Mining, Smelting and Railroading in Tooele County

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PREFACE

Prior to 1908 the City of Tooele, Utah was a farming and ranching community of approximately 1257 people. By 1930 it had become an industrialized city of 5000 people. This transformation was caused by the construction of the Union Pacific Railroad through Tooele County in 1905. The construction of the Western Pacific Railroad in 1907. The construction of the Tooele Valley Railroad in 1909. The firing of the first copper furnace at the Tooele Smelter in 1910 and the modernization of the Combined Metals Flotation Mill in 1924. These activities provided jobs for approximately 3000 residents of Tooele County.

On the east side of Tooele City a whole new town was built to provide housing and services for the smelter workers, many of them were immigrants from Europe. In addition to New Town the main business district of Tooele City was enlarged by the addition of a theater, a hotel, and 5 new retail stores.

As of 1986 the mines and mills of Carr Fork and Bauer and the Tooele Smelter had been closed and dismantled. The Tooele Valley Railroad tracks were torn up and the Tooele Valley Railroad Depot became a museum. Also the 380 million dollar mill which was equipped with computer control was dismantled and shipped to New Guinea. It has been reported that large reserves of good ore was still unmined. As a result of the closure of Carr Fork operations 700 employees were put out of work.

This book portrays the events of an important part of our history. With the exception of T. Allan Comp and Larry Deppe all of the authors cited were former employees of Tooele mining, smelting and railroading industries.

ACKNOWLEDGEMENTS

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EDITORS NOTE

Chapters 2, 3, 4, and 5 are reproduced here, essentially as written, by former executives of the Combined Metals Reduction Company at Bauer. These reports were provided by Ivan C. Droubay the last official to leave Bauer (1981).

The pictures in Chapters 2 and 12 were provided by Ivan C. Droubay and by Mrs. Ruth Hector. Pictures in the succeeding chapters were provided by Wilbur Smith, Larry Deppe, A. D. Thomas, Frank Dunlavy, Orrin Miller and the Tooele County Museum.

Permission to print the information in Chapter 23 was granted by the Rensselaer Polytechnic Institute, Troy, New York 12180-3590. "This article originally appeared in Volume 1, Number 1 of *IA, The Journal of the Society for Industrial Archeology* and is reprinted here with the permission of the Society for Industrial Archeology."

Mr. Dunlavy in Chapter 19, also used information from this professional report.

The other chapters are authored by former employees of the smelter, and Bauer or by local historians.

This book does not encompass all of the mining, smelting and railroading in Tooele County. Other historians, namely John Skinner are writing and researching the history of Ophir, Mercur, Dry Canyon and Gold Hill.

The construction of the Tooele Smelter and the Tooele Valley Railroad changed Tooele City from a rural agriculturally based town of 1257 people in 1900 to an industrialized city of 5000 people in 1930. Hence the slogan from Beef to Bullion.

The Tooele County Historical Society was organized as a non-profit corporation and chartered by the State of Utah and IRS during 1984. It was organized to research, collect and to preserve Tooele County history, local historic sites and buildings.

Money to print this book was provided by grants from federal, state and local government agencies under the Certified Local Government Program. In this arrangement special thanks are extended to Mayor George Diehl, the Tooele City Council and to Charles Stromberg, Lee Bracken, Reed Russell and Earl Tate, Tooele County Commissioners.

Orrin P. Miller
Editor

PART I MINING

CHAPTER 1

SUMMARY HISTORY OF BAUER IN CHRONOLOGICAL SEQUENCE

1864 General Connor located the first mining claim in what was to become the Rush Valley Mining District. It was named the Honerine. He also named the town of Stockton after his former residence in Stockton California.

Subsequently many other mines were located. Some of them were Ben Harrison, Argent, Calumet, Galena, King, Tip Top, Bluestone. This led to the requirement of organizing a mining district.

1864 General Connors Smelter (not successful).

1866 Monheim and John Smelters built.

1870 The Rush Valley Mining District was formed.

1871 Waterman and Smith Smelters built.

1872 Jack Smelter built at Stockton.

1873 Chicago Silver Mining Company Smelter Stockton Lake.

1873 Carson and Bozo Smelter built.

Some of these smelters were not successful and the others were inefficient. This was due mainly to the lack of coke or coal for fuel.

To supply the smelters with fuel a sizeable charcoal industry developed in Pine Canyon, Tooele and Soldier canyon. This industry flourished until the completion of the Utah Nevada Western Railroad (1873–1905).

1873 Utah Nevada Western Railroad completed to Lake Point from Salt Lake City. Ore was hauled from Rush Valley to Lake Point and supplies for the town mines and smelter were hauled back by team and wagon.

1879 The Great Basin Company constructed and operated a jig mill to reduce smelting costs.

1883 The Utah Nevada Western Railroad was reorganized after bankruptcy and completed to a terminix at Bauer.

1889 Some mines had reached the depth of 660 feet and encountered the water table which required pumping in order to continue mining.

1900 Known ore shoots had been mined as deep as water would permit.

1901–06 The Honerine Mining Company drove a drain tunnel to unwater the area at greater depths.

1905 The Salt Lake San Pedro Railroad (now the Union Pacific) was completed to Stockton.

1906 The Bullion Coalition Mining Company was formed. They acquired the Honerine and most of the small properties in the area.

1910 The Bullion Coalition Company built a large gravity concentration mill to treat the ores that were not of smelting grade. Sufficient water was available to operate the mill and a large orchard and farm.

1913 E. H. Snyder organized the Combined Metals Reduction Company Incorporated.

1915 Bauer received power from Clark Electric Company.

1917 Mining and Milling ceased but the mine and mill were maintained in standby condition. The shut down was due to the unreliability of power to pump water.

1922 Combined Metals purchased Bullion Coalition Company.

1925 Combined Metals took over the mine, mill and farm. However, the Bluestone Lime and Quartzite Company was not included in CMR properties until after 1936.

1928 Horses to pull mine cars were replaced by 20 cell battery locomotives.

1930 A crosscut tunnel from the Honerine to the Calumet mine was completed. Thus the Calumet mine was dewatered.

1936 Unions organized.

1938 The orchard died when the pumps were pulled from the Bluestone shafts.

1942 Living quarters erected to house soldiers assigned as miners.

1952 The CMR Co. experienced an operating loss of $49,912, because of a fire in the Calumet shaft near the surface.

1955 CMR had an operating loss of $150,734 due to low production and high costs that resulted from getting behind with development.

1956 Geologist and Mine Superintendent prepared a historical report (ch. 5) which indicated the development projects that needed to be done to provide ore reserves needed for full operation. He estimated that $422,400 in new capital was required and that it may be available from the Federal Government.

