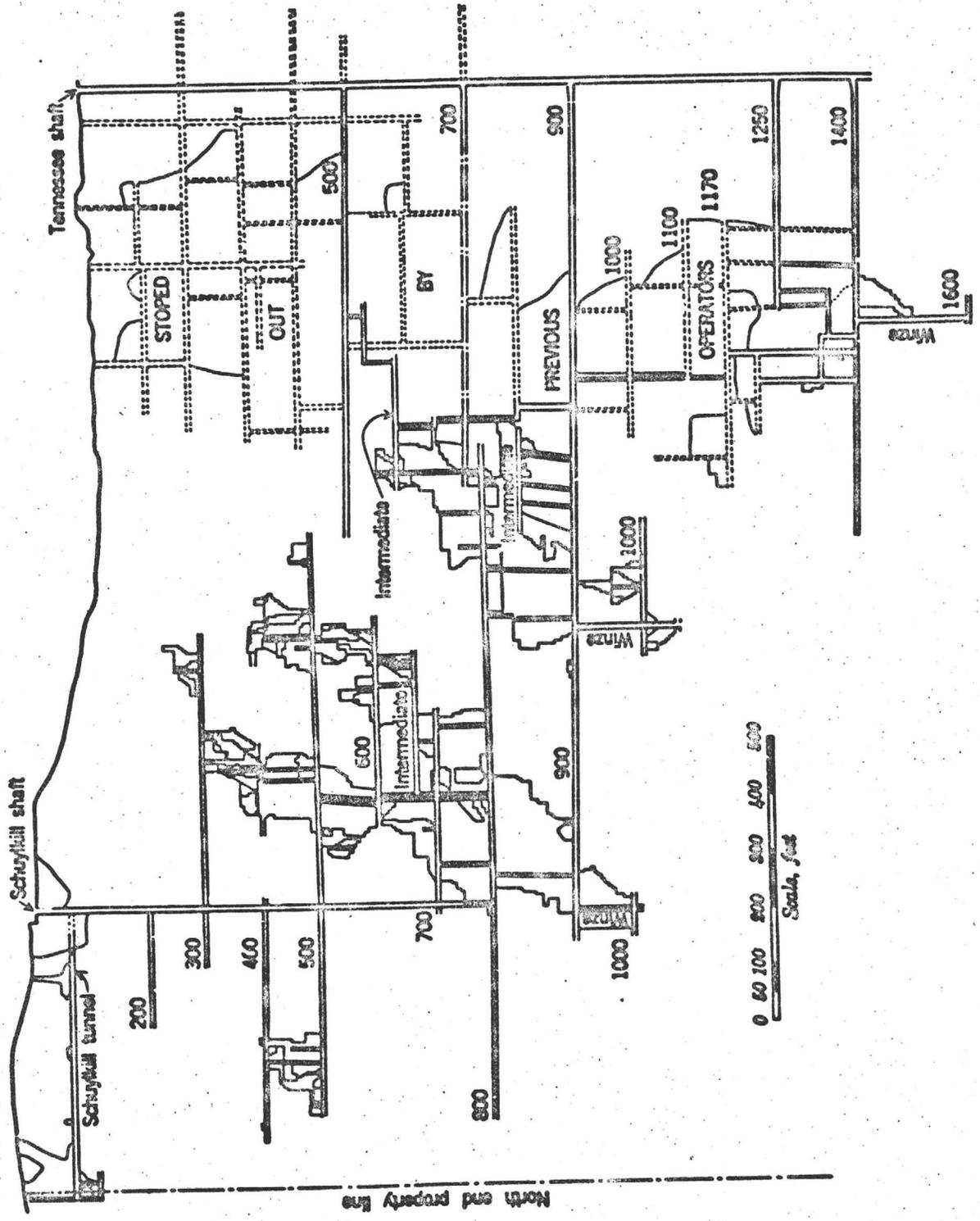


Figure 2.—Longitudinal projection, Tennessee-Schuykill mine, Chloride, Ariz., showing stopped areas, April 1933, (after Garrett).

vein matter is soft and heavy; relatively little powder is required to break the ore. Except in narrow, barren parts of the vein, drifts are difficult to maintain, and the heavy swelling ground must be relieved occasionally.

Mineable oreshoots range between 2 and 14 feet in width, the average being 5 feet. Four ore bodies shown in figure 2 range in length from 35 to 300 feet. The one north of the Tennessee shaft has been mined to a depth of 1,500 feet, mostly by early operators.

Ore shoots generally rake northward above the 900-foot level and tend to change to nearly vertical between the 900- and 1,400-foot levels.

Exploration

Ore shoots have been found to persist with depth. The longitudinal limits of the ore and the rake of the shoots can be predicted fairly accurately. Grade changes are nominal within the range of succeeding levels. Absence of cross faulting precludes likelihood of ore bodies being cut off abruptly. Exploration, therefore, is simplified. Levels are driven from the shafts or from winzes sunk in the vein with a fair degree of certainty of developing ore bodies virtually as large as those exposed on the preceding level.

Four ore shoots have been explored to depths ranging from 150 feet, on the one farthest north of the Schuylkill shaft, to 1,500 feet, on the one farthest south and immediately north of the Tennessee shaft. The two intervening shoots have been explored to a depth of over 1,000 feet. Drifting is being pushed on the lower levels and north of the Schuylkill shaft as fast as mining permits stopes to become available for waste disposal.

Sampling and Ore Estimation

Development headings are sampled by cutting channels across the face at intervals not to exceed 5 feet. Grab samples are taken from cars and combined to represent ore mined from each stope over a 24-hour period. When the grade of ore from a stope drops below 0.15 ounce gold per ton, 2 ounces silver per ton, 4 percent lead, and 5 percent zinc values are sampled after each round as a guide to mining.

The minimum economic grade of ore mined from stopes is \$6.50 per ton, based on current metal prices. When the grade of ore in a stope drops below this limit or the vein becomes too narrow to mine, stoping in that direction is stopped.

Ore reserve, tonnage, and grade estimates are made twice yearly. These estimates are based on sampling of development openings. An estimate of both "blocked-out" and "possible" ore is made. Ore exposed on two sides of horizontal development at 100-foot intervals is designated "blocked out"; that exposed on one side is considered "possible" ore and is extended to a depth of 100 to 150 feet.

Development

Figure 2 shows a longitudinal projection of development workings. The mine is entered through the Tennessee shaft at the southern end of the ore bodies and the Schuylkill shaft about 1,450 feet north along the strike of the vein. The two mines are connected by the 900-foot level from the Tennessee and a raise to the 800-foot level near the Schuylkill shaft. The 1,600 level is reached from the 1,400 level on the Tennessee side through a winze; the 1,000-foot level is gained from the 900-foot level by two winzes on the Schuylkill side. The 1,250-foot level is being driven around old caved stopes and eventually will open the Schuylkill and intermediate ore shoots for mining above it.

The mining interval generally is 100 feet, and haulage levels generally are established at 200-foot intervals. The 900 is the only haulage level being used at present. Short crosscuts connect the shafts with main drifts; the latter are driven in the vein, except in rare instances where it is found cheaper to run drifts around old caved areas. Occasionally, sublevel drifts have been driven from stopes to remove ore in parts of the vein where it has raked too far away to permit removal by gravity.

The Tennessee shaft is vertical and has two compartments, one for hoisting and one containing a ladderway, piping, wiring, and a counterbalance. The shaft is timbered with 6- by 8-inch timber shaft sets, each compartment being 4 by 4-1/2 feet inside the timber. The Schuylkill shaft is inclined 85° from the horizontal and is the same size as the Tennessee. Both shafts are in the footwall of the vein, the Tennessee extending below the 1,400-foot level and the Schuylkill extending to the 800-foot level. Both shafts were sunk to their present depth by previous operators.

A two-compartment (in part, three-compartment) ore pass and manway is maintained through filled stopes south of the Schuylkill shaft from the 300- to the 900-foot level; it is used for removal of ore from above the 900 level, for bringing in supplies, and for ventilation.

Winzes are sunk in the vein. The rock section is about 12 feet in length and as wide as the vein. They are timbered with 8- by 8-inch timber sets to form two compartments.

Crosscuts are 5 by 7 feet in section. Drifts are driven the width of the vein and 7 feet high; in narrow parts of the vein a minimum width of 5 feet is cut. Drifts are timbered with 8- by 8-inch posts and caps and 4- by 6-inch collar braces. Sets are spaced 4 feet 8 inches, center to center.

In drifting, 12 to 14 holes are drilled per round with mounted jack-hammers, using a "V" center cut. Between 50 and 60 sticks of 40-percent gelatin dynamite are used to pull a 4-foot round. Rock is shoveled to 1-ton cars and trammed by hand to a stope being filled or to an ore pass, depending on the grade of the rock.

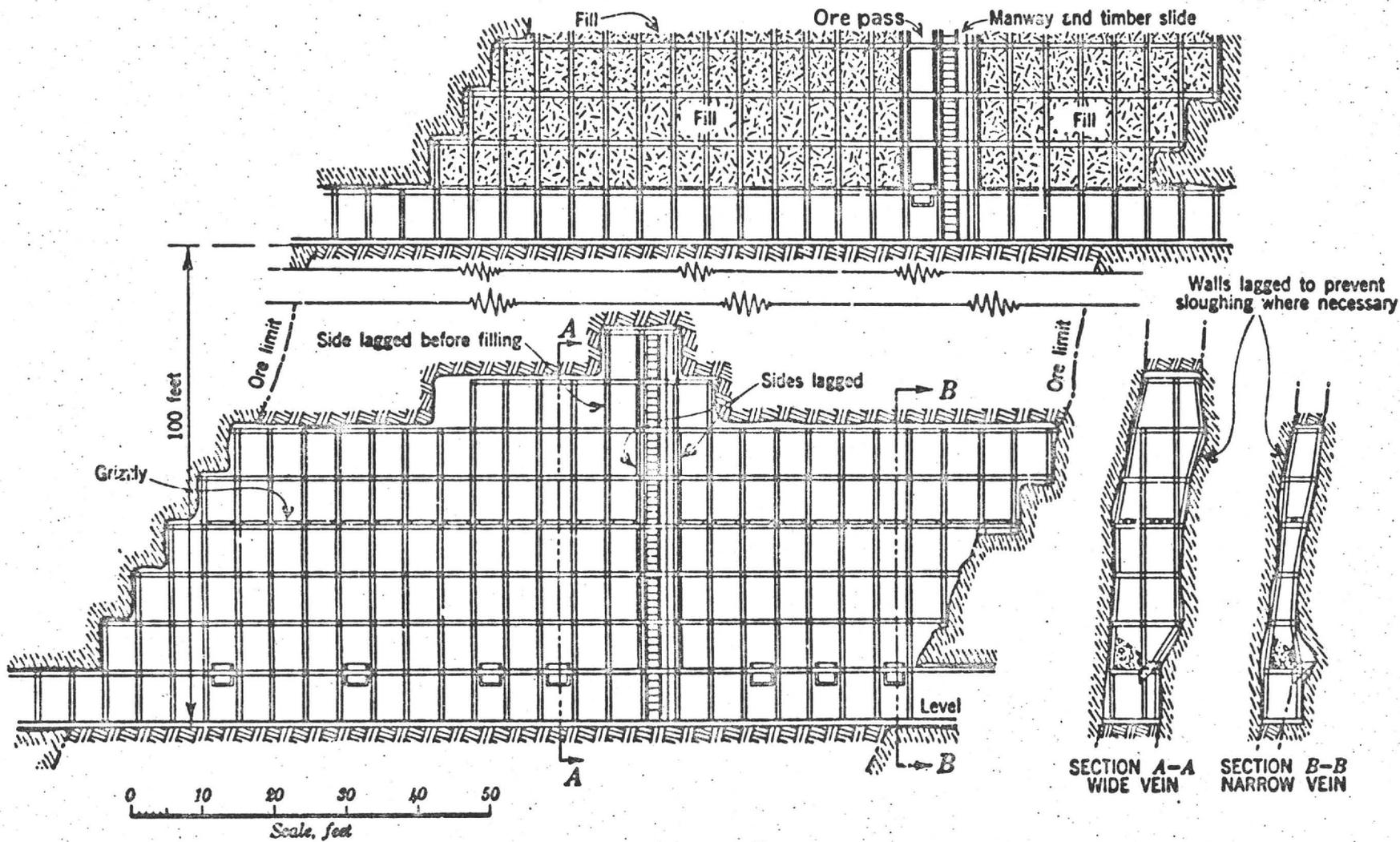


Figure 3.—Longitudinal projection and cross section of square-set method of stoping at Tennessee-Schuylkill mine, Chloride, Ariz.

Winzes are sunk with hand-held jackhammers. About 15 holes and 60 sticks of 40-percent gelatin dynamite are required to break a 4-foot round in a winze having a 7- by 12-foot rock section. The broken rock is shoveled into a 9-cubic-foot sinking bucket and hoisted to a bin on the level above. An advance of 4 feet is made in three shifts by a crew of three men on a shift. This includes one shift drilling and blasting, one shift shoveling and hoisting, and one shift placing timber.

A two-compartment raise is carried up in each stope ahead of mining. The raise is timbered with the regular stope sets, using 6- by 8-inch posts, 8- by 8-inch or 6- by 8-inch caps, and 4- by 6-inch collar braces. Posts are 6 feet long, braces 4 feet long, and caps cut to the width of the stope. One compartment serves for a ladderway and timber and supply slide. This compartment is lagged on the outside for protection. One set adjacent to the manway compartment is lagged before the stope is filled to provide passage for ore and waste.

Development is carried on intermittently as stopes become available for waste disposal. No separation is made of labor, supplies, or cost between development and mining. Most of current development is in ore, and mining cost per ton is increased only nominally by including development.

Stoping

Figure 3 shows a longitudinal projection and transverse sections of a typical stope. A modified square-set method is used. In narrow parts of the vein posts and collar braces follow the changing dip and strike of the walls. In wide parts additional posts and girts are placed along the middle to support the caps. Regulation square-sets are used where the vein is wide enough.

Stope sets comprise 6- by 8-inch posts, 6 feet long, 8- by 8-inch Oregon fir caps cut to extend from wall to wall, and 4- by 6-inch collar braces 4 feet long. Salvage material is used for braces when it is available. The walls are lagged with 2- by 12-inch lagging where it is needed to prevent sloughing.

In starting a stope the first cut is made above the back of the drift by advancing one set at a time in both directions from a stope raise. The ore is blasted onto "Chinaman chutes" built on spreaders between drift posts and is loaded into 1-ton cars and trammed by hand to a transfer raise. The cut for the second row of sets is blasted onto the same Chinaman chutes. Before the third cut is made, conventional dropboard chutes are installed as needed but not closer than every other set.

Before the third cut is broken, a grizzly floor is laid on the second row of caps. This is composed of 6- by 8-inch timbers 6 feet long laid on edge longitudinally across the caps (see fig. 3). The ends of each timber serve as spreaders for adjoining grizzlies. The spacing is 6 inches. Grizzlies are moved upward as stoping progresses and are maintained within 20 feet of the back of the stope; they safeguard workmen, prevent oversize from entering the chutes and protect them from large boulders during blasting.

I.C. 7077

Ore is completely extracted between levels in a continuous operation. After the next level above is reached, fine ore that has accumulated in the stope is cleaned out thoroughly. These fines are better than the average grade of the ore. Chutes are then removed, except those used in transfer raises, and the floor above the drift is lagged over. Waste from development is dumped between the rails above the stope until it is filled.

Raises are advanced ahead of mining, stopers being used for drilling. Drilling in stopes is done with mounted jackhammers. An average of 6 to 8 holes 4 to 5 feet deep are drilled per set. About 17 sticks of 40-percent gelatin dynamite are required to break a round.

In all drilling, 7/8-inch hexagonal crucible steel and conventional cross bits are used. Starters have a 2-inch gage and finishers a 1-5/8-inch gage. The gage change is 1/8 inch, and the changes in length are about 18 inches. Jackhammer steel is lugged, while stoper steel has plain shanks.

Transportation

Ore is drawn from stopes through conventional drop-board chutes to 1-ton ore cars. That from stopes above the 900-foot level is trammed by hand up to 400 or 500 feet and dropped to the 900-foot level. A short tram is made on the 500-foot level and a 140-foot tram on the 800-foot level to transfer the ore between transfer raises (see fig. 2). Below the 900-foot level all ore is hoisted through a winze to pockets above the level. Hoisting is done by a single-drum hoist gear-connected to a 25-horsepower motor.

A 1-1/2-ton Mancha battery locomotive collects loaded cars on the 900-foot haulage level and trams them 1,000 to 1,400 feet to the station at the Tennessee shaft. Six 17-1/2-cubic-foot cars make up a train. The average grade is 2 percent in favor of the loaded train, and track gage is 18 inches.

Cars are dumped by hand directly into a 1-1/2-ton skip suspended below a service cage. Ore is hoisted 900 feet vertically to a 50-ton coarse-ore bin at the headframe. The rope speed is 800 feet per minute, and a 7/8-inch-diameter hoisting rope is used.

Timber and supplies are brought into the mine on a cage through the Tennessee or Schuylkill shaft, whichever is more convenient. Timber trucks are used to transfer material to working places. Supplies are hoisted into stopes by air hoists through manways equipped with timber slides.