1957 Bauer shut down in 1957 and pulled the pumps.

1958 A community lease was awarded to some of the miners. They ceased mining in mid-1958.

1968 Anaconda purchased all of Bauer CMR holdings except the Calumet group of claims.

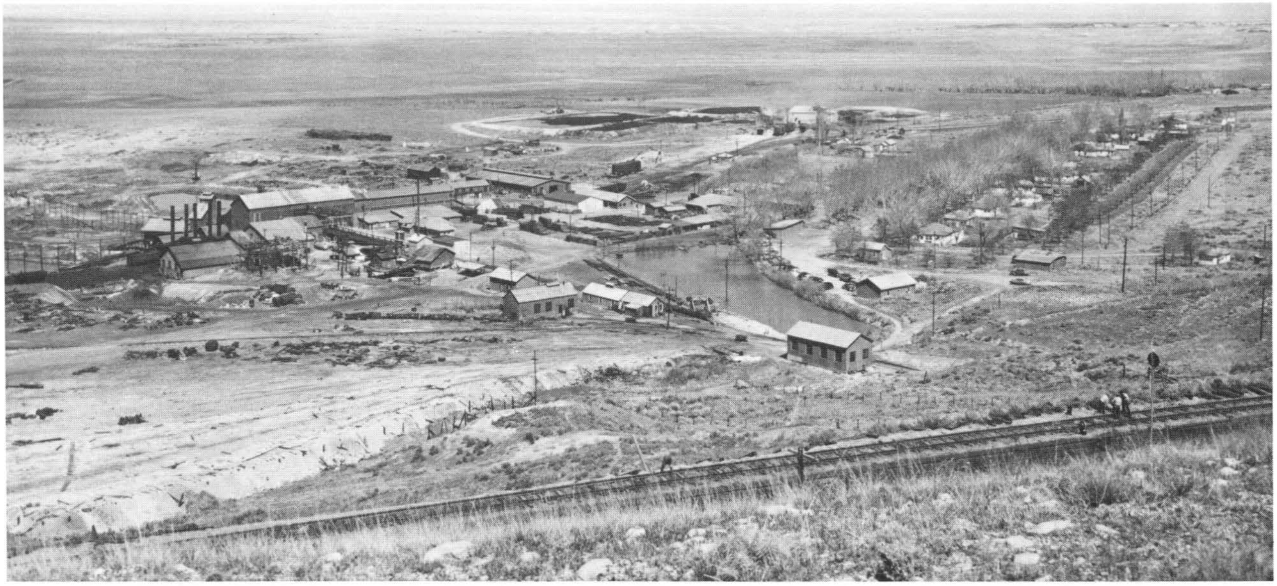
1975 Mill dismantled and burned.

1978 Resin plant burned in 1978.

1982 Calumet group of claims purchased for $50,000. They are now included in the new CMR and ore listed on the Intermountain Stock Exchange.

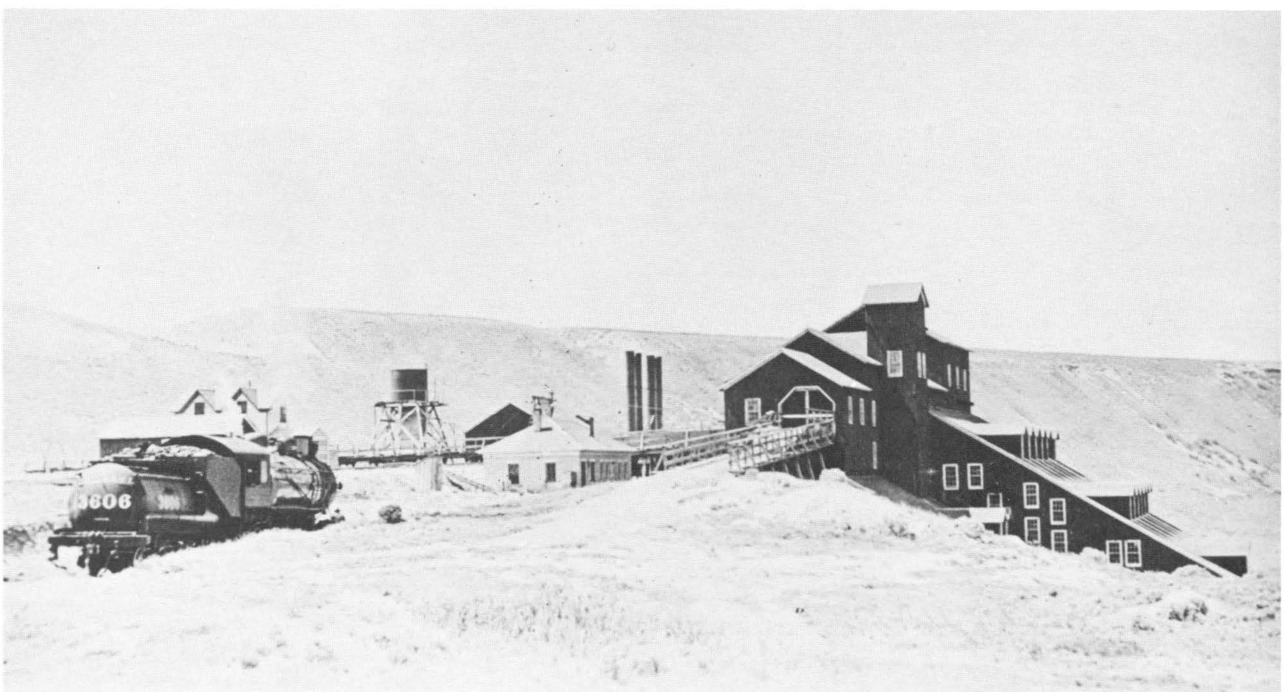
1982 I. C. Droubay, last staff member to leave Bauer moved to Tooele.

1983 Bauer is a *Ghost Town,* only the assay office, laboratories, scale shed, boarding house and some dwellings are left standing. Vandalism is rampant in spite of a locked gate on access road.



Bauer Plant Operations Circa 1954. Looking NW mine portal East of change room and pond. Large building is mill. East of mill maintenance shops, NE of mill laboratories, assay office and storage building, Panacalite plant and resin plant top right. Boarding house and scale house center. Dwellings right center.

Combined Metals Reduction Company Bauer Staff: Front l-r Afton Puff, Celia Long Moellering, Darlene Shields Jensen, Sam Craig. Standing l-r Clyde Shields, Henry Hansen, Oscar Cameron, Ivan C. Droubay, Roy Frailey, Kenneth Shields, F. M. Shields (partly hidden) Jim Russell, Don Rowberry, Frank Andrews, Neils Christensen. — February 1955.



Bauer Concentrater Mill built by Combined Metals Reduction Company — 1927 (rebuilt from old Bullion Coalition Gravity [Oxide Ore] Mill).

CHAPTER 2

UTAH OPERATIONS
COMBINED METALS REDUCTION COMPANY

Stockton, Utah
October 21, 1953

Utah operations of Combined Metals Reduction Company consists of the following:

1. Bauer Plant (6 miles south of Tooele, Utah)
   Calumet Mine
   Flotation Mill
   Resin Refinery
   Perlite Expanding Plant (Panacalite)
2. Butterfield Camp (Butterfield Canyon, 3 miles south of Lark, Utah)
   Butterfield Mine

The Bauer Plant is 40 miles southwest of Salt Lake City on the west side of the Oquirrh Range, and the Butterfield Camp is 30 miles southwest of Salt Lake City on the east side of the Oquirrh Range. The properties are 10 miles apart by direct line, but 50 miles by road.

BAUER PLANT

General Facilities

A paved road enters the camp from Highway U-36 and most employees drive to work from their homes in Tooele, Stockton and Granstville. Key personnel live in 16 dwellings in the camp. Utah Power & Light supplies electric power at 44,000 volts to the Bauer sub-station at .88¢ per KWH. Camp water is from the drain tunnel. The flow is 850 gpm. Compressed air for mine and surface plants is supplied by 2700 cu. ft./m electric driven compressor. A steam plant with five 150 HP boilers supplies heat and steam power. There are three research laboratories, assay laboratory, warehouse, machine shop, boardinghouse and offices.

The plant is served by a branch line from the Union Pacific Railroad. There is freight service daily. The major portion of ore milled is received in railroad cars, and concentrates are shipped to Tooele, Utah, and Great Falls, Montana. Resin is shipped by rail or truck to all parts of the country.

All units have reduced forces to adjust to the reduced activity. Utah operating personnel as of September 25, 1953, is as follows:

	Lessees	Daily Payroll	Salary	Total
Accounting			3	3
Administrative			2	2
Assaying			11	11
Boardinghouse		1	1	2
Engineering			1	1
Mill		23	6	29
Calumet Mine	4	50	4	58
Butterfield Mine	8	3	3	14
Ore Weighing & Watching			2	2
Research & Testing			3	3
Resin Refinery		12	1	13
Perlite Plant		2		2
Shops		23	4	27
Steam Plant		5		5
Stores		1	1	2
Yard & Surface		17	1	18
Total	12	137	43	192

Calumet Mine

The portal of the tunnel that leads to the Calumet and other workings is in the Bauer Plant. From the portal to the old Honerine and Galena King workings is two miles, and to the Ben Harrison and Calumet workings two and one-half miles;

the Ben Harrison and the Calumet being more than a mile apart with the other workings between.

Lead-zinc ores with some values in gold and silver occur as replacements in limestone beds. The sedimentary rocks in the area consist of limestone beds, 3 to 40 feet thick, interbedded with quartzite 135 to 400 feet in thickness. These beds have been tilted to 70° ± with the horizontal. The beds now strike generally east–west, and dip to the north.

Porphyry dikes and mineralizing faults striking north–south and standing at steep angles, cut across the bedding. At the intersection of the mineralizing faults and the limestone beds, ore bodies frequently occur; the main mineralizer making ore in several of the limestone beds.

Many of the ore shoots outcropped on the surface and were first mined in the late 1860's or early 1870's. Mining in the area has been almost continuous since that early date, and several of the shoots have been mined from the surface 2000 feet down the dip. Development footage in the old and new workings probably exceeds 35 miles of drifts and raises.

Records of operation of the old companies are not available. Summary of Combined Metals Reduction Company development and production during the past 28 years is as follows:

from drifts from this shaft on the Muscatine bedding, that current production is mined.

Present monthly production and grade: 2,000 tons, assaying — .059 Au, 9.64 Ag, 13.55% Pb, 2.47% Zn.

Water is pumped from the workings at the rate of 350 gpm.

From a branch of the tunnel a crosscut was driven to the Ben Harrison and Black Bear limestones. From the crosscut a drift was driven to the east to cut under the old Ben Harrison Mine. There was considerable lead mineralization but no shoot was discovered large enough to mine. At the present time the drift is being driven to the west toward the Muirbrook Mine. One thousand feet of drifting will complete this development. There are 4 feet of pyrite in the face of the drift today. This is a DMA project with government participation of 50%.

ORE RESERVES

For many years ore reserves in the Calumet Mine seldom exceeded three years' supply. During the past two years, due to mine fire and to drop in metal prices, development has been curtailed in the Calumet workings. Calumet ore shoots are usually 6 feet in width and vary in horizontal length from 20 to 100 feet.

Year	Dry Tons	Au	Ag	Pb	Zn	Production	Operating P and L	Development Footage
1925–40	367,973	.066	5.86	12.58	6.31	$ 3,584,331	$139,454	17,059
1941	42,105	.067	7.20	10.22	6.83	441,952	78,066	5,261
1942	37,996	.072	7.12	9.37	7.41	442,088	58,983	4,200
1943	41,583	.062	6.41	8.02	6.83	664,795	133,567	4,772
1944	43,991	.061	5.80	7.51	7.11	630,180	92,187	2,820
1945	32,447	.057	7.19	9.46	7.18	651,815	178,102	2,151
1946	32,094	.055	6.97	9.45	5.88	641,973	131,088	3,316
1947	32,010	.058	7.37	9.74	6.57	716,959	100,171	3,615
1948	40,154	.069	7.83	10.13	5.01	1,061,580	265,677	3,591
1949	33,873	.063	7.12	9.07	4.53	633,869	(112,722)	3,386
1950	14,630	.075	7.91	10.44	7.35	318,415	(191,312)	465
1951	25,740	.063	8.84	11.77	3.89	724,780	3,649	2,374
1952	20,802	.048	10.15	13.98	2.69	612,743	(49,912)	4,172
Total	765,398	.064	6.604	11.055	6.190	$11,125,480	$826,998	57,182

The loss in 1952 was the result of a fire in the Calumet shaft near the surface.

The tunnel from Bauer intersects the Calumet limestone 1000 feet below the surface. This Company developed ore shoots on the Calumet, Muscatine and Iroquois limestone and has mined these shoots for more than 1000 feet in depth below the level. The main shaft on the Calumet limestone bottoms on the 2100 level, 1100 feet below the tunnel level. From that level, a second shaft was sunk 240 feet on ore in the Muscatine bedding. It is

To develop the probable ore shown above it would be necessary to drive a cross-cut on the 2300 level, 400 feet to the Calumet, and then drift 800 feet on the Calumet limestone to cut all known ore shoots. The muscatine shaft would have to be sunk 250 feet, the 2400 and 2500 levels driven, and a crosscut to the Calumet driven on the 2500 level. Total footage, shaft 250 feet, crosscut 800 feet, drifts 3600 feet.

MINING PROPERTY

	Claims			Acreage		
	Patented	Unpatented	Total	Patented	Unpatented	Total
Honerine Mining Claims	93		93	791.212		791.212
Galena King Mining Claims	20	1	21	83.764	5.000	88.764
Peerless Group		12	12		210.000	210.000
Bullion Coalition Group		24	24		420.170	420.170
Ben Harrison Claims	21	2	23	292.810	40.000	332.810
Ben Harrison Land				33.330		33.330
Black Diamond Claims	4		4	21.025		21.025
Mill and Campsite				640.000		640.000
Farm				1761.500		1761.500
Calumet Group	30	1	31	181.613	8.000	189.613
Wright-Muirbrook Groups	9		9	49.040		49.040
Silver Coin	8		8	86.503		86.503
Joe Pulli		8	8		160.000	160.000
South East Calumet		35	35		440.000	440.000
Total	185	83	268	3940.797	1283.170	5223.967

		Blocked Out		Probable		Total	
Muscatine	2100–2200	6,810	T		T	6,810	T
Muscatine	2200–2300	13,560				13,560	
Muscatine	2300–2500			80,000		80,000	
Calumet	2100–2300			23,750		23,750	
Calumet	2300–2500			23,750		23,750	
	Total	20,370	T	127,500	T	147,870	T
Muscatine Ore	.05 Au	9.88 Ag	13.9% Pb	2.1% Zn			
Calumet Ore	.06	5.00	7.2%	5.0%			

Present Operation (September Profit & Loss)

Production 1,787 Tons	$34,503
Expense	38,493
Loss	($3,990)

The operation of the Calumet Mine is very important to the Bauer Plant and Flotation Mill. Included in the Calumet expense is 50% of camp expenses plus a share of general expense.

Bauer Mill

The Bauer Mill has been in almost continuous operation since 1924. It is a flotation unit especially designed for treating complex lead-zinc sulphide ores. It is composed of crushing units, three 8-foot ball mills, two complete circuits with necessary bins, filters, etc. Each circuit consists of a bank of lead cells, a bank of zinc cells and a bank of

PRODUCTION & EARNING RECORD

Year	Tons Milled	Production	Cost of Ore	Cost of Milling	Operating P and L
1924–42	2,060,015	$17,375,943	$18,747,102	$ 5,871,330	$2,757,511
1943	189,707	2,524,090	1,795,923	577,821	150,346
1944	190,788	2,152,307	1,303,018	716,260	133,029
1945	177,085	2,054,935	1,316,509	758,979	(20,553)
1946	170,209	2,224,350	1,345,889	770,223	108,238
1947	154,608	2,611,949	1,861,585	717,370	32,994
1948	180,210	5,025,747	3,759,490	932,974	333,283
1949	221,784	5,191,399	4,161,836	1,023,301	6,262
1950	205,293	4,544,002	3,396,055	886,881	261,066
1951	185,605	6,135,129	4,628,465	1,028,694	477,970
1952	192,979	8,010,404	6,792,499	1,069,576	148,379
Total	3,928,283	$67,850,255	$49,108,321	$14,353,409	$4,388,525
8 Months 1953	113,163	3,861,930	3,133,248	498,218	230,464

cells to be used either for pyrite or for lead oxide.

The building is old but many of the wood columns have been replaced with steel. Crushing department, sampling, filtering and flotation units are strictly modern. Fagergren cells are used.

Although the mill has a capacity of 24,000 tons per month the average rate per month in 1952 was 16,000 tons. Due to low market prices this tonnage has decreased to 10,000 tons per month.

The two company mines in Utah produce only a small fraction of the ore milled. Most of the ore comes from custom shippers.

Present ore supply:

Calumet Mine	2,000	Tons
Butterfield Mine	400	
Guatemala	1,200	
New Park	6,300	
Miscellaneous	100	Tons per
Total	10,000	Month

To supplement the low tonnage, a small addition is being made to the mill in order to treat tungsten ores. There appears to be available in the area 3,000 tons per month of ore assaying .7% to 1.0% WO_3. Five small cleaner cells and two tables are now being set up in the mill. Within thirty days the mill will be prepared to treat tunsten ore.