Drainage

About 50 gallons of water per minute is pumped from the mine as part of the mill supply. The main pumping stations are on the 1,400- and 700-foot levels of the Tennessee shaft. Water is pumped from the 1,400-foot-level sump to the 700-foot-level station by a 100-gallon-per-minute duplex horizontal pump driven by a 25-horsepower motor. A duplicate pump is held in reserve.

Water from the Schuylkill side and from the 900-level winze is accumulated in a surp at the 900-foot-level station of the Tennessee. The winze is equipped with a 100-gallon-per-minute Byron Jackson pump powered by a 25-horsepower motor. A 100-gallon-per-minute Ingersol Rand pump powered by a 25-horsepower motor lifts the water from the 900- to the 700-foot level.

All mine water is accumulated on the 700-foot level, where it is pumped to surface by a Worthington triplex pump with a capacity of 100 g.p.m.; it is driven by a 40-horsepower motor. An Ingersol Rand 2-stage centrifugal pump with a capacity of 100 gallons per minute and powered by a 50-horsepower motor is held in reserve for emergency.

Ventilation

All workings above the 900 haulage level are ventilated naturally. The Schuylkill shaft is strongly downcast; air from it passes through the workings and out the Tennessee shaft, which is strongly upcast. A Buffalo fan driven by a 5-horsepower motor forces air from the 900-level station at the Tennessee through a 12- by 12-inch wood pipe down to the 1,250-foot level. The pipe is of wood to resist corrosion from acid waters falling in the shaft. At the 1,250-foot level a booster fan of the same size forces the air through 8-inch-diameter "ventube" to the face of the drift on that level.

The 900-level winze is ventilated by another 5-horsepower Buffalo fan on the 900 level. An 8-inch-diameter ventube conveys the air to the 1,000-foot level of the winze. A small Vano air-driven blower is used to furnish air in emergencies.

Mine Labor

The mine is operated three shifts per day and seven days a week. Limited surface storage necessitates this arrangement. The following table gives occupation, wages, and average number of men required daily to operate the mine:

Occupation	Rate per shift	Number
Miners.....	1/ \$5.00	22
Do.....	4.50	35
Muckers and trammers.....	4.00	14
Hoistmen.....	5.00	8
Mechanics.....	4.00 to 5.50	5
Jigger bosses...	6.00	5
Motormen.....	4.50	3
Motormen helpers	4.00	3
		95

1/ Miners receive \$0.50 per shift extra for working below the 900 level in winzes and stope.

Mine Power

Power is generated at Boulder Dam at 44,000 volts and distributed by the Citizens Utility Co., Kingman, Ariz. It is stepped down to 440, 220, and 110 volts through transformers at the mine.

The power rate is \$0.016 per kw.-hr. metered on the low side of the transformers. The rate is based on the use of 400 kilowatts minimum demand. Generally, about 50 percent of the power is used for mining, including about 10 percent for hoisting.

The only direct current used is on the 900-foot-level station, where a motor-generator set is employed to charge the batteries for the locomotive.

Mining Costs

Table 2 gives the cost of mining at the Tennessee-Schuykill Corporation for September 1938 and for a period of 9 months in the same year as taken from auditor's report. Table 3 summarizes mining costs for September 1938. Table 4 summarizes costs in units of labor, power, and supplies. These costs are typical of those obtained since mining was begun in 1936.

Dynamite costs \$12.75 per 100 pounds, caps \$14.75 per 1,000, and fuse \$6.55 to \$7.75 per 1,000 feet. The average cost of timber is \$30 per thousand board feet.

MILLING

The Tennessee-Schuykill concentrator has a normal capacity of 150 tons per day, although as high as 175 tons have been treated in one day. The process is selective flotation; two products are made, a lead concentrate containing most of the gold and silver and a zinc concentrate with a smaller quantity of the precious metals. The ore is valuable principally for its gold content. A third product, concentrate from a jig preceding flotation, is relatively high in gold. A nominal tonnage of high-grade ore has been shipped direct to a smelter. A small tonnage of custom ore is received.

Figure 4 shows the general flow sheet and figure 5 the details of the selective flotation unit of the mill.

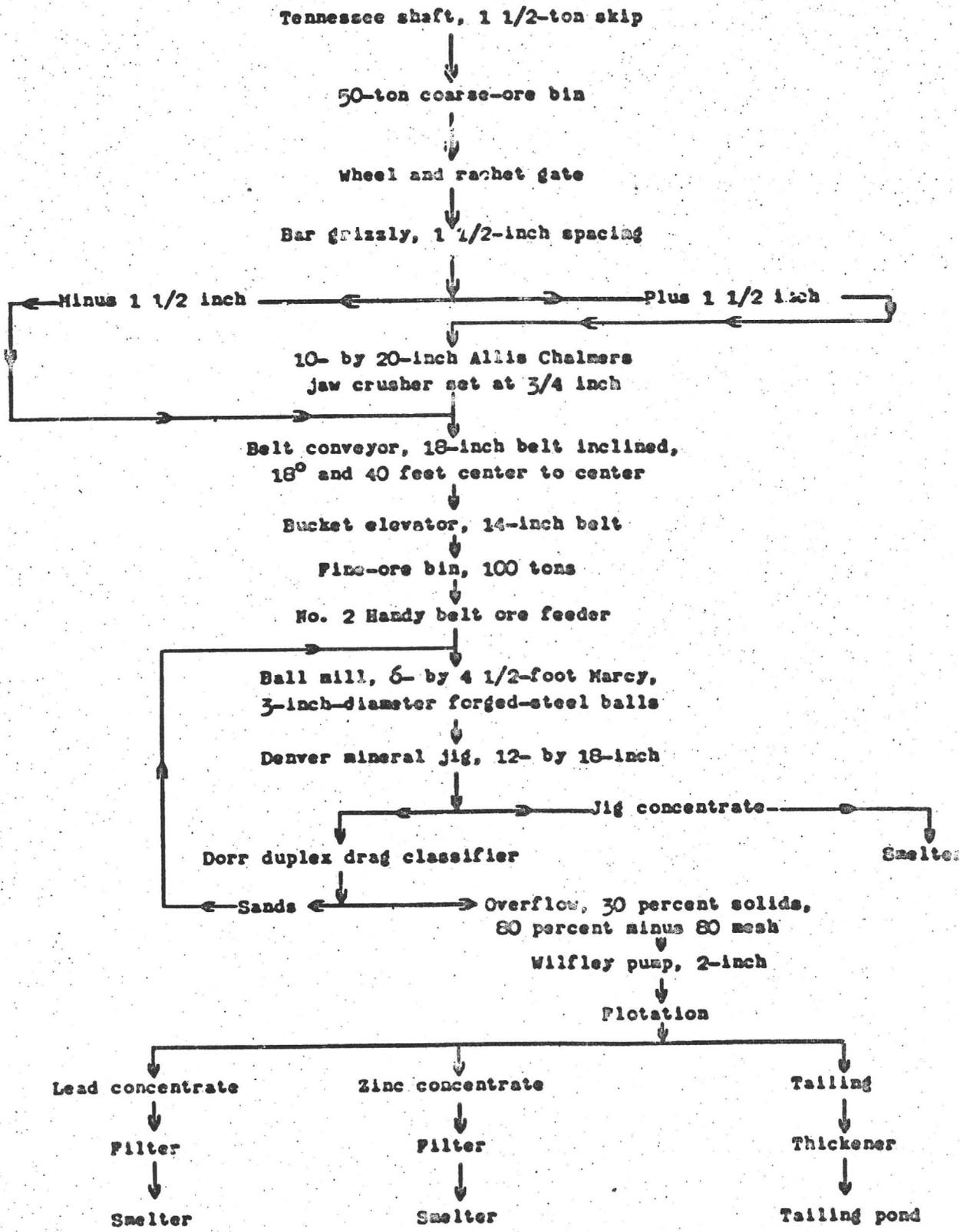


Figure 4.- Flow sheet of Tennessee-Schuykill mill, Chloride, Ariz.; capacity 150 tons per day.

(C) UFDATA 1976

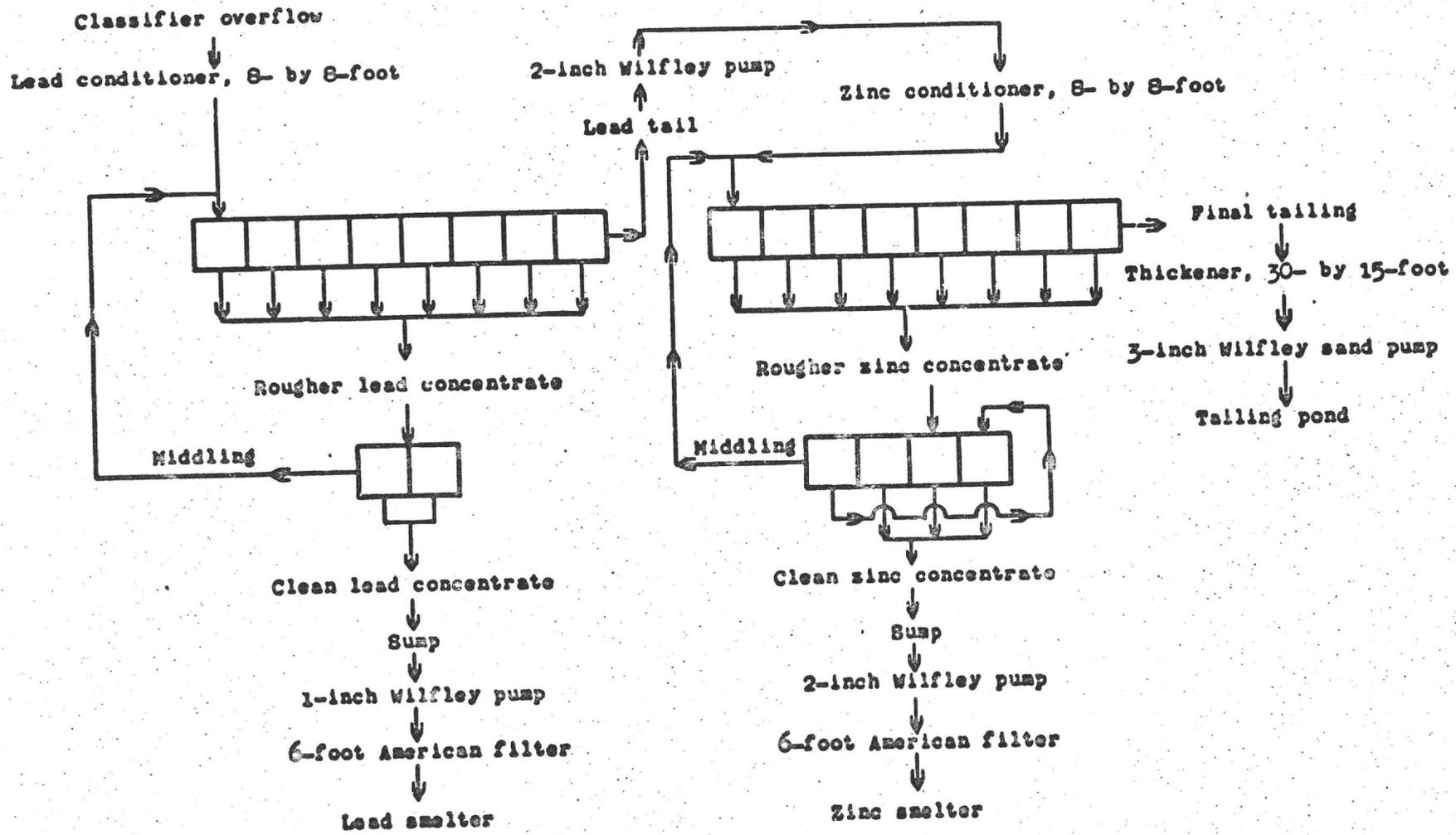


Figure 5.- Flow sheet of selective flotation, Tennessee-Schuykill mill, Chloride, Ariz.

TABLE 2. - Cost of mining at the Tennessee-Schuykill Corporation
for September 1938 and for the first 9 months of 1938.

Tonnage mined and hoisted.....	September, 1938 4,087		9 months, 1938 40,288	
	Amount	Per ton	Amount	Per ton
Salaries and wages:				
Supervision.....	\$ 1,154.00	\$ 0.2774	\$ 11,545.50	\$ 0.2866
Stoping and timbering.....	6,717.24	1.6435	72,981.52	1.8115
Tramming and mucking.....	2,226.50	.5448	24,591.65	.6104
Pumping and drainage.....	856.75	.2096	8,238.61	.2045
Hoisting.....	1,191.25	.2915	10,964.52	.2722
Service men.....	590.00	.1443	7,108.45	.1764
Total salaries and wages...	12,715.74	3.1111	35,430.25	3.3616
Drill steel and supplies.....	1,029.97	.2520	6,183.93	.1535
Lumber and timber.....	2,460.29	.6020	25,683.27	.6375
Equipment and repair parts.....	1,455.89	.3550	9,220.89	.2289
Power.....	1,235.66	.3023	13,502.84	.3352
Explosives.....	560.59	.1372	6,769.70	.1680
Compensation insurance.....	971.81	.2378	10,357.02	.2571
Unemployment tax.....	394.47	.0965	4,164.32	.1034
Old-age benefit tax.....	125.88	.0308	1,378.84	.0342
Medical expense.....	4.00	.0010	196.00	.0048
Yard and camp.....	213.23	.0522	2,382.42	.0591
Miscellaneous and office expense ^{1/}	507.86	.1241	5,525.26	.1372
Total mining.....	21,670.30	5.3020	220,794.74	5.4805

^{1/} One-half of unapportioned expense arbitrarily added.

TABLE 3. - Summary of mining costs, September 1938,
Tennessee-Schuykill Corporation (4,087 tons hoisted)

	Labor	Super- vision	Power	Ex- plosives	Timber	Drill steel and supplies	Total
Stoping and development..	\$1.64	-	\$0.27	\$0.14	\$0.60	\$0.61	\$3.26
Transportation.....	.34	-	.03	-	-	-	.87
Pumping and drainage.....	.21	-	-	-	-	-	.21
General underground.....	-	\$0.28	-	-	-	-	.28
Surface expense.....	.19	^{1/} .12	-	-	-	-	.31
Taxes and insurance ^{2/}37	-	-	-	-	-	.37
Total.....	3.25	.40	.30	.14	.60	.61	5.30

^{1/} One-half of assaying, engineering, and office expense.

^{2/} Includes compensation insurance, unemployment tax, old-age benefit tax, and medical expense.

I.C. 7077

TABLE 4. - Summary of costs in units of labor, power, and supplies at Tennessee-Schuylkill Corporation for September 1938

Tons of ore mined and hoisted.....	4,087
A. Labor (man-hours per ton):	
Breaking and timbering.....	3.35
Mucking and tramping.....	.82
Haulage and hoisting.....	.82
Supervision.....	.29
General.....	.29
Total labor underground.....	5.57
Average tons per man-shift.....	1.44
Labor percent of total cost.....	57.4
B. Power and supplies:	
Explosives (pounds per ton 40-percent gelatin dynamite).....	0.807
Timber (board feet per ton).....	20.
Power (kw.-hr. per ton).....	19.6
1. Compressed air and mine circuit.....	17.9
2. Hoisting.....	1.7
Other supplies in percentage of total supplies and power.....	36.8
Supplies and power, percentage of total cost.....	30.4
C. Percentage of total mining cost.....	87.8

Ore Treated

The ore of the Tennessee and Schuylkill mines is relatively soft for crushing and grinding. The hypogene ore minerals are galena, fine-grained gold-bearing pyrite, and sphalerite. The gangue minerals are several varieties of quartz, crystalline pyrite, and arsenopyrite. A small amount of chalcopyrite is obtained in the concentrates.

The sphalerite occurs as typical "black jack" and "rosin jack." Two varieties of pyrite are found; one occurs as well-crystallized cubes with no gold, and the other is somewhat massive and fine-grained and contains 0.3 to 15 ounces of gold per ton in pure specimens. Gold in the pyrite is extremely finely divided.

Crushing and Grinding

Ore is hoisted from the Tennessee mine in a 1-1/2-ton skip and dumped into a 50-ton-capacity coarse-ore bin. The flow is regulated by a wheel and ratchet gate that permits ore to pass over an inclined bar grizzly with 1-1/2-inch spacing between bars. The oversize is broken in a 10- by 20-inch Allis Chalmers jaw-crusher set to discharge a 3/4-inch product. The crusher is

driven by a "V" belt from a 20-horsepower motor. The grizzly oversize bypasses the crusher and joins the crushed product. Undersize is about 40 percent of the feed.

Crushed ore is conducted to a 100-ton fine-ore bin by an 18-inch belt conveyor (40 feet long and inclined at 18°) and by a 14-inch bucket elevator.

A No. 2 Handy belt feeder regulated to handle 150 tons in 24 hours discharges the crushed ore to a 6- by 4-1/2-foot Marcy ball mill. The ball mill is charged with 5 tons of 3-inch-diameter forged-steel balls. Manganese-steel liners in the ball mill have a life of about 60,000 tons of ore ground. A circulating load of 1-1/2 times the original feed and a pulp density of about 80 percent solids is maintained. The ball mill is operated at 27 r.p.m. through a herringbone gear and 100-horsepower motor.

Pulp from the ball mill discharges to a 12- by 13-inch Denver Mineral jig, from which about 17 to 20 percent of the gold is recovered in a lead concentrate. The ball mill and jig are in closed circuit with a Dorr duplex drag classifier. The overflow from the classifier is maintained at about 30 percent solids ground to 80 percent minus 80 mesh.