September Operation:

Concentrate Value	$369,970
Ore Cost	296,876
Margin	73,094
Expense	48,896
Profit	$ 24,197

A supply of ore totalling at least 10,000 tons per month seems assured for some time even at present low market. An increase in activity in the Calumet and Butterfield Mines would increase this tonnage. An increase in market prices for lead and zinc would stimulate production of custom ore. The milling of tungsten ores should increase the earnings by $5,000 to $10,000 per month.

Another potential source of revenue from the mill is in the treating of mill tailings for the pyrite content. In 1949 and 1950, 100,000 tons of tailings were refloated to produce 29,000 tons of pyrite assaying .08 Au, 2.40 Ag, 1.75% Pb, 37% Fe.

Resin Refinery

The resin refinery was built in 1946–47 to produce a pure fossil resin from Utah coals. The initial source of feed for the refinery was a sludge or concentrate collected in a coal preparation plant in Carbon County. This source provides only about two tons of resin per day, so it was necessary to float the resin from coals to supplement the refinery feed. A small flotation unit was added to the refinery in 1948.

The resin occurs in seams in the coal and breaks free during crushing and preparing coal. By screening out the fines the coal companies produce a "bug dust" coal containing 4% to 8% resin. This is the product that is treated in the coal float unit. The concentrate produce contains 50% resin. Resin-bearing coal in Carbon County is almost unlimited.

The refinery produces 10,000 pounds daily of resin 99.98% pure. The resin has some properties similar to synthetic or other resins but has other properties making it more desirable for certain uses. Principal customers use resin in the manufacture of paints, varnishes, printing inks and waterproofing.

The resin sludge from the coal washing plant and concentrates from the float unit are dried in a steam heated dryer. The resin is extracted from the concentrate by pulping in commercial hexane. The resin-bearing solution is filtered from the pulp, evaporated and the resin residue melted and cast into steel drums.

Six years have been required to establish a market and to get the bugs out of the refinery operation. In 1947 a price of 12¢ per pound, f.o.b. Bauer, was established. The price was not changed until July of this year when it advanced to 13½¢ per pound. Although the plant operated only nine months in 1952, had the price been 13½¢ instead of 12¢, the operation would have shown a loss of $16,254 instead of $39,182. Some plant alteration costs are included in that loss.

Since April, 1952, the plant has operated continuously, with sales and production well in balance. Increasing the price has had no apparent effect on sales.

The plant operated six days per week, three shifts per day, and employed 12 men and a foreman.

Summary of Past Operations

Year	**Production**	**Sales**	**P & L**
1947	890,928 Lbs.	103,737 Lbs.	($75,124)
1948	694,179	1,007,975	(38,815)
1949	1,298,933	1,278,448	(59,710)
1950	892,394	1,193,630	(13,961)
1951	1,983,105	1,328,227	(6,650)
1952	1,528,594	2,027,063	(39,182)
1953– 9 Mos.	2,023,395	2,155,882	5,277

A review by months of 1953 for the first nine months indicates the trend:

	Production		Value	Expense	P & L
Jan-Feb-March	611,726 Lbs.	12.0¢	73,407	80,525	($7,118)
April	210,628	12.0¢	25,275	25,178	97
May	247,756	12.2¢	30,263	29,418	845
June	224,995	12.0¢	27,029	18,369	8,660
July	224,242	12.0¢	26,909	33,467	(6,558)
August	253,087	13.6¢	34,310	29,666	4,645
September	250,961	13.5¢	33,880	29,172	4,707

Operations in the future should be much as at present. The refinery is near capacity and sales equal production. Some improvement in the cost of feed may be made by concentrating the resin in the coal fields. Some savings in packaging may be effected.

Panacalite Popping Plant

The Panacalite Plant at Bauer was built in 1947. It expands a fine perlite feed to make a lightweight plaster aggregate, lightweight concrete aggregate, insulation and filter aid. The demand for lightweight aggregate and filter aid is increasing and a similar popping plant on the coast is making and selling 50,000 to 60,000 four cubic foot bags per month.

Feed for the plant comes from the Panacalite crushing plant at Caselton, Nevada, where crude perlite is crushed and sized. Perlite is a potassium, aluminum silicate containing water of crystallization. It is of volcanic origin.

Expanding Process. The expanding is done at high temperature in a 24 inch vertical stainless steel tube. Thirty gallons of oil per hour, or equivalent, are used to provide the necessary heat. Sized perlite, usually less than 12 mesh, is fed into the flame in the tube at the rate of one ton or more per hour. The heat softens the rock and the contained water forms steam, expanding the particles to miniature Ping-pong balls. Through a system of cyclones and bins the product is cooled and then bagged.

Product Weight: 7½ pounds per cubic foot. Product is shipped in three and four cubic foot bags. Price f.o.b. Bauer, 60¢ 3 cubic foot and 80¢ 4 cubic foot bags.

The following tabulation shows the plant has operated at a loss yearly since it was first built. The plant was built originally as an experimental model and was operated as such for some time. Oil was used as the heat source and its use has not proven satisfactory. Due to the production of a non-uniform aggregate in the past, sales in the Salt Lake area are very small. Shipments are made to Montana and Colorado.

Record of past operations show:

Year	Bags	Value	Expense	P & L
1948	15,497	$ 8,737	$23,511	($14,733)
1949	49,047	32,951	81,892	(48,940)
1950	20,934	22,508	42,376	(19,868)
1951	25,887	21,961	37,508	(15,546)
1952	25,959	21,131	36,255	(15,124)
1953-9 Mos.	68,808	47,275	67,952	(20,677)

During the past two months the plant has been revamped at considerable expense. Fuel was changed from oil to propane. The unit now has a popping rate of 70 to 90 four-cubic foot bags per hour. The product is of good grade and more nearly uniform than in the past.

With the more efficient operation and greater rate of production, a greater market and slightly advanced price, the plant will operate at a small profit. For the next two months the plant will operate at a small loss.

Operating crew — 3 men.

BUTTERFIELD CAMP

Butterfield Mine is south of, and adjoining the largest lead-zinc mine in Utah, the U.S.S.&R. Co. Mine. Like the Calumet, its origin was back in early times when gold, silver, lead ore was mined from outcrops on the surface.

Ore occurs as limestone replacement, or as fissure ore is porphyry intrusion. Production to date has been mostly from the fissures. These fissures strike generally north–south and dip 65° to the east. Ore shoots vary from 2 feet to 10 feet in thickness and 10 feet to 100 feet in length. They sometimes extend for several hundred feet down the dip.

The sedimentary strata consists of interbedded limestone and quartzite. A huge porphyry stock was intruded into the center of the area with numerous porphyry dikes and sills. Limestone beds have been tilted until on the south end of the property they strike north–west and dip 15° to the northeast. On the north the beds have a dip of 70° or more. There are 15 or more strong fissures cutting the area, all of which have produced some ore; the best producers being the Rough Wrestler and the Silver Shield fissures.

Method of developing ore is to drive main drifts to crosscut the fissures, then drift or raise on the fissures.

The mine has two main levels — the Queen tunnel at 7000 foot elevation and the Butterfield tunnel (1200 level) at 6000 foot elevation. These tunnels are connected by a vertical raise from which other levels were driven.

A shaft was sunk 535 feet below the main tunnel level and some fissure and bedded ore mined from this area. Grade of the ore, heavy ground and low market forced discontinuance of this operation. This area is now flooded.

While losses on Butterfield operation appear great, the Bauer Mill made $2 to $6 per ton profit on the above production, and the expense included $25,000 per year general office costs.

Grade of ore mined in 1952 — .069 Au, 17.22 Ag, 9.17% Pb, 5.6% Zn.

Past experience has shown that one foot of raising or drifting will produce 4.374 tons of ore. During the past year there has been a decrease in development with the result that ore reserves at the present time are very low.