Flotation

The flotation section consists of an eight-cell lead rougher unit followed by a two-cell lead cleaner unit and an eight-cell zinc rougher unit followed by a four-cell zinc cleaner unit. Classifier overflow is pumped to an 8- by 8-foot lead conditioner by a 2-inch Wilfley sand pump. The conditioned pulp goes to the first cell of the eight-cell lead rougher unit. A rougher concentrate is taken from all eight cells and flows by gravity to the first cell of the cleaner unit. A clean lead concentrate is taken from the two cells, and the middling from the last cell goes back to the first rougher cell.

The rougher lead tailing is pumped by a 2-inch Wilfley to an 8- by 8-foot zinc conditioner. It then flows by gravity to the first cell of the zinc rougher unit. A rougher zinc concentrate is taken from the eight cells and cleaned in the four-cell cleaner unit. The cleaner unit produces a clean zinc concentrate and a middling that is returned to the first zinc rougher cell.

Considerable difficulty was experienced at first in attempting to use mine water for flotation. The water was found to be highly acid, often having a pH of 3.5; in addition, it carried considerable amounts of ferric sulfate, ferrous sulfate, zinc sulfate, and calcium sulfate. Attempts to neutralize the water with either soda ash or lime were unsuccessful, as the large quantities of carbon dioxide generated interfered with the flotation of the minerals. An attempt was then made to float the sulfides selectively in an acid circuit, with excellent results. The gold-bearing pyrite was floated successfully with the galena, the zinc sulfide being depressed naturally. Afterward the zinc could be activated and removed from the lead tailing.

I.C. 7077

The chief control over flotation consists in properly mixing virtually neutral tailing water, supplemented by other neutral water, with the acid mine water to maintain a pH ranging between 5.4 to 5.8. No other water conditioning is necessary.

Cresylic acid and sodium ethyl xanthate (Z-4) are added ahead of the ball mill, and an additional quantity of the latter is added to the first lead rougher cell. These effect flotation of the galena and gold-bearing pyrite. Copper sulfate, sodium-ethyl xanthate, and cresylic acid are added to the lead tailing in the zinc conditioner to activate and float the zinc sulfide.

The following table gives average consumption of reagents:

	Pounds per ton of ore
Cresylic acid.....	0.092
Sodium xanthate (Z-4).....	.175
Copper sulfate.....	1.007

Concentrate Handling

Lead concentrate flows by gravity to a sump, from which it is pumped by a 1-inch Wilfley sand pump to a 4-foot 4-leaf American filter. Zinc concentrates are handled likewise. The filtered concentrates contain about 10 percent moisture.

Lead concentrates and jig concentrates are shipped to the lead smelter of the American Smelting & Refining Co. at El Paso, Tex.; zinc concentrates are shipped to the zinc smelter of the American Smelting & Refining Co. at Amarillo, Tex.

Concentrates are trucked 22 miles to Kingman, Ariz. The contract price is \$1.50 per ton, including loading and unloading. Return supplies are trucked for \$2 per ton. The freight rate for lead concentrate from Kingman, Ariz., to El Paso, Tex., for concentrates valued at \$40 is \$5.50 per ton. The freight rate on zinc concentrate to Amarillo, Tex., for concentrate valued at \$30 is \$5.15 per ton. Jig concentrates are shipped separately to El Paso; the average value per ton is \$630 and the freight rate is \$10 per ton.

Tailing Disposal and Water Supply

Tailings from the zinc rougher cells are pumped by a 3-inch Wilfley sand pump to the tailing pond. When a shortage of water exists they are first thickened in a 30- by 15-foot thickener. Pulp to the thickener contains 45 to 50 percent solids, and discharged tailings contain 60 to 65 percent solids. Water is also reclaimed from the tailing pond by settling. The clear water is pumped back to mill storage by a 5-inch Myer bulldozer pump and a 3-horsepower motor. The water line comprises a 2-inch-diameter pipe 400 feet long; the head is 35 feet. The set-up provides for reclaiming about 60 percent of the water.

Fresh mill water is pumped from the mine at the rate of about 50 gallons per minute. This is supplemented by water pumped from the Dardanelles mine. A flat rate of \$100 per month is paid for this water. A jack-head pump and 3-horsepower motor lift the water an average of 180 feet from the Dardanelles mine to the collar, from whence it flows by gravity a distance of about 1 mile through a 3-inch pipe to the mill storage. About 400 gallons of water per ton of ore is used in the mill, of which 160 gallons per ton of ore is new water.

Sampling and Mill Control

Heads, concentrates, and tails are sampled by hand every half hour. The half-hour samples are combined to represent three 8-hour periods daily.

Tonnage is estimated from the number of skips hoisted and also checked against the cars trammed underground. Concentrates are weighed in the trucks and checked against the estimated tonnage.

Mill Labor

The mill is operated three shifts a day and 7 days a week. An average of 10 men per day are required in the direct operation of the mill; about two service men per day are charged to milling.

The following table gives labor classification at the mill:

Classification	Number per shift	Total per day	Wages per shift
Crushermen.....	1	3	\$4.00
Ball-mill operators	1	3	4.50
Flotation operators	1	3	5.00
Tailing attendant..	1 on day	1	4.00
Service men.....	2 on day	2	5.00
		12	

Metallurgical Data

Table 5 gives the metallurgical data of the Tennessee-Schuylkill mill for September 1938.

TABLE 5. - Metallurgical data, Tennessee-Schuylkill Corporation, Chloride, Ariz., September 1933

Product	Gold, ounces per ton	Silver, ounces per ton	Lead, percent	Zinc, percent	Iron, percent
Assays:					
Head.....	0.185	2.26	3.43	5.25	-
Jig concentrate.	14.98	37.70	36.22	4.77	-
Lead concentrate	.986	13.84	23.22	5.88	25.00
Zinc concentrate	.125	1.87	.59	51.97	-
Tail.....	.010	.16	.10	.75	-

I.C. 7077

TABLE 5. - Metallurgical data, Tennessee-Schuyler
Corporation, Chloride, Ariz., September 1935 (Cont'd)

Product	
<u>General:</u>	
Total tons ore treated.....	
Days operated.....	
Hours operated per day.....	
Average tons per 24 hours.....	
Total tons concentrate.....	
Jig concentrate.....	tons
Lead concentrate.....	do.
Zinc concentrate.....	do.

27.1
 57.18
 2.5
 2.2
 2.9
 16.6

Product	Gold	Silver	Lead	Zinc
<u>Recovery, percent:</u>				
In jig concentrate.....	16.6	2.9	2.2	0.2
In lead concentrate.....	74.4	85.6	94.3	15.9
In zinc concentrate.....	4.9	5.9	1.2	72.4
Total.....	95.9	94.4	97.7	88.5
Lost in tails..... percent	4.1	5.6	2.3	11.5

Product	
<u>Ratio of concentration:</u>	
Jig concentrate.....	483
Lead concentrate.....	7.2
Zinc concentrate.....	13.9
Total.....	4.7
Ball consumption..... pounds per ton of ore	2.5
Liner..... do.	.036
Net water consumption..... tons per ton of ore	1.6

Mill Power

Power is received from the same source for milling as for mining. The same rate and conditions also apply. Generally about 50 percent of the power is required for milling.

The following table gives the connected power load at the mill:

	Horsepower
Crusher.....	20
Conveyor.....	5
Elevator.....	7-1/2
Classifier and feeder.....	5
Ball mill.....	100
Flotation and blower.....	87-1/2
Pumps.....	27-1/2
Conditioners.....	15
Filters and blower.....	10-1/2
Tailing thickener.....	7-1/2
Water reclaiming.....	3
Water supply (Dardenelles).....	3
Total.....	291-1/2

Milling Costs

Table 6 gives the cost of milling at the Tennessee-Schuykill Corporation for September 1938 and for a period of 9 months in the same year, as taken from the auditor's report. Table 7 summarizes milling costs for September 1938. The 9-month costs are typical of those obtained since milling began in September 1936. The September cost is higher than average, due to the inclusion of the cost of relining the ball mill.

TABLE 6. - Cost of milling at Tennessee-Schuykill mine, Caloride, Ariz., for September 1938 and first 9 months of 1938

Tons milled.....	September 1938 4,278		9 months 1938 41,611	
	Amount	Per ton	Amount	Per ton
Salaries and wages:				
Supervision.....	\$ 490.50	\$ 0.1147	\$ 4,599.80	\$ 0.1105
Elevating and crushing.....	350.00	.0841	3,467.93	.0833
Grinding and classifying.....	405.00	.0947	3,733.49	.0899
Flotation.....	450.00	.1052	4,218.87	.1014
Service men.....	342.52	.0777	3,079.48	.0740
Total salaries and wages.....	2,037.92	.4754	19,104.57	.4591
Power.....	1,510.26	.3530	14,096.04	.3388
Balls and miscellaneous supplies.....	216.87	.0509	5,752.71	.1383
Reagents.....	475.41	.1115	3,775.67	.0907
Repairs and replacements 1/2.....	2,413.17	.5662	5,516.76	.1326
Yard and camp.....	71.07	.0166	689.22	.0214
Compensation insurance.....	17.73	.0042	124.23	.0030
Water expense.....	100.00	.0237	1,000.00	.0240
Kantiate royalties.....	42.75	.0100	416.11	.0100
Unemployment tax.....	67.71	.0158	651.57	.0157
Old age benefit tax.....	21.54	.0050	225.13	.0054
Miscellaneous and office expense 2/.....	507.86	.1185	5,525.26	.1329
Total milling.....	8,150.45	1.9050	57,707.27	1.3870

1/ Includes new lining for ball mill.

2/ One-half of unapportioned expense arbitrarily added.

I.C. 7077

TABLE 7. - Summary of milling costs, September 1938, Tennessee-Schuykill Corporation
(4,273 tons milled)

	Operating labor	Super- vision	Power	Repairs		Balls and supplies	Reagents	Miscel- laneous	Total
				Labor	Supplies				
Crushing and elevating.	\$ 0.084	-	\$ 0.070	-	-	-	-	-	\$ 0.154
Grinding and classi- fying.....	.095	-	.118	-	-	\$ 0.191	-	-	.404
Flotation.....	.105	-	.165	-	-	-	\$ 0.112	1/ \$0.010	.392
General milling.....	.016	\$0.115	-	\$0.078	\$ 0.565	-	-	2/ .024	.798
Assaying, engineering, and office expense...	4/ .039	3/ .118	-	-	-	-	-	-	.118
Taxes and insurance....	-	-	-	-	-	-	-	-	.039
Total.....	.339	.233	.353	.078	.565	.191	.112	.034	1.905

1/ Xanthate royalties.

2/ Rental of water right, Dardenelles mine.

3/ One-half of engineering, assaying, and office expense.

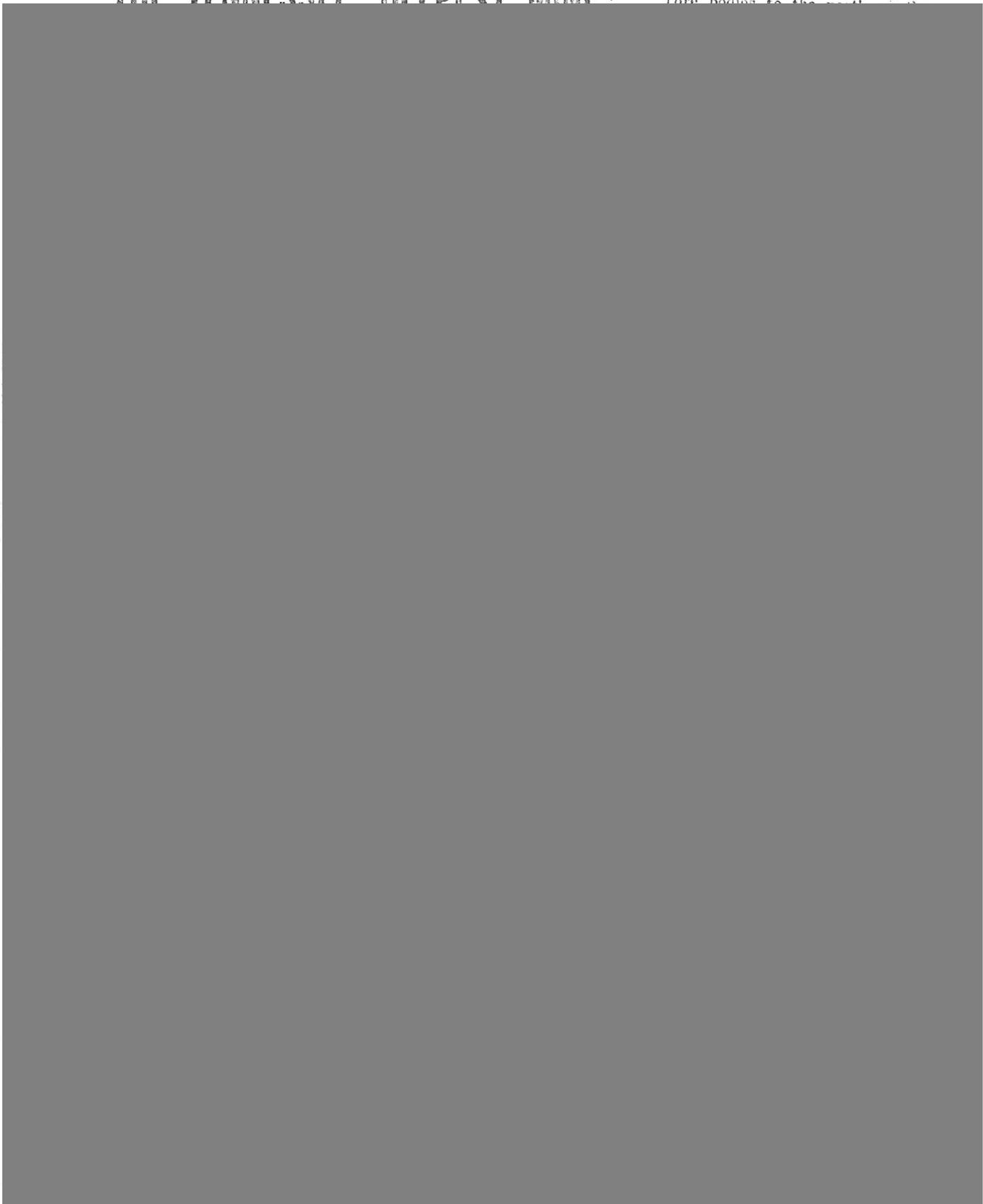
4/ Includes compensation insurance, unemployment tax, old age benefit tax, and medical expense.

©UPDATA 1976

Kingman

THE TENNESSEE DEEPEST MINE

large amount of saves, so that ti
ore bodies to the





November 11, 1944

Mr. Thomas Bardon, President,
Shattuck Lenn Mining Corporation,
c/o R. W. Higgins, Chicago Club,
Michigan Blvd. & Van Buren,
Chicago, Illinois.

Re: Tennessee-Schuykill Mine

Dear Mr. Bardon:

I returned late last night after spending two days at the Tennessee-Schuykill Mine at Chloride, Arizona.

The mine is 23 miles from the shipping point at Lingman, and trucking of concentrates is on paved road.

Equipment and improvements consist of a number of miners' houses, guest house, excellent office building, the usual number of mine structures, steel headframe, three acid electric compressors, Ottumwa double drum 100 HP mine hoist, and a 150 ton selective flotation plant which is generally in good condition.

The Tennessee Shaft, near the south end of the ore zone, is vertical, 1400 feet deep, and is sunk in the foot-wall. The Schuykill Shaft, 1450 feet north of the Tennessee Shaft, is 800 feet deep at an 80 degree incline in the ore zone. At present it is used only for ventilation and emergency mine exit.

The vein is a fissure in granite and gneiss, often associated with a quartz porphyry dike. The vein gangue is mostly quartz. Galena and sphalerite are the economic minerals, together with minor quantities of gold, silver and copper. The vein also contains about 10% of pyrite.

The stoped area is about 2000 feet long and extends down to the 1200 foot level with some stoping above the 1300 foot level at the north end of the mine. About one half of the vein area has been stoped, the intervening areas, because of small widths and low grade are not minable. Total extract-

Mr. Thomas Bardon:

2

November 11, 1944

ion to date is 541,750 tons, covering a period from 1901 to the present.

The values in the south or Tennessee end of the vein are chiefly lead and zinc, with but little gold and silver. The Schuykill ore has more gold, silver and lead than the south end.

Ore reserves as of January 1, 1944 showed 31609 tons of probable ore with a net smelter-mill value of \$8.38 per ton, and assay of Gold .06, Silver 2.22, Lead 4.08 and zinc 7.72. A block of ore north of the winze, estimated at 1600 tons, is typical of the better ores on the north end, assays Au. .22, Ag. 4.0, Pb. 9.1, Zn. 7.5, with a net smelter-mill value of \$16.27 per ton. Ore in this area must be hoisted through the winze to the 1200 foot level and trammed 1500 feet to the hoisting shaft.

The mine makes about 40 gallons of water a minute. The water contains enough sulfates and acid so that it is rather bad on pumps, pipe lines and mine rails.

The vein is moderately hard, though somewhat shattered. The hanging wall next to the vein is very soft for a depth of several inches to several feet. In general, the ground is heavy, caused by wall swell and the settling down of large blocks of vein on the timber. Stopes must be timbered with square sets and filled. Present costs of mining one square set containing about 13 tons is \$35 per set, with about \$15 more for filling. Most of the remaining blocks of ground will be expensive to recover, and to properly develop the north end of the mine at depth will entail a program so expensive that it is doubtful if this cost could be returned from proceeds of the ore developed.

Rather than submit more than a general brief report, I have prepared the enclosed figures from the available monthly reports on file at the mine office. The production is based on mill reports and may be slightly different than actual smelter returns. The costs do not include depreciation depletion or general administrative. A study of the monthly costs and net smelter returns indicates for 1943 \$10.67 per ton and \$6.75 per ton respectively. For eight months of 1944 the costs are \$16.47 per ton, net smelter returns of \$6.13, an operating revenue including "A" premiums, of \$9.73 per ton, and a loss even with "C" premiums.

Mr. Thomas Bardon:

3

November 11, 1944

While costs of operation could be reduced a little, and perhaps some improvement made in mill performance, these could not by any means cover the difference between costs and income with an "A" premium. It is doubtful that future prices will be as much as present ceiling plus "A" premiums.

While the mine is not bottomed, it appears that stope areas on the lower levels are becoming smaller with depth and that remaining ore will be small as compared with past production. Mining at greater depths will mean a high development cost and problems in haulage and ventilation which would offset any possible reduction in present operating cost.

In conclusion, I recommend that we do nothing with the property.

Yours very truly,

SHATTUCK DENN MINING CORPORATION

By

Manager

HFM:B

c.c. S. D. M. Corp.,
New York.

Visited 10/21/27

Tennessee Schuyler Mine

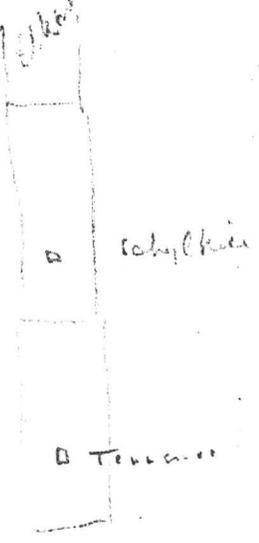
Arizona

Owned by Frank Garbutt

Rent & Lease held by

Kyle Manager

CS



Lower workings in bar shape. Did not go under

Mine developed to 1600 in Tennessee ground and 900 in Schuyler where it has

been connected with 900 Tennessee

by drift & poison

1600 Tennessee opened up by raise from

1425 level. Shaft down 1450 feet

Mines make 200 gallons a minute for 6 hours pump = 50 gallons a mile for 22 hrs

Tennessee Mine

Completely stopped to sea level.

Surface slopes to 1400 level with

filler down left and north end of stopes

2' to 3' pyrite in blue granite set top to wall

OK 900 level down to connect with Schuyler

practically continuous on from north end of

stopes to Schuyler shaft (projected in distance)

of 660' sinking total 1100' of which

including stopes for 1100' of which Tennessee end (south) 660' will average about as follows:-

width	gold	silver	Pb	Zn
3.6'	.06	4.9	9.3	19.0

1600 level & 1425 level just the same as above

as far as width & values

400' stopes between 1600 & 1500' leaving pillar of 200' ± a little more dist of 1100'

= $\frac{660 \times 3.6 \times 1100}{10} = 260000 \pm$ Ton, about 100,000 ±

1600' level

Tennessee Schuylkill (Cont)

Amount of Concentrate per day

Tennessee (100 tons) = $\frac{19}{28.3} \times \frac{1}{2.5} \times 100 = 27 \text{ tons}$

Schuylkill (50 tons) = $\frac{3.6}{6.7} \times \frac{1}{14} \times 50 = 2 \text{ tons}$

Total
of zinc concentrates (50% Zn) 29 tons

Also Tennessee (100 tons) = $\frac{9.3}{28.3} \times \frac{1}{6.5} \times 100 = 5 \text{ tons}$

Schuylkill (50 tons) = $\frac{3.1}{6.7} \times \frac{1}{20} \times 50 = 1 \text{ "}$

Total
of Pb conc. (60% Pb) 6 tons

Total Au + Ag = $2.55 \times 100 = 255$
 $5 \times 50 = 250$
\$ 505 daily

Combined Mines

On sight 188,800 ± tons

Profit in sight \$1,077,600

Minimum Capital in coal 200,000

Net profit in sight \$877,600

with payments on property out of this

Probable profits per day = \$1000

" " " year \$300,000

1932
1900.00
1015.00
485.00

360.00
282.50
141.50
1218.00
930.00

5
930.00

1000
1000
1000

Tennessee Schuyler (cont)

Schuyler Mine

One developed on quality 400' long.
 Average grade 900' as follows: -

Width	Au	Ag	Pb	Zn
3.7	.30	23	3.1	3.6

Best Silver values.

Silver	6.00
Silver	1.15
Total	7.15

3.1	Pb =	3.1 x	20 x	.7 x	.05 =	2.17
3.6	Zn =	3.6 x	20 x	.7 x	.05 =	2.52
Average =					7.15 x .7 =	5.00
						9.69

Total

Mining	5.00
Millage	1.50
Treated Pb	.21
Zn	.92

Total 7.63

Profit

7.63
\$2.06

On in sight 1000 x 600 x 3.7 = 888000 tons

Profit = \$177600 / 10

Each foot below 900 =

$$\frac{400 \times 3.7}{10} = 148$$

100' = 14800 tons

at 50 tons per day = 290 days

less than manager.

0.30
 1.15
 2.06
 2.17
 2.52
 5.00
 9.69
 3.1 x 20 = 62
 62 x .7 = 43.4
 43.4 x .05 = 2.17
 3.6 x 20 = 72
 72 x .7 = 50.4
 50.4 x .05 = 2.52
 7.15 x .7 = 5.00
 5.00 + 2.17 + 2.52 = 9.69
 9.69 - 7.63 = 2.06
 1000 x 600 x 3.7 = 888000 tons
 888000 / 50 = 17760 days
 17760 / 60 = 296 months
 296 / 12 = 24.6 years

Tennessee Schyzokite (cont)

Below 1600' level, if an shaft is 660' long
3.6' wide, each foot of depth will make

$$\frac{660 \times 3.6}{10} = \frac{237}{10} \text{ tons}$$

Every 100' will make 237.00 tons.
If we mined at rate of 100 tons a day
it will be necessary to ship $\frac{23700}{100} = 237$

At low rates a day 100' will be mined in 237 days

Values
0.6 gold = 4.9
4.9 silver = 2.45
Total Analy = 3.65

9.37 Pb =	9.37 x 70 x .7 x .05 =	6.51
19.1 Zn =	19.1 x 70 x .7 x .05 =	13.30
3.65 Analy =	3.65 x 7 =	2.55
<u>Total</u>		<u>22.36</u>

Mining	5.00	
Milling	2.50	
Treatment Pb	0.45	
" Zn	6.45	
	<u>13.40</u>	

Profit per ton \$ 8.96

It would be necessary to construct
a 150 ton mill = \$150,000

Total Profit in sight \$ 900,000

Weight

\$ 750,000

186
7
1300
5
650

19
38
7
266
138.0
= 85
2585

93
685
518
28.3
6.5
191.5
1659.5
9
1100
290
25

9.3
380
45
83.70
20.40
25.19
283

1
205

7071
2746
4225
5000
5000
5000

For Immediate Release.

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Mines
Washington

July 22, 1939

MINING AND MILLING METHODS AND COSTS AT TENNESSEE-SCHUYLKILL
CORPORATION MINE, CHLORIDE, ARIZONA

Mining and milling methods and costs at the Tennessee-Schuyldkill mine, Chloride, Mohave County, Ariz., are discussed in a report recently published by the Bureau of Mines, Department of the Interior. In 1937 and 1938 the mine was the second largest lead and zinc producer in the States. From 1901 to 1938 the total value of gold, silver, copper, lead, and zinc produced was over \$7,000,000.

About 115 men were employed daily during 1938 in mining and milling 150 tons of lead-zinc ore. Between \$350,000 and \$400,000 are expended annually, mostly for wages and supplies within the State. The ore was mined by the square-set method, modified to fit the varying width of the vein. This method is necessary because of the heavy ground. The ore was treated in a selective flotation mill. As water in the district is scarce, the operators found it necessary to use the acid water from the mine for milling. After considerable experimenting at the beginning, they were able to separate the lead and zinc minerals successfully by selective flotation in an acid circuit.

Concentrates were trucked to Kingman, Ariz., from which point they were shipped by rail to smelters. Jig and lead concentrates, carrying most of the gold and silver, were treated at the American Smelting & Refining Co.'s lead smelter at El Paso, Tex. Zinc concentrates were treated at a zinc smelter owned by the same company and situated at Amarillo, Tex.

Copies of this report designated as Information Circular 7077, "Mining and Milling Methods and Costs at the Tennessee-Schuyldkill Corporation Mine, Chloride, Ariz.," by Jacob Schoder and Paul T. Allsman, may be obtained from the Bureau of Mines, Washington, D. C.

**TENNESSEE SCHUYLKILL
CORPORATION**

**ANNUAL REPORT
1943**

OPERATIONS REPORT, 1943

N. A. WIMER, *President*
70 Pine Street
New York 5, New York

Summarizing the year 1943, our problems in operation were caused by poor, inadequate labor and worn-out machinery. It was apparent that labor would become more of a problem as the year progressed but this was a problem that would have to be met as it presented itself. There were numerous government directives and regulations controlling labor, and it was obvious that these regulations were becoming more stringent as attempts were made by the War Manpower Commission to control migration and labor pirating.

At the beginning of the year we were fully aware of the condition of the machinery, both of the mine and the mill. It was imperative that most of the machinery be replaced if we were to continue to operate, and it was necessary to make these replacements while continuing full scale operation with a minimum of lost production.

We were confronted with the task of determining which of the machinery was in the most critical condition. A plan was formulated for machinery replacements in 1943, and in January we started installation of a new 1200 cubic foot Sullivan Angle Compound air compressor.

The old compressor was in such condition that it would not run twenty-four hours without some repair. We managed to keep the old compressor in operation until the installation of the new one was completed.

During the installation of the new compressor, our underground pumping equipment rapidly approached a state of complete breakdown, but it was necessary to keep the mechanical crew on the installation of the compressor as without compressed air it would be impossible to operate.

In March, 1943, the compressor installation was complete and we began repairing the pumps. In the interim several milling problems developed which we had not anticipated at that time. One of these problems was repair of the flotation cells of which the wooden bottoms had rotted to an extent that four of them fell out. We also discovered that it would be necessary for us to install a thickener tank for the zinc concentrates, as with a larger production the filters would not filter the increased amount of zinc concentrates with the prevailing high moisture content. Hence, a Dorr Thickener was installed and put into operation.

A heavy duty Triplex pump had been purchased for installation on the 1400 level, but before this pump could be put into use the old pumps on the 1400 level developed a condition which was beyond our means of repair. Before other pumps could be installed, the 1400 level was flooded. To remove the water from the 1400 level and finish assembling the Triplex pump developed into a problem of major proportions due to the high acid content of the water and the inability to obtain equipment from the manufacturer. We finally borrowed equipment that was adaptable and the 1400 level was un-watered. By the middle of May, 1943, the un-watering was completed.

Due to the un-watering operations the shaft was tied up intermittently which hampered production and development.

By this time, our contract with the United Mine Workers of America had been signed and was in full effect. Up to this period labor had been a problem in that it was exceptionally poor quality and government control was in a stage of experimentation.

Numerous small properties and mines in the vicinity were starting operations on government loans. These smaller properties were offering higher wages than we were allowed to pay at this time. As our negotiations with the War Labor Board for approval of a raise in wages were still pending, our employees were becoming very restless and began to quit. The United States Employment Service was no help to us for replacements and before we obtained our wage raise in July our crew was not only poor quality but inadequate in number. At one time during this period we had six miners working compared to a normal total of thirty.

After the wage raise was approved in July, we had no difficulty in building up our crew to normal by the last of August. However, the quality of miner remained poor.

During this period the condition of the mill was becoming increasingly critical. We were, of course, obtaining continuance of mill operation by repairs that could be accomplished on the property. The shell of the ball mill had been cracked around its circumference for a period of approximately two years and it was held together with stay bolts and inadequate welding. This crack was continually becoming wider and negotiations were started for the purchase of a new ball mill and classifier.

During the month of October we had worked up to a point in the mine where we could again seriously consider the installation of a more modern and practical mining system, such as the sandfill. This is simply the process of using the mill tailings for stope fill. The surface plant and underground installations for the sandfill were completed in November and test filling was started on the surface.

By this time the new ball mill had been purchased and it was apparent that installation of the new mill should be made as quickly as possible due to the fact that the old mill was reaching a point where repair would not keep it operating.

The crew that was being used on the sandfill was then shifted to the new mill installation. To maintain operation of the old mill during this period required incessant repairs. Due to this, there followed much lost time in mill operation.

In December, 1943, the new mill was set on its foundations and at the end of the year there remained but a few minor details to be completed before the new ball mill was to be put into operation.

The labor situation has been static, that is there has been enough labor to operate but mostly of very poor quality, and it is my opinion that this situation will remain for the duration.

FRANK C. CASSIDY,
General Manager.

PRESIDENT'S REPORT, 1943

TO STOCKHOLDERS OF TENNESSEE SCHUYLKILL CORPORATION:

The year 1943 has presented many obstacles. Most of our troubles have been man-made which, of course, applies to the whole world. The major troubles with which our Corporation was confronted were labor, worn out machinery and housing shortages.

During the latter part of 1942, an effort was made by the United Mine Workers of America to organize the employees of the Tennessee Schuylkill Corporation into a union. In January, 1943, the National Labor Relations Board issued an order directing the Company to hold an election among the employees for the purpose of determining whether or not it was their wish to organize themselves into a union and appoint the United Mine Workers of America as their collective bargaining agent. This election was held on January 30th. Considerable publicity adverse to the interest of the Company was circulated in advance of the election by the union organizers. The election resulted in a victory for the union by a wide margin. Based on the advance publicity, the Company undertook to protest the result but the protest was rejected by the N.L.R.B.

After the election result was reported to the National Labor Relations Board, an order was issued directing the Company to enter into negotiations with representatives of the United Mine Workers of America with the object of making a contract between the Company and the Union covering wage rates and containing various other terms and conditions. The Union submitted their regular form of contract calling for closed shop, union dues and assessments to be withheld from employees' paychecks by the Company and paid over direct to United Mine Workers Headquarters in Washington, D. C., which is known as the check-off system, substantial wage raise, etc. After much negotiation and consultations with representatives of the Conciliation Service of the United States Department of Labor, an agreement as to the terms of the wage contract was reached and on March 29th the contract was signed. As signed, the contract called for union maintenance instead of closed shop, the check-off system, a wage raise of \$1.61 per shift, said wage increase to be retroactive to October 1, 1942.

Previous to the time the terms of the union contract were agreed to between the Company and the Union, all wages and salaries were frozen by Presidential Order. In order that the Union Contract and wage raise might become effective, it was necessary to submit the contract to the National War Labor Board. The Company was highly in favor of an increased wage rate at the Tennessee Mine because other western mines were paying higher wages making it impossible to recruit anything like a full crew to say nothing of the grade of the labor available to the Tennessee Mine. Every effort was made by the Company to obtain a decision from the National War Labor Board as early as possible. Assurance was given to the Company employees that the Company officials were exerting every means known to them to rush this decision. Apparently a goodly proportion of the employees did not believe this was being done and on June 18th, half or more of them went out on strike. Upon being advised through their union affiliations that no action would be taken by the National War Labor Board as long as a strike existed, the strike ended, it being of only two days duration. Under date of July 6th, the order of the National War Labor Board was issued approving

the wage contract in substantially the form it had been submitted. The new and higher wage rates went into effect July 16th, the result being the quantity of labor immediately picked up although there still remained much that could be asked for in the way of quality. It was found that retroactive wage payments called for under the National War Labor Board decision amounted to approximately \$35,000.

In making the application to the National War Labor Board, the Company had also submitted a request that permission be granted to increase the pay of employees receiving monthly salaries as well as those receiving an hourly wage. The National War Labor Board refused to accept jurisdiction over salaried employees and upon investigation it was learned that a new application would have to be made by the Company to the Salary Stabilization Unit of the Office of the Commissioner of Internal Revenue for permission to increase any salaries it was thought necessary. This brought about a condition where for a period of some months the wage earners were receiving more than their bosses. After passing through another maze of red tape, a decision was finally received from the Salary Stabilization Unit granting permission to increase salaries under date of September 23th and containing a clause making all such increases retroactive to April 1, 1943.

During all of these negotiations, naturally there were several changes in the staff which did not lessen the difficulties encountered in the effort being made to perfect the organization. One of the principal difficulties the Company has encountered is absenteeism among the hourly wage employees. In November, a Labor-Management Committee was established and measures taken to combat excessive absenteeism along with other things.

In the accompanying reports from the Operations and Engineering departments, mention is made of some of the principal difficulties that were overcome with regard to worn out machinery and the general run-down condition of the plant. Much could be added to what is said in these reports as they only deal with the major new installations.

The housing problem was another big difficulty that had to be overcome in the past year. Several residence houses were purchased by the Company and others leased and much time and money spent in rehabilitating them so as to make them fit for occupancy. The mill building was enlarged and a sizable warehouse was completed during the year.