MINING PROPERTY

	Claims			Acreage		
	Patented	Unpatented	Total	Patented	Unpatended	Total
Lavagnino	41		41	726,060		726.060
Park Bingham	52		52	457.1346		457.1346
Barstow	4		4	26.743		26.743
Moyle	5		5	85.965		85.965
Wilson's Bingham	4	11	15	72.599	144.752	217.351
Presidential		9	9		140.021	140.021
Black Jack		5	5		59.304	59.304
Spanish		5	5		19.289	19.289
Beals		7	7		88.142	88.142
Johnnie		13	13		240.000	240.000
Golden Star		4	4		80.000	80.000
Maple		15	15		212.000	212.000
C.M.R.		29	29		527.000	527.000
Fraction		4	4		5.600	5.600
Part Ownership	3	1	4	14.558	.600	15.158
Stockgrowers, Etc.		Land		460.000		460.000
Butterfield		Land		320.000		320.000
Total	109	103	212	2163.0596	1462.708	3679.7676

PRODUCTION & DEVELOPMENT

Year	Dry Tons	Au	Ag	Pb	Zn	Production	Operating P and L	Development Footage
1934-40	141,018	.142	10.65	4.67	4.23	$1,086,399	($ 60,159)	75,753
1941	31,308	.105	11.12	3.67	4.26	264,099	(3,576)	8,667
1942	26,754	.106	8.93	4.63	4.30	365,815	(62,130)	6,457
1943	28,899	.115	7.00	4.69	4.60	434,479	(71,171)	6,420
1944	26,220	.116	5.25	4.96	3.63	360,440	(26,995)	4.650
1945	19,583	.081	5.36	5.46	5.15	298,494	(80,403)	2,580
1946	12,989	.111	4.67	6.43	2.99	226,306	(164,825)	4,074
1947	17,739	.068	8.47	9.71	3.15	356,288	(108,130)	5,384
1948	31,148	.062	8.92	10.56	3.93	844,235	70,533	6,758
1949	38,301	.058	8.58	9.39	3.93	660,132	(216,931)	7,851
1950	24,711	.069	10.53	11.96	4.52	525,283	(66,051)	5,466
1951	17,972	.076	13.03	10.77	5.00	525,033	(140,660)	5,501
1952	21,507	.070	17.22	9.15	5.54	541,880	(42,268)	5,952
Total	438,149	.104	9.622	6.619	4.250	$6,488,883	($972,766)	145,513

ORE RESERVES

			Au	Ag	Pb	Zn
65 Fissure	1200 Level	3000 Tons	.02	18.33	1.7	1.2
Rough Wrestler	560	6000	.05	17.00	7.6	5.2

On the basis of past experience, there are several drives on fissures that should develop ore tonnages.

Present operation is curtailed to lessees mining ore and company operation driving one development drift.

This development drift is a DMA project. It is on the footwall of the "F" limestone, 1200 level. The drift will follow the limestone bed through the major fissures of the mine. Last objective 1800 feet. There is considerable mineralization in the contact between the quartzite and the limestone, so a bedded ore shoot is expected at the intersection with a strong mineralized fissure.

September production — 350 Tons	$ 7,533.00
Expense	10,376.00
Net Loss	$(2,843.00)

SERVICES

Butterfield electric power is supplied by Utah Power and Light at 40,000 volts. Compressed air is provided by 1500 cubic foot PRE compressor. Ore is hauled from mine bins to railroad spur in Lark, three miles distant. The camp has shop, offices, change room and six dwellings. There is a bituminous road to the camp.

SUMMARY

Should conditions remain static as at the present time, Utah operations would show only a small profit per month. Without additional exploration Calumet will eventually be out of ore. This, however, could be forestalled by spending an additional $5,000 per month for development. There are several things that could bring relief to the operation.

1. The development of a good ore shoot in the West Ben Harrison (Calumet Mine) is possible.
2. Successful development on the "F" limestone (Butterfield Mine).
3. Treating tungsten ores in the Bauer Mill.
4. Alterations at the Panacalite Plant are nearly complete. A good production is now being made. Increased sales coupled with proposed increase in price should put this unit in the black.
5. Increase in the price of lead and zinc.

Following are two estimates of Utah operations. The first column indicates operations with present markets. The last column is based on estimated production with 15¢ lead, 14¢ zinc prices, and in the case of Panacalite, with sales of 20,000 bags per month.

In the event of the higher metal prices it is assumed mill tonnage would be 15,000 tons per month instead of 10,000 tons as of the present time. (Average per month for 1952, 16,082 tons.)

		Per Month 13.5¢ Pb 10.0¢ Zn	Per Month 15.0¢ Pb 14.0% Zn
Calumet Mine	2,100 Tons	$ Even	$ 5,000.00
Butterfield Mine	400	(2,500)	(1,500.00)
Bauer Mill	10,000 15,000	6,000	31,000.00
Resin Refinery	125	4,500	4,500.00
Panacalite Plant	(10,000 Bags (20,000	Even	1,500.00
		$8,000	$40,500.00

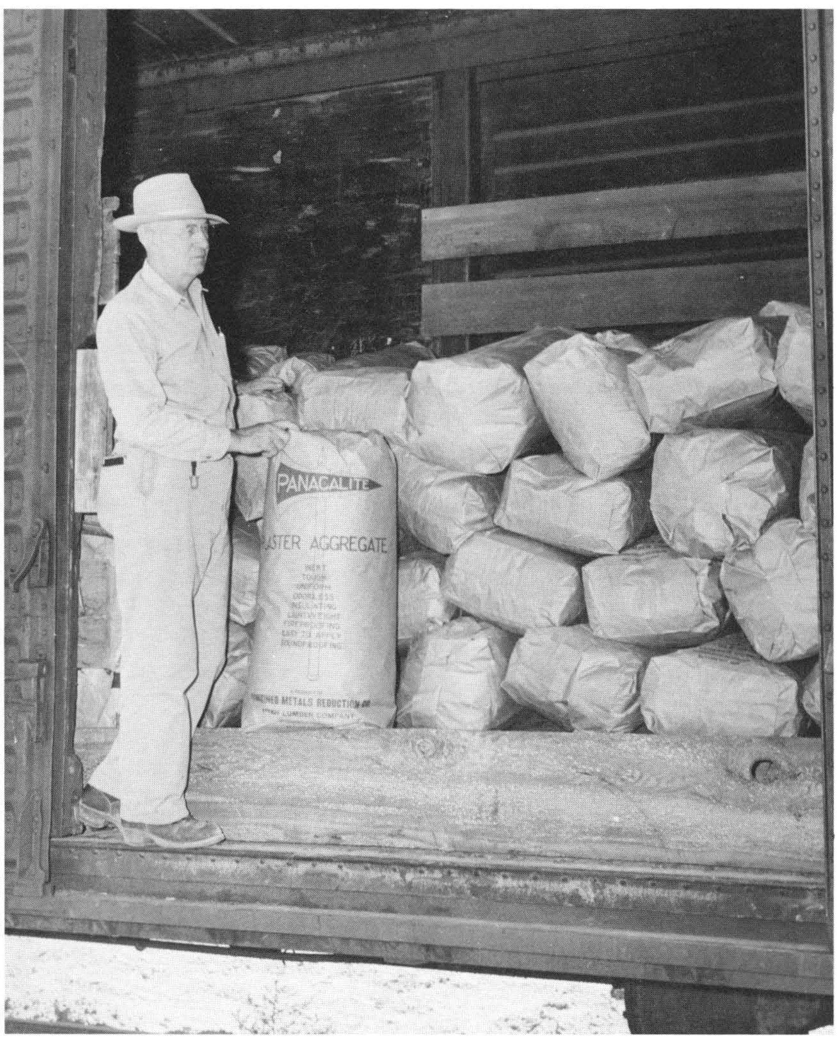
The low metal prices have resulted in lower earnings for Utah operations, but effort has been made to adjust expenses correspondingly. Profit and Loss Statement for the first nine months of 1953 shows an operating profit of $172,788, exclusive of losses on slab zinc subsequent to production.