There is submitted with this report a Balance Sheet and Income and Expense Statement covering the operations of the Corporation for 1943 which were prepared from the audited records of the Corporation.

In January, 1943, the United States Corporation Company, 15 Exchange Place, Jersey City, New Jersey, was appointed transfer agent for the Company's stock and given instructions covering the exchange of shares in the merged corporation as called for in the merger with another corporation voted on late in 1942. At the end of 1943, there remained in reserve for exchange, 285,457.5 shares of the 2,000,000 shares listed on the Balance Sheet as outstanding.

Referring to the Income and Expense Statement, it will be noted that the gross sales increased substantially (nearly \$200,000.) over 1942. This was due to increased premiums received by the Company for its production. Based on the fact that wages and materials had increased in price substantially, the Company made application at various times in 1943 for increased premiums. Early in the year, the Government changed its premium formula from the one that had been effective in 1942 to what is known as an A, B and C class of premiums. In February, your Corporation applied

for increased premiums and was granted a zero A and B and 225 ton C premiums retroactive to February 1st. Again in July, a further premium application was made to the Quota Committee in Washington, the result being that the Company was granted a zero A, B and C retroactive to February 1st and effective until July 1st after which time the rating of zero A, B and 50 ton C became effective and remained in effect for the rest of 1943.

Further reference to the Balance Sheet will show that the ore reserves carried at the end of 1942 are no longer carried as an asset. It was decided that following accepted accounting practice ore reserves, as shown by the Company's engineers in their periodical ore reserve reports, would not be written into the books as an asset and then gradually written off each month as mined. At the end of 1943, the Company's Engineering Department compiled a report showing the ore reserves as of that date to amount to 31,609 tons with a gross value of \$577,812.52 figured at B premium prices. This ore reserve compares favorably with the one of a year previous. The Tennessee Mine is a property that at no time shows large ore reserves. The ground is of such a nature that to open up large ore reserves in advance and hold the ground open would be a great expense. Present indications are that the supply of ore will continue in the future as it has in the past.

Based on the preliminary annual figures given in the Mineral Market Report of the United States Department of Interior, Bureau of Mines No. MSS1128, the Tennessee Mine produced the following percentage of recoverable metals of the entire production of the State of Arizona in 1943: Gold, 0.61%; silver, 1.13%; lead, 9.84%; zinc, 7.66%.

In January, 1943, the Tennessee Schuylkill Corporation requested the United States Bureau of Mines to make an examination of the Chloride district and if it was deemed advisable, to appropriate the necessary funds with which to do enough exploration work in the district to make certain determinations. This work has been completed but as yet, the Bureau of Mines has not made public their findings. In connection with this request, the United States Geological Survey had a crew of men in the district making new maps during the year.

In the early part of the year, there was considerable evidence of sabotage around the plant at the Tennessee Mine. The Federal Bureau of Investigation was called in and a thorough investigation made. No charges were brought, however, the apparent sabotage discontinued. The Company employed regularly constituted officers of the law to patrol the property at frequent intervals and instituted a system of identification badges to be worn by employees and all other persons permitted on the property. The United States Bureau of Mines made separate reports on the mine and the mill covering fire and sabotage hazards, safety precautions, blackout measures, etc.

During the first half of the year considerable trouble was had through a shortage of available food in the district. A petition was circulated among the employees of the Company requesting the Office of Price Administration to grant additional food supplies, especially meat, to the Chloride district. After about the middle of the year, measures were taken to relieve the situation and sufficient food supplies were available for the remainder of the year.

In September, the Company established a monthly publication for the benefit of stockholders and employees known as "The Chloride Miner". This publication has been well received and the Company plans to continue its publication.

N. A. WIMER,
President.

PRODUCTION AND DEVELOPMENT REPORT, 1943

MR. N. A. WIMER, *President*
70 Pine Street,
New York City 5, N. Y.

The production of the Tennessee Mine for the year 1943 was 38,286 dry tons with an average grade of:

<u>Gold</u>	<u>Silver</u>	<u>Lead</u>	<u>Zinc</u>
.036 oz.	2.01 oz.	3.70%	5.91%

Based on the average prices for the four metals for the year, this ore would have an average value, before mining and milling of \$14.81 per ton. The production was divided as follows:

<u>Production From</u>	<u>Tons</u>	<u>Oz. Gold</u>	<u>Oz. Silver</u>	<u>% Lead</u>	<u>% Zinc</u>	<u>Value/Ton</u>
Mining	36259	.037	2.06	3.80	6.02	\$15.14
Development	2027	.021	1.19	2.27	4.97	9.59

The ore from the Tennessee Mine was milled in the selective flotation plant on the property at the average rate of 106 tons per day to produce 3014.9790 dry tons of lead concentrate of the following grade:

<u>Gold</u>	<u>Silver</u>	<u>Lead</u>	<u>Zinc</u>
.320 oz.	21.35 oz.	43.08%	4.57%

and 3100.3885 dry tons of zinc concentrate of the following grade:

<u>Gold</u>	<u>Silver</u>	<u>Lead</u>	<u>Zinc</u>
.037 oz.	2.36 oz.	1.28%	51.87%

Mill recoveries were as follows:

	<u>Recovery in %</u>			
	<u>Gold</u>	<u>Silver</u>	<u>Lead</u>	<u>Zinc</u>
Lead Concentrate	69.9	83.7	91.7	6.1
Zinc Concentrate	8.4	9.5	2.8	71.1
Tailings	21.7	6.8	5.5	22.8

Metal shipped to the smelters is shown below:

	<u>Ozs. Gold</u>	<u>Ozs. Silver</u>	<u>Lbs. Lead</u>	<u>Lbs. Zinc</u>
Lead Concentrate to A. S. & R. at El Paso	963,9238	64,382.88	2,597,879	275,778
Zinc Concentrate to A. S. & R. at Amarillo	115,7089	7,315.54	79,306	3,216,431
Total	1,079,6327	71,698.42	2,677,185	3,492,209

The concentrates also contained 58,521 pounds of copper. Metal recoverable at the smelters and its value are as follows:

	<u>Value</u>	<u>Price</u>
Gold	1,056,4909 ozs. \$ 34,672.57	\$32.82 oz.
Silver	65,378.89 ozs. 46,170.26	70.6c oz.
Lead	2,400,665 lbs. 243,624.17	10.15c lb.
Zinc	2,909,908 lbs. 421,348.82	14.48c lb.
Total Gross Value	\$745,815.82	

Development work for the year consisted mainly of driving 905 drift further south to explore the Tennessee vein and driving 1231 drift southerly to explore the area below the 900 stopes. A raise was also driven to the 700 level and the level reopened for a distance of approximately 170 feet. The 1600 winze was also unwatered and repaired but the 1600 level was not worked. The development work totaling 1384 feet, is divided as follows:

	<u>Drifts</u>	<u>X-Cuts</u>	<u>Raises</u>	<u>Winzes</u>
New Development	360	283	368	14
Reopening old workings	168	4	0	187
Total	528	287	368	201

Diamond Drilling — 500 level — 460 feet.

TENNESSEE SCHUYLKILL CORPORATION

BALANCE SHEET

DECEMBER 31, 1943

ASSETS:

Cash on Hand and Due from Smelters	\$ 10,037.69	
Due from Metals Reserve Company	<u>27,856.76</u>	\$ 37,894.45
Special Deposits and Accounts Receivable		6,600.63
Mining Properties	\$ 84,929.97	
Development Thereof	<u>89,933.06</u>	
	\$174,863.03	
<i>Less:</i> Reserve for Depletion	<u>106,535.34</u>	68,327.69
Buildings, Machinery and Equipment:		
Buildings and Machinery	\$190,911.93	
Staff House and Furnishings	5,449.60	
Office Furniture and Equipment	<u>5,125.20</u>	
	\$201,486.73	
<i>Less:</i> Reserves for Depreciation	<u>57,547.98</u>	143,938.75
Supplies on Hand		17,916.36
Prepaid Insurance, etc.		<u>3,914.59</u>
TOTAL ASSETS		<u><u>\$278,592.47</u></u>

LIABILITIES AND CAPITAL:

Accounts and Accrued Wages Payable		\$ 55,253.38
Trade Acceptances Payable		10,930.64
Notes and Contracts Payable		21,194.16
Accrued Taxes, Insurance and Interest		29,724.12
Reserve for Federal Income Tax for 1943		14,382.85
Capital Stock Outstanding (2,000,000 shares 10c par) ..	\$200,000.00	
Deficit December 31, 1943, per Analysis of Surplus (Deficit) Account	<u>52,892.68</u>	147,107.32
TOTAL LIABILITIES AND CAPITAL		<u><u>\$278,592.47</u></u>

ANALYSIS OF SURPLUS (DEFICIT) ACCOUNT:

Deficit, January 1, 1943		\$ 2,422.52
Valuation of "Ore Reserves" written off	\$ 74,920.00	
Federal Income Tax for 1942	<u>3,456.86</u>	78,376.86
		\$ 80,799.33
Profit for 1943 after provision for Federal Income Taxes ..	\$ 25,018.75	
Sundry Surplus adjustments, net	<u>2,887.95</u>	27,906.70
DEFICIT, DECEMBER 31, 1943		<u><u>\$ 52,892.68</u></u>

TENNESSEE SCHUYLKILL CORPORATION

INCOME AND EXPENSE STATEMENT

DECEMBER 31, 1943

Sales—Lead and Zinc Concentrates		\$747,778.25
Smelting Charges, Transportation, etc.		<u>177,840.44</u>
Net Smelter Settlements		\$569,937.81
Miscellaneous Income		<u>4,005.23</u>
Gross Income		\$573,943.04
Production and Sampling Tax	\$ 2,640.23	
Milling Costs	84,972.23	
Mining Costs	304,214.94	
Overhead Expense (Yard, Camp, Assaying, Engineering and Mine Office)	48,819.17	
Maintaining Housing, Cafe and Staff House	7,382.39	
Administrative Expense	<u>38,831.44</u>	486,860.40
Profit before Depreciation and Depletion		\$ 87,082.64
Depreciation and Depletion		<u>47,681.04</u>
Profit before Provision for 1943 Income Taxes		\$ 39,401.60
Provision for Federal Income Taxes		<u>14,382.85</u>
Net Profit to Surplus Account		<u>\$ 25,018.75</u>

PRODUCTION AND DEVELOPMENT A COMPARISON OF 1942 AND 1943

	1941	1942	1943	1943-1942
TONNAGE	43,152	40,055	38,286	95.6%
COST PER TON				
Mining		\$ 5.9022	\$ 7.9456	134.6%
Milling		\$ 1.4800	\$ 2.2239	150.3%
AVERAGE HOURLY RATE FOR MINERS		\$ 0.869	\$ 1.141	131.3%
GRADE OF MILL HEADS				
Gold	0.073	0.063 oz.	0.036 oz.	57.1%
Silver	2.92	2.28 oz.	2.01 oz.	96.6%
Lead	5.5	4.19%	3.70%	88.3%
Zinc	5.53	5.16%	5.91%	105.3%
GRADE OF LEAD CONCENTRATE				
Gold		0.475 oz.	0.320 oz.	67.4%
Silver		16.34 oz.	21.35 oz.	130.7%
Lead		36.72%	43.08%	117.3%
Zinc		4.50%	4.57%	101.6%
GRADE OF ZINC CONCENTRATE				
Gold		0.054 oz.	0.037 oz.	68.5%
Silver		2.41 oz.	2.36 oz.	97.9%
Lead		0.29%	1.28%	441.4%
Zinc		54.51%	51.87%	95.2%
GRADE OF TAILINGS				
Gold		0.008 oz.	0.009 oz.	112.5%
Silver		0.10 oz.	0.16 oz.	160.0%
Lead		0.11%	0.24%	218.2%
Zinc		1.08%	1.61%	149.1%
RECOVERY OF METALS IN LEAD CONCENTRATE				
Gold		83.2%	69.9%	84.0%
Silver		87.1%	83.7%	96.1%
Lead		97.4%	91.7%	94.1%
Zinc		9.1%	6.1%	67.0%
ZINC CONCENTRATE				
Gold		6.5%	8.4%	129.2%
Silver		9.0%	9.5%	105.6%
Lead		0.5%	2.8%	560.0%
Zinc		75.03%	71.1%	94.4%
TAILINGS				
Gold		10.3%	21.7%	210.7%
Silver		3.9%	6.8%	174.4%
Lead		2.1%	5.5%	261.9%
Zinc		15.6%	22.8%	146.2%
PRODUCTION				
Ozs. Gold		2,278.08	1,079.63	47.4%
Ozs. Silver		80,194.30	71,698.42	89.4%
TO LEAD SMELTER				
Lbs. Lead		3,267,120	2,597,879	79.5%
Lbs. Zinc		410,360	275,778	67.2%
TO ZINC SMELTER				
Lbs. Lead		17,760	79,306	446.5%
Lbs. Zinc		3,383,980	3,216,431	95.0%
TOTAL LBS. LEAD		3,284,880	2,677,185	81.5%
TOTAL LBS. ZINC		3,794,340	3,492,209	92.0%
FEET OF NEW DEVELOPMENT		1411	1025	72.6%
FEET OF REOPENING OLD WORKINGS		0	359	
FEET OF DIAMOND DRILLING		1482	460	31.0%

*Our Reserves end of 1943: 31,609 tons with
gross value \$577,812.52 at B premium prices*

Yours very truly,

W. C. WIMER, E. M.

Closed down about Jan. 1948

**PRODUCTION AND DEVELOPMENT
A COMPARISON OF 1942 AND 1943**

	1941	1942	1943	1943-1942
TONNAGE	45,150	40,055	38,236	95.6%
COST PER TON				
Mining	.875	\$ 5.9022	\$ 7.9156	134.6%
Milling		\$ 1.4800	\$ 2.2239	150.3%
AVERAGE HOURLY RATE FOR MINERS		\$ 0.869	\$ 1.141	131.3%
GRADE OF MILL HEADS				
Gold	.073	0.063 oz.	0.036 oz.	57.1%
Silver	2.92	2.28 oz.	2.01 oz.	96.6%
Lead	5.2	4.19%	3.70%	88.3%
Zinc	5.53	5.16%	5.91%	105.3%
GRADE OF LEAD CONCENTRATE				
Gold		0.475 oz.	0.320 oz.	67.4%
Silver		16.34 oz.	21.35 oz.	130.7%
Lead		36.72%	43.08%	117.3%
Zinc		4.50%	4.57%	101.6%
GRADE OF ZINC CONCENTRATE				
Gold		0.054 oz.	0.037 oz.	68.5%
Silver		2.41 oz.	2.36 oz.	97.9%
Lead		0.29%	1.28%	441.4%
Zinc		54.51%	51.87%	95.2%
GRADE OF TAILINGS				
Gold		0.008 oz.	0.009 oz.	112.5%
Silver		0.10 oz.	0.16 oz.	160.0%
Lead		0.11%	0.24%	218.2%
Zinc		1.08%	1.61%	149.1%
RECOVERY OF METALS IN LEAD CONCENTRATE				
Gold		83.2%	69.9%	84.0%
Silver		87.1%	83.7%	96.1%
Lead		97.4%	91.7%	94.1%
Zinc		9.1%	6.1%	67.0%
ZINC CONCENTRATE				
Gold		6.5%	8.4%	129.2%
Silver		9.0%	9.5%	105.6%
Lead		0.5%	2.8%	560.0%
Zinc		75.03%	71.1%	94.4%
TAILINGS				
Gold		10.3%	21.7%	210.7%
Silver		3.9%	6.8%	174.4%
Lead		2.1%	5.5%	261.9%
Zinc		15.6%	22.8%	146.2%
PRODUCTION				
Ozs. Gold		2,278.08	1,079.63	47.4%
Ozs. Silver		80,194.30	71,693.42	89.4%
TO LEAD SMELTER				
Lbs. Lead		3,267,120	2,597,879	79.5%
Lbs. Zinc		410,360	275,778	67.2%
TO ZINC SMELTER				
Lbs. Lead		17,760	79,406	446.5%
Lbs. Zinc		3,383,980	3,216,431	95.0%
TOTAL LBS. LEAD		3,284,880	2,677,185	81.5%
TOTAL LBS. ZINC		3,794,340	3,192,209	92.0%
FEET OF NEW DEVELOPMENT		1111	1025	92.6%
FEET OF REOPENING OLD WORKINGS		0	359	
FEET OF DIAMOND DRILLING		1482	400	26.9%

*These are based on
the new method of 1943 3,607 tons
having year value of \$8,777,812.50
at 13 premium prices.*

Yours very truly,

W. C. WIMER, F. M.

November 1, 1956

Mr. C. P. Keegel
1721 S. 14th Street
Las Vegas, Nevada

Dear Mr. Keegel:

Replying to your letter of recent date, the only information we have on the production of the Tennessee-Schuylkill operation which is contained in U. S. Bureau of Mines MINERALS YEARBOOKS and is as follows:

1938 -	54,000	lead-zinc-ore
1939 -	11,588	tons lead-zinc-ore
1940 -	55,521	tons " " "
		(Property was ranked first in the production of zinc and 2nd, in the production of lead in the State).
1941 -	45,150	tons lead-zinc-ore
1942 -	40,005	tons " " "
1943 -	38,286	tons (grade averaged 0.04 ozs. gold, 2.1 ozs. silver, 0.10% copper, 3.70% lead, 5.65% zinc per ton).