S E Craig

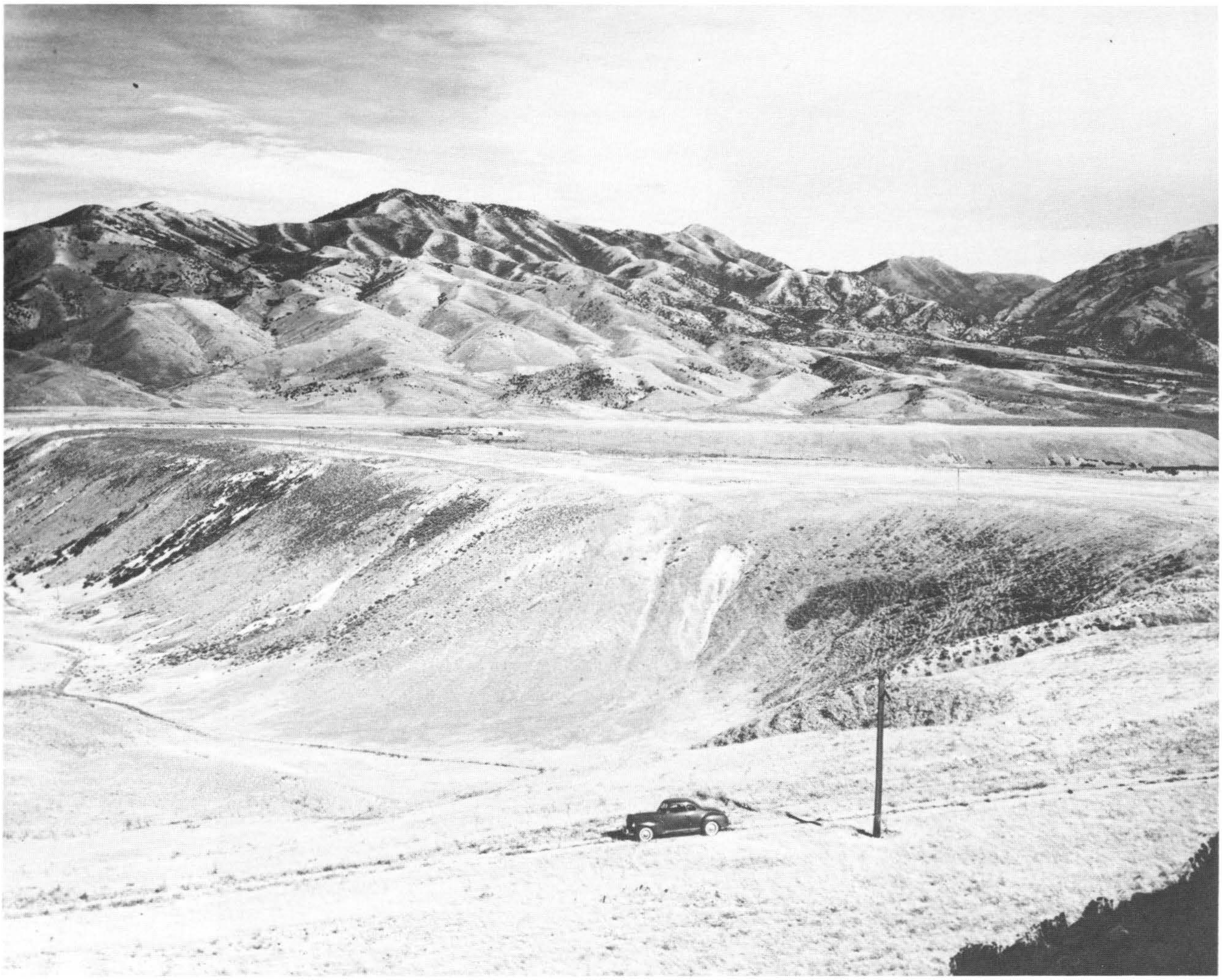
S. E CRAIG
General Superintendent
Utah Operations

Combined Metals Reduction Company and National Lead Company officials with Tooele City and Tooele Chamber of Commerce officials. l-r Guy Snyder, Mayor Cecil Tate, Roy Frailey, Ed Snyder, Herbert Hoover (ex-president) George Snyder, Ollo Harries, Jeremia McClelland, Oren Probert, LaVar Tate, and Dr. Millburn and Max Kennard. — Circa 1954.

Resin Plant, Bauer Utah owned and operated by Blackhawk Resin Company (Hercules). Burned down first in 1955, then again in 1978.



Carload of panacalite, James Bradford, Manager.



Stockton Bar and the Rush Valley Mining District. Stockton town is behind Long White Sand Bar at right center of picture.

CHAPTER 3

RUSH VALLEY MINING DISTRICT

Stockton, Utah

April, 1954

Fifty miners working in the drifts and stopes of the Calumet Mine of the Combined Metals Reduction Company are producing 2,000 tons per month of ore assaying .05 Au, 9.57 Ag, 13.5% Pb, 3.0% Zn. These men are assisting in perpetuating an industry started in the hills to the east of Stockton, Utah, 90 years ago.

In 1855 a military reservation was established in Rush Valley. Stockton Lake was large and the surrounding meadows provided pasture for the cavalry horses. The probable main reason for selecting this remote location was to keep the troops out of the Salt Lake area.

Lt. Steptoe commanded the first detachment. In 1862 General Connor reported the Stockton Lake had shrunk to only a pond in size. Probably several of the soldiers riding the hills east of the lake observed outcrops of lead oxide ore, but it was not until 1864 that its value was recognized. Soldiers of L Company, 2nd Cavalry, California Volunteers, made the first discovery and during the same year the town of Stockton was surveyed and organized as an army post, Camp Relief.

The first house in Stockton was built in 1864, but due to the mining stimulant, by 1866 the town had grown to 40 houses and over 400 inhabitants.

The first official claim was located on the outcrop of what is known as the Connor shoot in 1865 by General Connor. The claim was called Honerine, a name still used to indicate the central area of the district and the tunnel from the Bauer plant.

There were many outcrops of ore and many more indications of mineralization in an area two and one-half miles square. Mining rules in the territory were not too definite and many small and some unusually shaped claims were located. A few of the claims were 100 feet wide by 1,500 feet long, but most of the early claims were 200 feet wide by 1,500 feet in length.

The Rush Valley Mining District was formed August 6, 1870.

In the early days many of those working claims lived in cabins on their properties. Smelters were built in Spring Canyon and at Stockton Lake. The ore mined in those days was lead-silver ore with very little zinc and a small amount of gold. The lead was mostly carbonate and semi-oxide ore with the percentage of sulfides increasing with depth. Zinc was leached from most of the shoots in the oxide zinc.

Smelting of ore was a problem. The smelters must have been small and crude and some not successful:

1864 General Connor's Smelter (not successful)
1866 Monheim and Johnson Smelter
1871 Waterman and Smith Smelter
1872 Jack Smelter at Stockton
1873 Chicago Silver Mining Company Smelter, Stockton Lake
1873 Carson and Bozzo

For benefication of some of the ores before smelting, hand jigs were used early in the camp history. The first record of milling indicates that in 1879 the Great Basin Company had a mill of jigs with a capacity of 100 tons a day. The general grade of crude ore, however, is probably indicated in the note that "the first car of ore shipped from the Galena King Mine assayed 40 ozs Ag and 50% Pb."

Incomplete records indicate the greatest depth in 1889 was 660 feet. It is probable the Great Basin and other companies drove the 600 level tunnel about that time to permit mining to greater depths. The pumping of large volumes of water in those days was almost impossible.

In 1905 the standard-gage U. P. R. R. was completed through Stockton. The building of large smelters in Utah, plus adequate transportation facilities, did much to stimulate mining in the district. By 1900 known ore shoots had again been mined as deep as water would permit. Between 1901 and 1906 the Honerine Mining Company drove the Honerine drain tunnel to unwater the area to greater depth.