We have no data on the Elkhart mine.

Yours very truly,

Richard T. Moore
Asst. Geologist

REFERENCES

see Book V-V - A.L. Flagg vanadium reports

See: USGS Bull. 978-E - Page 158

See report by Medy Fritzler in Cerbat Mineral Co., Ltd. file

Arizona Mineral Commodity Update on Zinc, by D. D. Rabb, Bureau of Geology and Mineral Technology, filed in zinc commodity file.

See: "Cerbat Mtn. Country", by Roman Malach, Mohave Cty. Historian, Pg. 27, 43, & 44. & Mohave Co. Place Names", Pg. 21, 1982

USGS Bul. 340, p. 63

New Jersey Mine (file)

USGS Bul. 397, p. 54-57

Arizona Mining Journal, August 1920, p. 13

ABM Bul. 140, p. 95

ABM Bul. 145, p. 111-112/117-118

Malach, R., Mohave County Mines, 1977, p. 29

MILS Sheet sequence number 0040150781

Thomas, B. E., Geology of the Chloride Quad, 1953, p. 406 - Geology File

others are separated from them by several inches of soft argillaceous or talcose gouge. The gangue is quartz and the ores are sulphides of silver, lead, copper, and zinc, generally containing gold. Silver and lead predominate in the Chloride, Mineral Park, and Stockton Hill districts, and gold and silver in the Cerbat district.

The ore deposits as seen in some mines suggest two epochs of ore deposition which have been followed by deep oxidation and sulphide enrichment. The great depth of this oxidized ore is a favorable indication for the future of the district. Many of the mines, notably in the Chloride and Mineral Park districts, which near the surface were silver mines, with increase in depth have become base-metal or lead mines, and with greater depths are becoming cupriferous. The so-called copper belt of the area extends from Mineral Park northwestward toward Chloride, a distance of several miles.

CHLORIDE DISTRICT.

General outline.—The Chloride district, the most important in the region, is situated about 20 miles north-northwest of Kingman, on the west slope of the Cerbat Mountains and the adjacent border of Sacramento Valley. It covers an irregular area about 6 miles in diameter. The mountainous portion is in part rugged, and is scored by several deep washes. Within a distance of about 2 miles the surface descends from the altitude of 6,000 feet at the crest of the range to about 4,000 feet at its base, where it meets the plain of Sacramento Valley.

Chloride, the shipping and distributing point, is favorably situated just northwest of the center of the district in the open border of the valley at 4,000 feet elevation. As a camp it dates from the early sixties and as a town from the early seventies. From that time it continued to be more or less active and in 1899 and 1900 reached its zenith, with a population of about 2,000; but for the last four or five years it has been very quiet. Several of the more important mines, however, are in operation and considerable work is being done on a score of other good properties. Lack of water has been the chief drawback, but the deeper mines show that by sinking wells plenty of water can be obtained.

Many of the veins are persistent and have an extent of nearly a mile. The ores carry principally silver and lead, with some gold and copper. They have produced several hundred thousand tons of lead and several millions of dollars in gold and silver. Exact figures are not available.

The district contains about 20 mines, located mostly in the lower slope of the mountains. Six of these mines have been opened to depths of 500 to 600 feet, and many others range from 200 to 300 feet in depth. The most important are the Tennessee, Samoa, Lucky

Boy, Towne, Pinkham, Altata, Midnight, Minnesota-Connor, Elkhart, Schuylkill, Juno, and Pay Roll, the first seven being the principal present producers. Of these the Samoa, Minnesota-Connor, and Tennessee are the most prominent.

Tennessee mine.—The Tennessee mine is located a mile east of Chloride, at the base of the mountains, its elevation being 4,050 feet. The country rock is pre-Cambrian gneiss, with granite and schist occurring near by. The gneiss is composed essentially of sericitized feldspar and crushed quartz. The mine is located on the Tennessee vein, which further north has also been opened by the Schuylkill and Elkhart mines. It is developed to the depth of 600 feet by two shafts and six levels, which aggregate about 5,000 feet of workings. It produces some water. The principal surface improvements are a well-equipped 100-ton concentrating mill and two steam hoists.

The vein dips steeply to the east. The croppings show quartz stained brown or black by iron and manganese oxides. The walls are hard, smooth, and regular and show several systems of slickensiding. In places the vein itself is fissured. The ore contains the sulphides of lead, zinc, and iron, carrying silver values and some gold and copper. Its average run of mine, omitting zinc, is about as follows: Lead, 20 to 70 per cent, concentrates 75 per cent; silver, 8 ounces, concentrates 25 ounces; gold, small amount; copper, some in deep part of mine. Of the output about one-third is high-grade shipping ore; the remainder is milled.

The mine has been productive from the surface. Thousands of tons of rich galena have been shipped to the smelter from the upper 400 feet. Here the ore shoot had a horizontal extent of about 250 feet, and was locally 15 feet in width. There is still much good ore in this section of the mine. On the 400-foot level solid galena was mined for a vein width of 21 feet and 5 inches, extending horizontally for about 40 feet. From the fourth to the fifth level there is a decrease in the value of the ore due to local increase of zinc, but from the fifth to the sixth level the ore again contains more lead. The 500-foot level contains good ore for a distance of 800 feet and the upraise from it yields much solid galena. Toward the end of the 200-foot drift north, on the 600-foot level, the vein now shows about as follows beginning on the hanging-wall side: Good ore with quartz coming in toward hanging wall, 2 feet 9 inches; milky quartz waste, 8 inches; fair-grade ore with bunches or lenses of feldspar and quartz, 7 feet. It is stated that the tailings on the dump contain much zinc blende which can be recovered by concentration. The ore is shipped to the smelter at Needles, on Colorado River, or to Deming, in southwestern New Mexico.

Samoa mine.—The Samoa mine is situated $3\frac{1}{2}$ miles east of Chloride, near the crest of the range, at an elevation of about 6,000 feet.

It is developed to a depth of about 400 feet by tunnels, shafts, and drifts, aggregating over 3,000 feet of underground work. It produces some water. The principal surface improvements are two well-equipped power plants, with gasoline engines, aggregating about 90 horsepower, for operating the steam and air-compressor drills and the hoists. The country rock is principally dark medium-grained biotite granite of pre-Cambrian (?) age. It is intruded by the light aplitic granite near by. There are six veins, which strike nearly north and are either vertical or dip steeply to the east. Of these the principal producer, known as No. 3, is about 4 feet thick and its ore shoot ranges from 1 to 30 inches in width. The ore contains gold and silver, some galena, pyrite, zinc blende, and here and there a little molybdenum. As shown by the smelter return sheets from 1903 to 1906 inclusive, it averages about as follows: Gold, 1½ ounces; silver, 15 ounces per ton; lead, 8 per cent; and zinc, 5 to 8 per cent. The total production has been about \$180,000. The present rate of output is about 90 tons per month. The ore is shipped principally to the Needles smelter.

Towne mine.—The Towne mine is situated 1½ miles southeast of Chloride, in the Sacramento Valley about one-half mile from the base of the mountains. It is developed by six shafts and drifts. It produces considerable water. The country rock is pre-Cambrian schist. A vogesite dike is associated with the vein on the foot-wall side. The vein, which is 3 to 8 feet wide, dips steeply to the north.

The gangue is quartz and the ore shoot, ranging from 3 to 18 inches in width, averages about 5 inches and favors the foot-wall or dike side of the vein. The ore contains silver, gold, copper, lead, and zinc and runs about \$200 per ton mostly in gold and silver. The production from 1882 to 1906 was about \$100,000.

Pinkham mine.—The Pinkham mine, perhaps the most important copper mine of the region, is located about 2 miles southeast of Chloride, near the foot of the mountains. It is developed by a 250-foot shaft and five levels containing about 1,000 feet of drift and crosscuts. It contains considerable water. The principal surface equipments are a steam hoist and two smelters, one coke and one oil, both recently installed. The country rock is pre-Cambrian granite. The vein is about 12 feet in width. It strikes N. 30° W. and is nearly vertical. The ore occurs in elongated lentils and chimneys. It is mostly chalcocopyrite and bornite associated with iron sulphide, and averages about 3 per cent of copper and 18 ounces per ton of silver.

Midnight mine.—In the Midnight mine, situated near the Pinkham mine, the vein is less well defined than the Pinkham vein and contains considerable zinc. A recent carload shipment of the ore ran silver 66 ounces per ton, copper 4.5 per cent, and gold \$2.50 per ton. The production under the present management is reported to be 100

tons of shipping ore, averaging
ing ore, containing values of about

In association with the Pinkham
ting the pre-Cambrian rocks near
base dikes.

General outline.—The Mineral
southeast of Chloride, mainly in
between the elevations of 4,000
westward into the Sacramento V
Wash. Chloride is the principal
freight are hauled direct to the

The first locations were made
soon taken out and shipped to the
a cost for freight of \$125 per ton
less active until 1882, since which
of the mines being worked.

The pre-Cambrian complex is
mass of aplitic granite and by d
The deposits contain gold, silver
occur together, mostly in fissures
extensive. The mines, number
exceed 300 feet in depth or 1
work. Some of the principal
Queen Bee, Tyler, Keystone,
Bug, Standard, and Golden S
at present are the Keystone, Ty

Keystone mine.—The Keystone
about one-fourth mile east of M
by a 450-foot shaft and 500 fe
foot level, above which the g
The principal country rock is
to the north. The ore occurs
a quartz gangue. It contains
ter grade running 200 ounces
glance; 2½ per cent of copper;
per cent of iron. Locally it
side of the lenses. It is rich
averaging \$20 or more per ton
None lower than this grade is
per month. As most of the
be milled on the ground. The

Tyler mine.—The Tyler mi
eral Park, near the summit of

TENNESSEE-SCHUYLKILL MINE REPORTS

Month 1943	Tons	Assays Hls				Operating Cost	Per Ton	Net Smelter Value Concts.	Per Ton	Value with Premiums		
		<u>Au.</u>	<u>Ag.</u>	<u>Pb.</u>	<u>Zn.</u>					<u>A</u>	<u>B</u>	<u>C</u>
Jan.	3990					\$ 28329.00	7.10	\$ 20034.00	5.02			
Feb.	2769	.05	1.7	3.4	7.8	25578.00	9.23	21017.00	7.59			
Mar.	3730	.044	2.0	4.3	8.3	29384.00	7.86	29918.00	8.02			
Apr.	3434	.03	2.0	4.2	6.6	24343.00	7.08	29059.00	8.46			
May	2690	.03	1.8	3.6	6.9	30390.00	11.30	17577.00	6.53			
June	3191	.02	1.6	3.1	5.2	33111.00	10.38	15797.00	4.95	\$25884	35891	
July	3471	.03	1.7	2.8	5.2	38035.00	10.96	16810.00	4.84	27033	37387	
Aug.	3906	.03	1.9	3.3	6.7	39835.00	10.20	26443.00	6.74	42747	59247	67163
Sept.	3289	.04	2.1	3.4	6.8	37765.00	11.48	24321.00	7.39	38960	53599	60282
Oct.	3403	.03	2.3	3.4	6.4	46500.00	13.60	24143.00	7.09	38399	52655	58619
Nov.	2877	.03	2.1	2.8	6.8	44000.00	15.29	18412.00	6.39	29904	41395	46348
Dec.	2685	.04	2.5	4.8	7.2	43511.00	16.20	22812.00	8.50	36566	50320	55227
	39435					420781.00	10.67	266343.00	6.75			
1944												
Jan.	2298	.04	2.8	4.8	8.1	45459.00	19.78	19803.00	8.61	\$32394	44985	49476
Feb.	1982	.04	2.8	4.6	8.1	41175.00	20.77	17794.00	8.98	29016.	40239	44421
Mar.	1978	.04	1.9	3.8	6.0	41911.00	21.19	12815.00	6.48	21210	29604	31767
Apr.	2683	.03	1.8	3.3	6.9	38808.00	14.46	15474.00	5.77	26803		42440
May	3019	.024	1.2	2.6	4.8	36464.00	20.78 12.07	9716.00	3.22	17103		26174
June	2407	.032	1.9	3.5	6.7	36160.00	15.02	15035.00	6.24	25214		38890
July	2480	.030	1.5	3.3	5.8	38154.00	15.38	13942.00	5.62	23531		38772
Aug.	2170	.030	1.3	3.3	5.3	35114.00	16.18	11975.00	5.51	19867		32254
	19017					\$ 313145.00	16.47	116554.00	6.13	\$ 185138		\$ 304194
										9.73 Per Ton		

CONCENTRATED MINING ACTIVITIES FROM ARIZONA, WESTERN NEW MEXICO, SONORA

COCHISE

mining engineer
go, Cal., has been
n Payson District
ntis and the M

gist for the Old
Globe, has been
e Phelps Dodge

been retained by
pper Corporation
ts in connection
ts and has sailed
k on June 30.

ft boss for the
ning & Smelting
o take charge of
st Gulch road
on of Gila County

, recently of the
dated Arizona
it, Arizona, has
nd operations with
r Co. at Jerome

resigned as
Cornelia Copper
open an engine
ies, Cal. He was
Coope, of Ajo,

will continue
e asbestos deposi
n Carlos Indian
r is now able to
luties at Washing

was taken serious
ical reconnaissance
ed to Washington
proved after
ni-Inspiration H

is left the Estaca
ontra Estaca,
the Delores
as H. D. H
intendent for
ny.

ampton, former
with J. P. S
has moved to
Santa Monica
ed offices as
ik A. Cramp

marly of Phoenix
is headquarters
ned from New
now engaged
Colorado. He
the summer
ke City.

assistant geologist
er Company, at
York, June 1
ople, Turkey,
up a mining
Mr. Eyoab

U. S. Geology
nsferred from
's office in
will be associ
Mr. Hill's field
ill include the
to some extent

is

is

The Grand Central mine of Tombstone
is that about 50 lessors are at work
on the property and between 90 and 100
tons of ore monthly are being shipped,
the average being from \$10 to \$50 per

The Apex group of claims, belonging to
the Lavell Mining Company, have been
sold at a sheriff's sale.

The Wolverine Mining Company has
shut up entirely mining operations in
the new workings and has returned to the
old workings. Much retimbering will be done
and fallen rocks cleared away.

The ventilating shaft of the C. & A.
Company below the Junction shaft has
reached a depth of 310. The shaft when
completed will be more than 800 feet in
length. New machinery is also being in-

stalled.
The Boras Leasing Company, Bisbee,
has just paid a dividend of 10 cents per
share on its capitalization and expects
to continue monthly payments at this rate,
in report from Bisbee.

The report comes from Don Cabezas
of the Central Copper Company has
acquired the entire holdings of the Mascot
Copper Company, including the townsite
and railroad to Willcox.

The Hilltop mine, near Paradise, is said
to be planning a smelter and railroad.
The property is owned and operated by
J. O. Fife of Kansas City.

GILA

The Iron Cap's new mill is giving very
good results. Developments are being
made on the 1300 level, the level being in
milling grade ore for a distance of
15 feet.

The Superior & Boston, Globe, are
fully pressing forward with their un-
derground work, less water having been
encountered during the last month than in
the history of the company.

The Arizona Commercial has opened a
shaft of 85 feet in ore on the 16th level
and averages 10 per cent copper, is re-
ported from that section. The company is
shipping about 600,000 pounds of cop-
per monthly.

The Jerome-Superior Copper Company,
Hopewell, is being electrified
throughout. Much new machinery is be-
ing installed and the old steam plant re-
now engaged. It is said the company will put
the shaft down to 2000 if necessary.
Carson & McAuliffe are making ship-
ments by truck from their property on
Creek to Globe.

The Old Dominion, Globe, is developing
the "A" shaft of the Maggie vein with
satisfactory results.

The Bishop Knoll property at Payson
has started operations and are now pre-
paring to carry forward a consistent de-
velopment program.

Reports are expected from the
Spring Springs mine when they hit
the vein. The former strike was on Vein
E and the Vein E is the largest on the
mine.

The reported sale of the Inspiration
Needles to B. C. Granville has been con-
firmed. This property, which is adjoin-
ing the Inspiration is being financed in
the east and will soon enter upon an ac-
tive development program.

GRAMHAM

The Grand Reef Mine, near Safford,
has been purchased by the Aravaipa Leas-
ing Company. It is stated that the new
company will make vast improvements
on the property, chief among which will
be a railroad from the mine to either
Willcox or Pima. Other improvements
will be new buildings, mill, air compres-
sors, diamond drills, etc.

MARICOPA

The Grande Mining Company, three
miles west of Hot Springs Junction, will
resume development work soon. The ore
is low grade silver-gold.

The Gold Prince mine is continuing de-
velopment with excellent results. This
property is eight miles from Beardsley
and 80 miles from Phoenix.

MOHAVE

It is said the IXL, 14 miles north of
Kingman, has been reopened and rich ore
broken into after sinking 100 feet in an
old shaft.

The United American, Oatman, is re-
ported to have opened up an ore shoot
180 feet west from the crosscut and about
30 feet going east. They are working
two shafts.

Testing for mill process for the Tennes-
see mine, Chloride, is being done at the
M. B. Dudley laboratories at the C. O. D.
mine.

In crosscutting into the ore body on
the 400 level of the Catherine, Kingman,
a water body was opened that has flood-
ed that level. It is said that enough
ore has been exposed to keep a milling
plant busy for years.

The ore body recently opened on the
180 level of the Rural mine near King-
man, is showing better values with ad-
ditional work, is the report of local papers.

The Diamond Joe mine, Kingman, has
entered a splendid body of ore. The
main shaft is to be carried down to the
300 level and drifting done from that
level.

Philip Smith, of Chloride, has shipped
a carload of ore from the old Arthur
claim. This claim was formerly known
as the Independence.

A big body of water has impeded pro-
gress on the crosscut of the Thumb Butte
mine.

The Pawva claim, formerly the old Jon-
athan, near the Frost ranch, is being
worked.

It is said the Tennessee Company will
build a mill and start operations on a
large scale soon.

The Tom Reed Gold mine, Oatman, is
said to have sufficient ore in sight to
keep the mill running to capacity for a
year without any new exploration work.

It is said the Highland Chief property,

near Oatman, will be developed soon.
The direct development is in charge of
Frank Aspen.

The Green Quartz mine, Oatman, has
installed a Gibson mill. The shaft is
down 140 feet, but the water is up to the
75-foot level and they are not yet equip-
ped to handle the water.

The Dardanelles, Chloride, is shipping
ore and expects to put on a larger force
of men shortly.

The Cyclopic mine, Kingman, is said to
be operating its mill with a big saving in
values.

The Blue Jacket mine near Crown King,
have made recent developments that show
great improvement in the property.

The Distaff mine recently shipped from
Chloride a car of ore which is expected
to bring about \$8000.

The Wilhelm group of mines in the
Secret Pass section, about four miles from
Goldroad, have been taken over by the
Secret Pass Mining Company. This prop-
erty is said to be rich in gold.

The Silver Trails Mining Company has
lately been organized by C. W. Herndon.
This company will finance and operate
the Diamond Joe mine.

The Payroll at Chloride has resumed
work with one shift of men. It is said
work on the Rankin tunnel will commence
in the early fall.

We are informed that ore has been
reached in the drift on No. 1 vein in the
Hidden Treasure, Chloride, the ore body
being four feet thick and well mineralized.

The Kingman Consolidated Mines Com-
pany is making rapid progress with its
tunnel. The face of the bore is said to
be all in ore. It is expected that a big
flow of water will be encountered.

The drift from the 50-foot level from
the Buckeye shaft, Mineral Park, is being
driven in rich ore, is report of local pa-
pers.

The Golden Star mine at Mineral Park,
has broken into ore on the 180 level, hav-
ing a value of \$1200 per ton, according
to report.

Work in the shaft at the Molly Gibson-
Chloride has ceased for a short time. At
present a station is being cut at the 100
and a pump placed to keep the water out.

Recent developments at the Grannis
mines in Deluge Wash, is said to have
exposed good grade milling ore.

PIMA

General Manager Kelso of the Arizona-
Tucson Copper Company, Tucson, reports
the completion of the installation of
equipment on the company's property.
The double compartment shaft has
reached a depth of 200 feet and is going
down.

PINAL

The Magma Chief Copper Company,
Sombbrero Butte, is shipping regularly,
three trucks hauling the ore to the Hay-
den Smelter. Two shifts of workmen are
employed and development work is being
kept well ahead of ore extraction.

(Continued to Page 30)

RECEIVED

DEC 15 1947

DEPT. MINERAL RESOURCES
PHOENIX, ARIZONA

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 1,009 Lbs.) (Lead 61,966 Lbs.) (Zinc 75,520 Lbs.)

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

(Copper 1,507.5 Lbs.) (Lead 63,385 Lbs.) (Zinc 116,810 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?

(Copper 1,000 Lbs.) (Lead 65,000 Lbs.) (Zinc 120,000 Lbs.)

4. What is your estimate of production per month if some incentive plan such as the Russell Bill were in effect?

(Copper 2,500 Lbs.) (Lead 85,000 Lbs.) (Zinc 160,000 Lbs.)

5. General remarks: Since the Presidents veto of the Allen Bill we have been losing about \$6,000 per month. Unless premiums are re-instated we will be forced to close down in January 1948

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

CHD:mh

We have tried all means to to improve our grade of ore and cut our costs, but have had little success.
Miners Co-operative Association operating

From Arizona Bureau of Mines Bulletin # 140

	Cu	Pb (lbs)	Au	Ag	Total Value
Tennessee 1890-1930	1,000,000 lbs	30,000,000	\$30,000	\$650,000	\$5,500,000*
Schuykill 1900-1930	-	2,000,000	5,000	20,000	125,000

* includes about 20,000,000 lbs Zn

U.S.B.M. Minerals Yearbook ^{K₂}

Tennessee - Schuykill

	Tons Produced	%Cu	Pb	Zn	Au	Ag	Remarks
1931-5	None						T-S one of 34 mines producing 14,775
1936							60 ton mill Pb-Zn, T-S 2nd largest Pb producer in Tenn.
7	59,990						
8	54,092						
9	11,588						Closed Jan. to Oct.
1940	55,521						
1	45,150						150 Ton mill. 2nd in Pb 3rd in Zn
2	40,055						
3	38,286	0.1	3.7	5.65	.04	2.01	
4	20,300						Closed Oct. 6 Lack of labor
5	11,523		6.01	7.17	.075	2.517	Jan 1 - Oct 20 by Miners Operating Co.
6	3,555		4.15	7.03	.05	2.5	Miners Co-op Assoc.
7	11,797		3.60	6.50	.02	1.95	"
8	13,231		2.74	6.04	.024	1.48	Closed Dec 1948
	None since						

Total 1931-1958 365,088

(From U.S.B.M. MINERALS YEARBOOKS)

From Arizona Bureau of Mines Bulletin # 140

	Cu	Pb (lbs)	Au	Ag	Total Value
Tennessee 1890-1930	1,000,000 lbs	30,000,000	\$50,000	\$650,000	\$5,500,000*
Schuykill 1900-1930	-	2,000,000	5,000	20,000	125,000

* includes about 20,000,000 lbs Zn

Kingman 11/11/32

Whittlesey, McLane and Company of Detroit, Michigan, failed to exercise their 60-day option granted on the Tennessee-Schuylkill mines at Chloride, Arizona. The Mon-

The date of complete mill operations is nearing at the Tennessee-Schuylkill mine at Chloride. Many new additions are being made to the present milling plant and the actual date of starting

Maple
8-13-53



Yield Tripled
At Lead Mine ¹⁹⁴⁷

Si
cc
se
C
pl

Ralph R. Langley, president, Box 1200, Kingman; R. H. Leshner, secretary-treasurer, and Charles P. Elmer, a director.

tendent.

Present 3-30-46

Present 3-30-46

Present 4-30-45

5
e

L. Chapman is manager of operations.

July - 1-30-44

is
r-
D-
r-
e
s
r
e

the
ine
red
ed
nes
de.
ent
on
be
w
of
s,
s-
e-
y
d-

Cherry
3-30-45

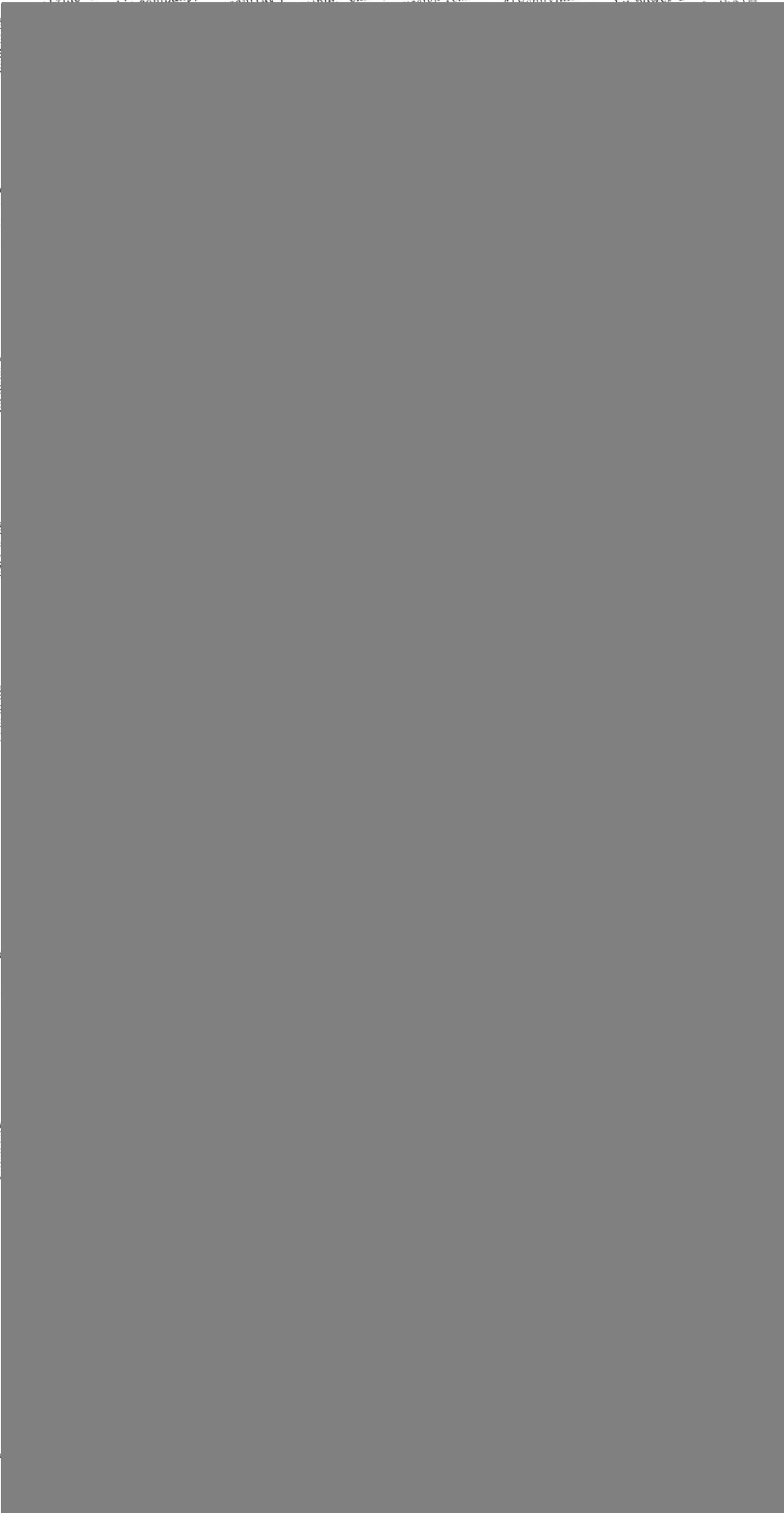
ed
ng
at
ce
10
o.
7
x
July - 30-45



THE MINING JOURNAL for MAY 15, 1944



zinc ore were company, shipped lead chiefly because resistance Babynkill mine and power furnished

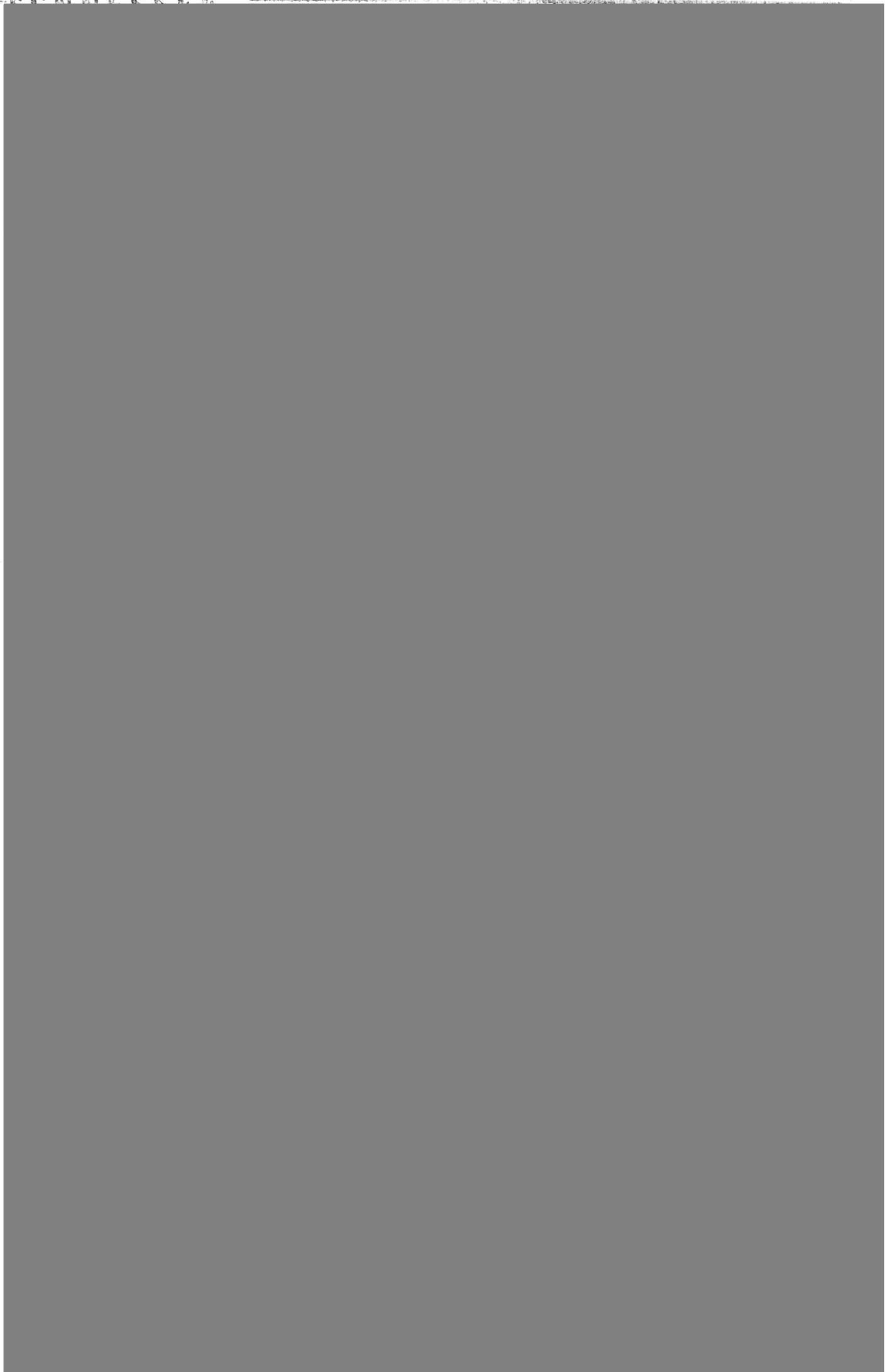
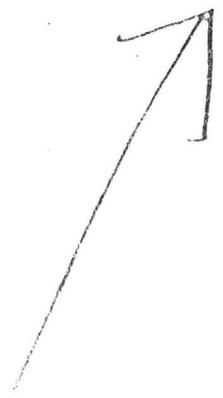


... of ... also a good ...

**Chloride Mine
Installs New
Joshua Mill**

1-27-44
Will Increase

7-27-44



TENNESSEE
HOIST NOW IN
COMMISSION

RETIMBERING
AT TENNESSEE

WORK GOING ON
AT TENNESSEE



TENNESSEE-SCHREVEVILLE LEAD MINES

Month	Tons	Assays %				Operating Cost	Per Ton	Net Smelter Value Concts.	Per Ton	Yr
		Ag.	Pb.	Zn.						
1945										
Jan.	3990				\$ 28329.00	7.10	\$ 20034.00	5.02		
Feb.	2769	.05	1.7	3.4	25578.00	9.23	21017.00	7.59		
Mar.	3730	.044	2.0	4.3	29384.00	7.86	29918.00	8.02		
Apr.	3434	.03	2.0	4.2	24343.00	7.08	29059.00	8.46		
May	2690	.03	1.8	3.6	30390.00	11.30	17577.00	6.53		
June	3191	.02	1.6	3.1	33111.00	10.38	15797.00	4.95	\$25809	
July	3471	.03	1.7	2.8	38035.00	10.96	16810.00	4.84	27033	
Aug.	3906	.03	1.9	3.3	39835.00	10.20	26443.00	6.74	42747	
Sept.	3289	.04	2.1	3.4	37765.00	11.48	24321.00	7.39	38960	
Oct.	3403	.03	2.3	3.4	46500.00	13.60	24143.00	7.09	38399	
Nov.	2877	.03	2.1	2.8	44000.00	15.29	18412.00	6.39	29904	
Dec.	2685	.04	2.5	4.8	43511.00	16.20	22812.00	8.50	36566	
	39435				420781.00	10.67	266343.00	6.75		
1944										
Jan.	2298	.04	2.8	4.8	45459.00	19.78	19803.00	6.61	\$32394	
Feb.	1982	.04	2.8	4.6	41175.00	20.77	17794.00	8.98	29016	
Mar.	1978	.04	1.9	3.6	41911.00	21.19	12815.00	6.48	21210	
Apr.	2683	.03	1.8	3.3	38808.00	14.46	15474.00	5.77	26803	
May	3019	.024	1.2	2.6	36464.00	20.78 ^{12.07}	9716.00	3.22	17103	
June	2407	.032	1.9	3.5	36160.00	15.02	15035.00	6.24	25214	
July	2480	.030	1.5	3.3	38154.00	15.38	13942.00	5.62	23531	
Aug.	2170	.030	1.3	3.3	35114.00	16.18	11975.00	5.51	19867	
	19017				\$ 313145.00	16.47	116554.00	6.13	\$ 185138	

9.73

TENNESSEE-SCHREIBER LEASE REPORT

Ln.	Operating Cost	Per Ton	Net Smelter Value Concts.	Per Ton	Value with Premiums		
					A	B	C
	\$ 28329.00	7.10	\$ 20034.00	5.02			
7.8	25578.00	9.23	21017.00	7.59			
8.3	29384.00	7.86	29918.00	8.02			
6.6	24343.00	7.08	29059.00	8.46			
6.9	30390.00	11.30	17577.00	6.53			
5.2	33111.00	10.38	15797.00	4.95	\$25884	35891	
5.2	38035.00	10.96	16810.00	4.84	27033	37387	
6.7	39835.00	10.20	26443.00	6.74	42747	59247	67163
6.8	37765.00	11.48	24321.00	7.39	38960	53599	60382
6.4	46500.00	13.60	24143.00	7.09	58399	52655	58619
6.8	44000.00	15.29	18412.00	6.39	29904	41395	46348
7.2	43511.00	16.20	22812.00	8.50	36566	50320	55227
	420781.00	10.67	266343.00	6.75			
8	45459.00	19.78	19803.00	6.61	\$32394	44985	49476
8	41175.00	20.77	17794.00	8.98	29016.	40239	44421
9	41911.00	21.19	12815.00	6.48	21210	29604	51767
3	38808.00	14.46	15474.00	5.77	26803		42440
5	36464.00	20.78 12.67	9716.00	3.22	17103		26174
5	36160.00	15.02	15035.00	6.24	25214		38680
3	38154.00	15.38	13942.00	5.62	23531		36772
3	35114.00	16.18	11978.00	5.51	19867		32254
	\$ 313145.00	16.47	116554.00	6.13	\$ 185138		\$ 304194

9.73 Per Ton

SHATTUCK DENN MINING CORP.
 MARICOPA COUNTY, ARIZONA

Aug 31, 1944.