The portal of the Honerine drain tunnel is located in the Shadow of a great gravel bar of ancient Lake Bonneville. The camp then was known as Buhl, a name which was later changed to Bauer. The tunnel is 600 feet vertically below the 600 level and is called the 1200 level. From the Bauer camp the tunnel passes beneath the U. P. R. R. and Highway 36. The first quarter of a mile the tunnel is in lake bed sediments, then passes through 1,000 feet of porphyry, and then into the sedimentary bedding of the mountain range. The tunnel branches to cut under the many small mines of the district, several of which are two and one-half miles from the portal.

The camp was quiet from 1906 to 1910. At that time the drain tunnel had been driven to and through the Connor ore shoot on the Honerine limestone. There was no development on other limestones on the tunnel level.

In 1910 the Bullion Coalition was formed, acquired most of the small properties in the area and began mining operations.

The water flow from this drain tunnel was great for several years, probably reaching as much as 10,000 gpm. This provided the Bauer camp with more water than was needed for ore treatment, so the Bullion Coalition Company added agriculture to its activities. A ranch was started at Bauer and an orchard planted. Potatoes, wheat, and alfalfa were grown. The orchard of apricots, peaches, and apples was one of the largest in the State and for a number of years many carloads of fruits were shipped in season.

At the Bauer Camp near the portal of the Honerine drain tunnel, the Bullion Coalition Company built a large gravity concentrating mill to treat the ores that were not of smelting grade. By early 1920 the Company was in difficulty because once more most of the known ore shoots were mined to the water level and added to that, the lead and zinc in some ores could not be separated in the gravity mill. The Bullion Coalition Company sank a shaft from the 1200 level to the 1600 level, developed and mined considerable ore on the 1400 level, but had drifted only a few feet on the 1600 level when water and metallurgical trouble forced them to discontinue operations.

In 1922 the Combined Metals Reduction Company acquired the Bullion Coalition property and de-watered the workings below the 1200 level. The gravity mill was changed to one of flotation, a pioneer in the field of fine grinding and selective flotation. A plant for leaching of lead-zinc concentrates was also constructed. This unit produced a considerable amount of lead bullion and zinc bullion but due to mechanical trouble was discontinued after a year of operation.

With the exception of a short period in the early 1930's the flotation mill has operated continuously since 1923 treating ores from the Honerine–Calumet Mine, the Pioche Mines, Butterfield Mine, Chief Consolidated Mines, New Park Mine, Triumph–Hailey Mine, and many smaller custom shippers. Mill capacity is 850 tons a day.

Within the mine, operating through the Honerine drain tunnel, the Combined Metals Reduction Company continued mining and development of ore shoots. Drifts were driven on all productive limestone. On the 1600 level of the Honerine workings, 400 feet below the drain tunnel, ore was mined from shoots on the Honerine, St. Patrick, Hercules, and King limestones. Ore occurred at intersection of the limestone beds with the principle mineralizers such as Palace and Connor crossings.

Operating also through the Honerine drain tunnel, the Bluestone Lime and Quartzite Mining Co. produced excellent grade lead smelting ore from the King Limestone. Pumping the Honerine 1600 level kept the Bluestone workings dry to the 1400 level. As they continued mining downward, they were forced to pump and soon their pumping left the Honerine 1600 level dry. The Bluestone Company mined to a vertical depth of 800 feet below the tunnel where the presence of large amounts of water and the lessening of size of ore shoots combined to force discontinuing the operation.

While the water was being held at the lowest level in the Bluestone, the Combined Metals used the opportunity to sink below the 1600 level on many of the ore shoots in the Honerine workings. The deepest working here was on the Connor shoot where a depth of 325 feet below the 1600 level was reached.

Development from the Honerine tunnel cut under the Galena King Mine, East Argent, Ben

Harrison, Muirbrook, Calumet, and lesser known workings.

The Calumet became the major producer of the mine after 1937 and has remained so to this date. The Calumet has three producing limestones: Calumet, Muscatine, and Iroquois. The Iroquois limestone seldom exceeds two feet in width but ore shoots are usually good grade and extend for 30 feet or more horizontally. The Calumet and Muscatine limestones are six to eight feet in thickness. Ore shoots vary in length from 10 feet to 100 feet.

Ore shoots on the Calumet limestone have been mined from the surface to below the 2100 level. Muscatine ore shoots have been mined from the 1000 level to the 2300 level, a vertical depth of 1,250 feet below the 1200 level, and to 2,250 feet below the surface at that point. Shoots are continuing down at their maximum sections.

Production records for the Rush Valley Mining District are far from complete. It was estimated that 80,000 tons of ore valued at $1,250,000 were mined to the end of 1889. The Bureau of Mines list the production from 1901 to 1927 at 447,505 tons with a value of $8,936,185. There seems to be no available record of that mined between 1889 and 1901.

From 1927 to 1954 production from the district appears to be something over 1,000,000 tons with a grade of .06 Au, 6.60 Ag, 12.6% Pb, and 5.0% Zn. Ore mined in the early days contained less zinc and much more silver and lead.

Water restricted mining in the district almost throughout its history. Various methods to get rid of the water were used. Bailing with skips or ore buckets was not uncommon before 1915. In the Palace incline below the 600 level, steam-driven pumps were used.

During development of the 1600 level the Combined Metals Reduction Company pumped as much as 3,000 gpm for a period of time. After development was generally discontinued the flow as pumped from the lowest level of the Bluestone Mine settled down to 970 gpm. In 1938 the pumps were pulled from the Bluestone workings and the lower workings of the Honerine and Bluestone Mines were allowed to fill. After 16 years these lower workings are not yet filled with water. The water level today is 80 feet below the 1200 level. Approximately 100 gpm is being pumped from these workings to supplement the mill water supply.

The Honerine drain tunnel did not drain the Calumet workings until a crosscut was driven from the Honerine to the Calumet in 1930. A 1,000-foot porphyry dyke or stock separates the two workings. Present water supply for the Bauer Camp:

	GPM
East Face, Honerine Drain Tunnel (Weir)	125
West Face, West Muscatine, 1200 level	200
Honerine workings below 1200 level (pumping)	100
Calcumet Mine, 2300 level (pumping)	350
	775

The orchard died after pumping in the Bluestone was discontinued.

Geology

The Stockton Mining District extends along the western slopes and foothills of the Oquirrh Range from Soldiers Canyon on the south to an indefinite boundary three to four miles north. The productive area, covering about six square miles, is characterized by numerous rounded ridges with limited outcrops that slope gently to the west. The elevation varies from 4,950 feet at the Bauer plant to about 7,000 feet near the eastern limits of mineralization.

The district lies on the northeast side of the great Ophir anti-cline which stretches for nearly 25 miles from the old camp of Sunshine on the south to the western edge of South Mountain. The beddings have much variation in strike and dip as local folds are superimposed on the fundamental anticlinal structure. In general, beddings strike east–west to north 70 west with dips varying from 45° to the north to vertical.

The sediments are classified as belonging to the Oquirrh Formation of the Pennsylvanian. Its total thickness of plus 15,000 feet consists of interbedded, lenticular quartzite in limestone in the lower portion, changing to somewhat lenticular limestones in quartzite or quartzitic sandstone in the upper portion. In the workings of the Honerine mine a series of relatively thin limestones, sometimes somewhat dolomitic, are interbedded with quartzitic sandstone. Sixteen of these limestone beds are known in the property and have been developed over a stratigraphic thickness of about 3,000 feet. The ore bodies are all found in the limestones although not all of the limestones have been productive. An interesting study made during the summer of 1952 shows that the thickness of the productive section increases toward the east. This seems to be connected with the original sedimentation.

The most common intrusive rock of the Stockton area is a quartz monzonite porphyry, of which there are many variants with various grain sizes. The "Raddatz Porphyry" with its large orthoclase crystals is perhaps the best known type. At many places in the Stockton mines dykes of highly altered dark greenish-gray rocks occur. They contain horn blende, plagioclase, quartz, and chloritized biotite, and may be classed as diorite porphyry.