MEMORANDUM OF THE BOARD OF DIRECTORS - PHOENIX, ARIZONA

Year 1943 mined and milled 71,000 tons. Total cost 747,490.
 Sales, including previous metal 177,540
 Freight, treatment etc. 85,335.
 Net sales 89,205.
 Profit before depletion, Federal taxes etc. 95,000.
 Net profit to surplus approximately:

Heads	Lead Cons	Zinc Cons
Av. .036	0.32	.04
Ag. 2.0	31.0	2.1
Lead 3.7	43.	1.8
Zinc 5.3	--	51.8
39200 tons	3015 tons	3100 tons.

Recoveries %

	<u>Cold</u>	<u>Silver</u>	<u>Lead</u>	<u>Zinc</u>
Lead Cons	61.0	27.7	91.7	6.1
Zinc Cons	4.4	0.6	2.0	71.1
Tailings	21.7	3.9	5.5	22.3

Estimating freight and treatment, it would appear that smelter return of 6.20 per ton of head was made from both concentrates. Total return is 14.20, indicating about 8.50 per ton in premiums. The mine is operating at present under "C" zinc and "D" lead premiums. Total cost amounts to 12.72 per ton.

Cost items are as follows:

Miscellaneous taxes	2640.
Billing	34072.
Mining	204214.
Overhead	10110.
Administration	33321.

Among the assets are:

Buildings	190,011.
Staff House	5,449.
Office	5,125.
	<u>201,485.</u>
Depreciation	57,547
	<u>143,938.</u>
Eng. Prop. & Dev.	174,863
Less Depletion	<u>106,575</u>
	68,288
Supplies	17,916.

Liabilities.

Payable and Payroll	55,253
Trade Acct.	10,430
Notes	31,164
Acc. Taxes	20,724
Reserve for Taxes	11,322
Gen. Stock	200,000
Surplus(-)	<u>52,207</u>
	<u>147,107</u>
	272,510.

C O P Y

NYE A. WIMER
530 West Sixth St.
Los Angeles 14, Calif.

October 15, 1945.

Mr. F. G. Gurley, President
Atchison-Topeka-Santa Fe Railway Co.
80 E. Jackson Blvd.
Chicago 4, Illinois

Dear Mr. Gurley:

The writer is president of the Tennessee Schuylkill Corporation, owners and operators of the Tennessee Mine at Chloride, Arizona. We have been shipping over your lines from Kingman, Arizona, to Amarillo, Texas, and to El Paso, Texas, for a number of years.

Recently a group of associates and myself became interested in investigating the possibilities of reclaiming some of the desert valley lands in Mohave County, Arizona, the county seat of which is Kingman. After talking with members of the Reclamation Service of the Department of Interior; Mr. O. C. Williams, State Land Commissioner of Arizona; and Arizona Congressman John R. Murdock, who is the chairman of the House Committee on Irrigation and Reclamation, we find that the plan we have is feasible.

It seems that the time is now logical to aggressively pursue the idea because the federal government is concerned with the problem they are facing in providing homes and suitable means of livelihood for returning veterans. The project we have in mind is of such a nature that it could be started almost immediately and completed within a reasonable length of time. It would provide in the neighborhood of one thousand farms on soil that could be made to produce a large variety of crops, water being the only thing lacking. There is lots of water in the Colorado River, and at this time the federal government is considering the financing of a number of reclamation projects scattered around the country, some of which are undoubtedly less practical than this.

This project, when completed, will be of substantial benefit to the Santa Fe Railroad through increased freight and passenger traffic, as well as increasing the value of a large amount of land now owned by the Railroad which would come under the proposed irrigation project.

The writer would like very much to see you at your convenience to discuss the above matter further. I understand you spend considerable time in Los Angeles and if you would be kind enough to let me know when you would have the time to see me, I would appreciate it.

Very truly yours,
(Signed) N. A. Wimer

October 24, 1945.

Mr. N. A. Wimer,
530 West Sixth Street,
Los Angeles 14, California.

Trinity 6041.

76,0060

Dear Mr. Wimer:

Your letter of October 15th about the possibilities of reclaiming some of the desert valley lands in Mohave County, Arizona, has been read with interest. At the moment I have no definite plans for my next visit to Los Angeles, but in the meantime I would suggest that you may wish to get in touch with my Executive Representative, Mr. R. G. Rydin, 114 Sansome Street, San Francisco, or our Mining Engineer, Mr. W. M. Balling in the Santa Fe Building at Sixth and Main Streets, Los Angeles. Either of these gentlemen is well qualified to discuss the subject and I am sure they will be very glad to have a visit with you on the matter. I am giving them copy of your letter so that they will be acquainted with the correspondence if you call on them.

Very truly yours,

(Signed) F. G. GURLEY

bcc - Mr. Rydin
Mr. Balling ✓
Mr. Grogan:

With copy of Mr. Wimer's letter.
In the event Mr. Rydin or Mr. Balling
have a talk with him about this
subject I shall be glad to have any
comments they care to make.

F. G. G.

360662

Los Angeles, November 9th, 1945
File 76,0060

Mr. F. G. Gurley,
President,
Chicago, Illinois.

Dear Mr. Gurley:

This refers to your letter of October 24th, file 360662, to Mr. N. A. Wimer, copies to Mr. Rydin, Mr. Grogan and me. Accompanied by Attorney W. V. O'Connor of this City Mr. Wimer called at my office to discuss the possible reclamation of desert lands in Mohave County, Arizona.

Mr. Wimer's scheme contemplates persuading some Federal Agency or Bureau to install pumping equipment and a pipe line to deliver sufficient water from Lake Mead to irrigate 200,000 acres of the Sacramento Valley or Wash in Mohave County, Arizona. He proposes that the water be obtained from Lake Mead near the northerly end of Detrital Wash at a point slightly south of the former confluence of the Virgin and Colorado Rivers. The water would be pumped the length of Detrital Wash and over a divide about 2200 feet higher in elevation than Lake Mead. Detrital Wash as the name implies is strewn with detritus resulting from cloud-burst-actuated flash floods. Any proposed pipe line and necessary pumping stations for elevating water up Detrital Wash will require extensive and costly protection work. The upper end of Sacramento Wash is between 55 and 60 miles by air line due south of the proposed water source. It is only about 15 miles air line east of the lake to be formed by the proposed Davis Dam. This closer source of water was not mentioned to Mr. Wimer. He envisions immediate construction of the project in order that returning veterans could then build homes and start farming in the area.

Mr. Wimer is relying principally on the claimed political influence of his attorneys and upon additional influence or moral support which he hopes the Railway Company might exert in Washington. He would want from the Railway Company a long term option at a low price on a substantial acreage of Railway land that could be put under irrigation by the scheme.

He claims to have consulted Congressman Murdock of Arizona, Representatives of the Department of the Interior at Boulder City, and Arizona State Land Commissioner O. G. Williams. Mr. Wimer states that Mr. Williams is charged with allocating Arizona's share of the available Colorado River water. I understand that these consulted expressed interest but made no commitments or promises. No engineering work, such as

surveys or preparation of estimates, has been performed, and therefore no figures as to the costs of construction or operation can be prepared. He hopes to be able to secure some of this information from Government sources.

Mr. Wimer's proposal is in such a preliminary and visionary stage that I would not recommend we make any commitments whatsoever regarding options on any properties we may have in the area. At the present time I doubt that we can say more to Mr. Wimer than to tell him that we always look with favor upon any project calculated to develop agriculture and/or industry in the territory adjacent to our rails, and if government agencies and competent engineers can satisfactorily work out a project such as he suggests, we would use our best efforts to make it a success.

Very truly yours,

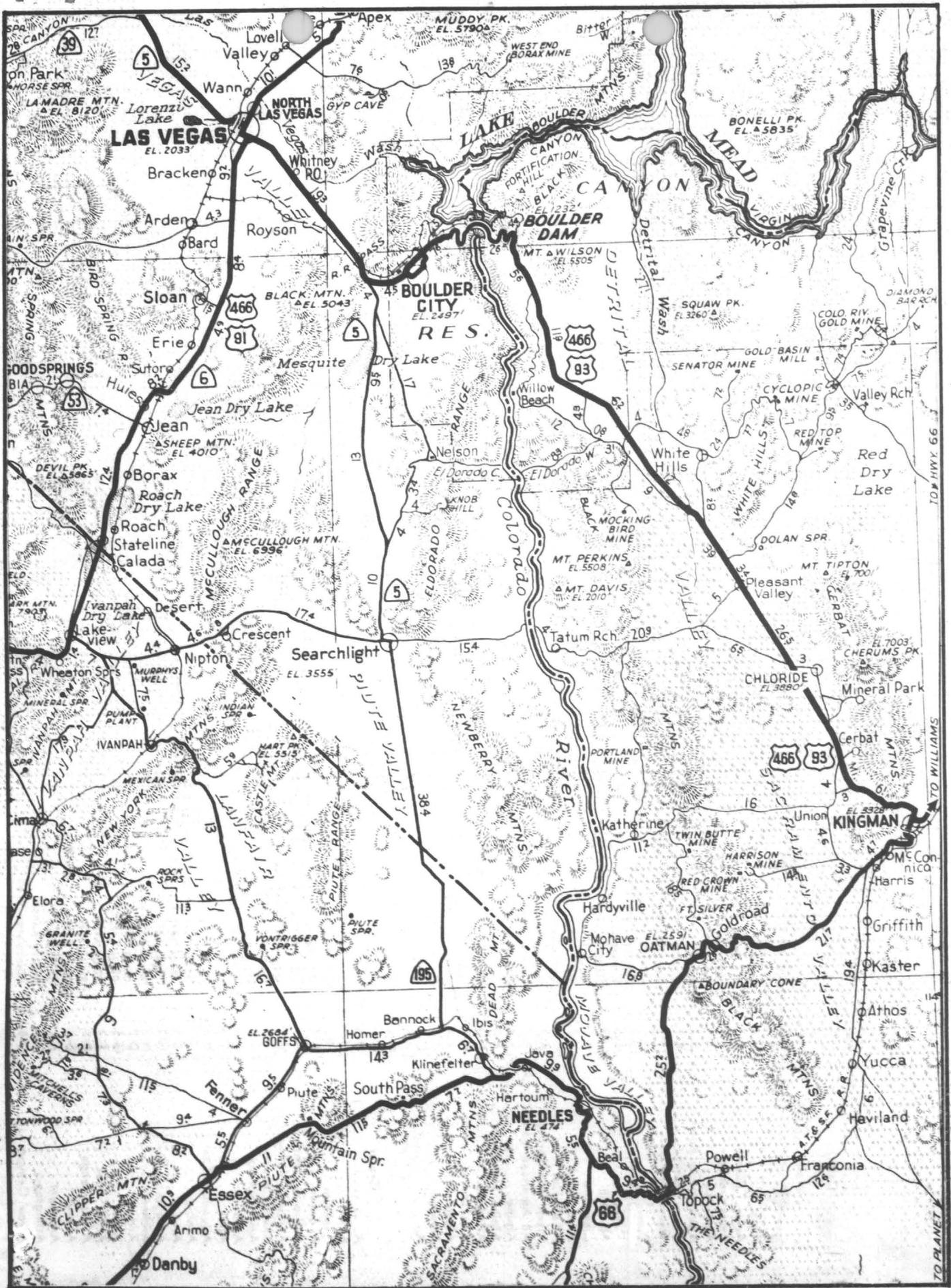
Consulting Mining Engineer.

cc -
Mr. R. G. Rydin,
San Francisco.
Mr. J. J. Grogan,
Chicago.

Blind cc - Mr. E. O. Hemenway,
Albuquerque.

P.S.- Since dictating the above I have talked with Mr. Rydin. He recalls that a similar scheme was suggested to us several years ago and that investigation then indicated it to be an impractical promotion with which the Company would want to avoid any connection. Mr. Rydin is checking with Mr. Hemenway and will write you soon.

W. M. B.



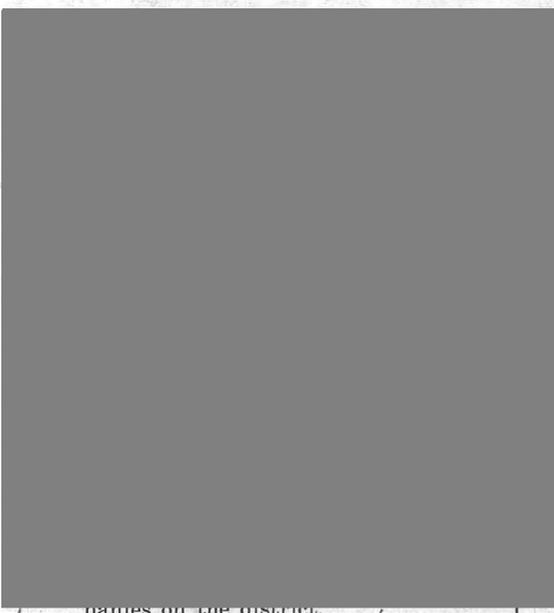
41.0050



Mining World
Nov. 1947

41,0050

Merrill No.
1055 111 2



panies on the district.
Mining Journal June 1947

Los Angeles, November 6th 1944.

File 41.0050

Memo:

Mr. Bruce of Seeley-Mudd Corporation, called and wanted to know if we could inform him if the Tennessee-Schuylkill Mine was shut down.

I called Mr. C. K. Adams, who wired the Agent and received the following reply:

"GOIN:- Los Angeles - Nov. 4, 1944

At present time Tennessee Schuylkill Mine is closed down. Some talk that they will re-open under new management within a short time. I will keep you advised.

NORTHRUP 2:35 PM "

Later I telephoned Mr. Bruce and read him the telegram. He then asked if we could determine the reason for the mine closing down.

Mr. Balling called Northrup the Agent at Kingman who informed him that it was due to financial troubles. They have no labor difficulties and apparently their ore reserves are plentiful. Mr. Northrup said that some people from Globe were looking at the mine and he thought that they would assist in getting the mine in operation within 30 days.

T. O. E. ✓

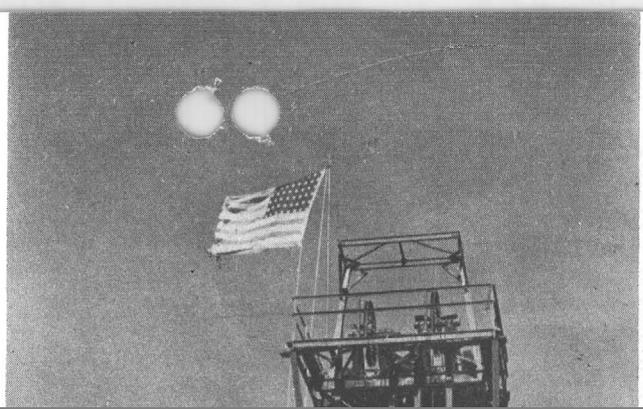
41.0050



Engineering Journal
March 1947

**TENNESSEE
SCHUYLKILL**

August 1944



*Mining World
Aug. 1944*

Base Metals

Los Angeles, October 15, 1942

~~41.0000~~
41.0000

The Tennessee Schuykill is at present milling 125 tons of lead zinc ore per day, at Chloride, Mohave County, Arizona, and is planning to double its mill capacity. Milling includes flotation and a close separation of lead and zinc is accomplished.

Lead concentrates are shipped to El Paso, while the zinc concentrates are shipped to Amarillo, Texas.

A recent diamond drilling program is reported to have discovered a large ore body of zinc ore on the 900 foot level south of the present shaft. N. A. Wimer is President of the Company, with executive offices in New York City.

W. M. Balling