The igneous rocks occur as many dykes, sills, and small stocks. Curiously enough, in the southern part of the district most of the occurrences are small irregular stocks, while to the northward the prevailing form consists of north to northeast trending, west-dipping dykes. In size these dykes may exceed one hundred feet in thickness. Because these dykes parallel the numerous faults and because of displacement across the dykes of the limestone beds, it is probable that the dykes were extruded along pre-existing faults.

Faulting

The many faults in the Stockton area can be grouped into two classes: 1) bedding faults, and 2) crossings. The bedding faults are believed to be the earlier and are probably associated with the doming of the sediments. They antidate the dyke intrusions. The best known of these faults follow the limestone bedding rather closely both in strike and dip. No measurements of the movement have been made, but the displacements are believed to be small.

The "crossings" or north–south faults are much more noticeable and are often so closely associated with the mineralization as to be of great economic importance. These faults, in general, strike from N 10 to 30° E and dip westerly between 60 and 70°. The displacements vary from a few feet to several hundred and are evidenced by the offsets to the limebeds which they cut at nearly right angles. This great system of faults is earlier than the porphyries and the mineralization and seems to have served in many cases as channels for the porphyries. They are often spoken of as the mineralizers. It may be that this series of faults is connected with the series of "Basin range" faults that occur along the western front of the Oquirrh Range south of Stockton, and are a part of the great adjustments of that period. The Continental Fault, east of Bauer, is considered to have displaced the western block over 80 feet to the south. There is evidence of minor faulting later than the prophyry intrusion and earlier than the mineralization. Also, a still later small east–west movement occurred, but these are of only local importance.

Ore Bodies

The typical ore body is localized by the intersection of a "crossing" with a limestone bedding. As the beds, in general, strike E–W and dip northward while the crossings strike northerly and dip westerly, the rake of the ore body is always northwesterly. As there are scores of the crossings and a dozen productive limestone beddings, the number of intersections in this grid pattern becomes very large. The individual ore bodies which have been mined exceed eighty in number. There are 20 on the Honerine lime; 17 on the King lime; and 10 or more on the Muscatine, the St. Patrick, and the Hercules limes. In size these ore bodies vary from small shoots that can be mined in their entirety by putting up an ordinary-sized raise to shoots that can boast of a production worth a million dollars or more and have been mined for over 2,000 feet along the rake.

Ore production for the district probably exceeds $25,000,000, a figure that is not large when compared with the earnings of some of the other districts; but the operation has been steady and almost continuous, adding to the wealth of the state for the past 90 years.

This report of the district is very incomplete and sketchy. It passes lightly over the thrills and heartbreaks that are common to mining. No mention has been made of the work of famous mining men of the West whose efforts contributed to the development of the district. Among these are the familiar names of Buhl, Weir, Raddatz, Kirk, and Snyder.

S. E. CRAIG

The above information from Bureau of Mines Professional Papers nos. 111 and 126; Earl Young; and records of Combined Metals Reduction Company.

CHAPTER 4
BULLION COALITION MINES

BAUER, TOOELE COUNTY, UTAH
SIX-HUNDRED, HONERINE, BULLION, CALUMET, BLUESTONE OF THE COMBINED METALS REDUCTION COMPANY

Some history of the Combined Metals Reduction Company is necessary to explain, not only how the Bauer plant and the Bauer mines got into the Combined Metals Reduction Company picture, but also why the development of the Bauer mines, with their promise, were never worked to anywhere near their full potential.

E. H. Snyder, a graduate of the Michigan School of Mines, ran the Pioche, Nevada, Assay Office. In 1913 he with E. W. Clark, G. W. Snyder, Frank Nichols and Harry Cushing organized the Greenwood Leasing Company. This partnership acquired a lease on the "Combined" mine and opened up one of the largest lead-zinc-silver ore bodies in the West, 160 feet wide and 15 feet thick, with a gross value then of $40.00 per ton. The name "Combined" came from the fact that the lead and zinc were so intimately united that, at that time, no one had any means of profitably separating them. E. H. Snyder organized the Combined Metals, Incorporated to work out a profitable method of handling these ores. The new company consisted of Charles Read, J. C. Jensen, Willard Scrowcroft, and W. F. Snyder & Sons.

Backed by the new Company, E. H. Snyder with N. C. Christensen, a metallurgist with vast leaching plant experience and Bill Fagergren, a flotation expert, worked out a combination acid flotation and acid leaching process for treating these lead-zinc-silver ores from the Combined Metals, Incorporated mine at Pioche, Nevada. Then E. H. Snyder, through J. A. Caselton, manager of the St. Louis Smelting and Refining Plant, a subsidiary of the National Lead Company of New York, interested the National Lead Company in the mine and the process of the Combined Metals Incorporated. To prove up the process, the National Lead Company had the Combined Metals, Incorporated build and operate a pilot plant at a subsidiary plant of the National Lead Company, at Florence, Colorado. After the successful operation of the pilot plant, the National Lead Company joined with the Combined Metals, Incorporated in the construction of a commercial sized plant, November, 1923. The National Lead Company put up $350,000.00 against the Combined Meals, Incorporated's mine and process to build the plant. The new Company to be called the Combined Metals Reduction Company.

The plant was a combination acid circuit flotation plant followed by a hydrochloric acid leaching plant. The flotation plant produced a bulk acid lead-zinc-silver concentrate. This concentrate went to a hydrochloric acid brine spray heater which produced a boiling hot brine solution of lead-chloride, zinc-chloride and silver-chloride from which solution, when filtered and cooled, the lead-chloride dropped out as pure white crystals. These lead-chloride crystals when washed and dried and fed to a molten zinc furnace produced a 99.99 percent lead plus zinc-chloride.

Pioche, Nevada, at that time, never figured as a place for the new plant. It was 350 miles from a supply of salt, sulphuric acid, coal and electric power and besides, Pioche had no water. All of which the new plant had to have. The Union Pacific Railroad wanted the zinc-chloride to treat its ties, the paper mills on the Union Pacific Railroad wanted the sodium-sulphate and of course the National Lead Company itself especially wanted the 99.99 percent lead.

At Bauer, Utah, belonging to the Bullion Coalition Mines Company, was an idle 100 tons per 24 hours gravity concentrating mill, with railroad facilities, that could be made over to fit the needs of the new flotation and leaching plant. This mill had been built in 1900–04, when the Honerine tunnel was being driven and was built to handle the ores from the mine. Since most of the ores from the mine turned out to be direct shipping ores the mill had had little use. There was no electric power available at the time the mill was built. The mill was driven by a 100 HP Corless steam engine and by a number of small steam engines. The mill was equipped with a gyratory crusher, Chilian mill, jigs, tables and a vanner. There was a steam plant with four 150 HP boilers and two 2000 cfm steam driven Corless cross compound air compressors. The Combined Metals Reduction Company took over this mill, steam plant, camp buildings and 500 gpm of water, one half the flow from the mine. The Bauer property retained 500 gpm, one half the flow from the mine, for the farm and the orchard. The Combined Metals Reduction Company did not take over the mine, farm and orchard till January, 1925. The mine was not being worked at that time and had not been worked, but just maintained, for the past seven years, since 1917.

The Combined Metals Reduction Company cleaned out all the old gravity mill equipment, installed the new flotation plant, built a hydrochloric acid plant, installed the leaching equipment and within less than eighteen months had the new flotation and leaching plants producing 99.99 percent lead, zinc chloride and sodium sulphate. Then within the next three months the plant proved it could add the sulphuric acid direct to the brine-spray-heaters and get even better extraction than it got with the hydrochloric acid. This step cut out the whole hydrochloric acid plant. Then W. D. (Johnny) Green, the Company's flotation metallurgist, worked out a basic flotation circuit, which, with a finer grind, made a higher grade lead-silver-concentrate and a high grade zinc-concentrate with higher recovery of all three metals. With this change the leaching plant, for the time being, was dropped and the Bauer mill became a straight flotation plant. Able to get high recoveries from past impossible ores the Bauer flotation plant, besides handling its own Pioche ores, became also a custom flotation plant and grew to a two section then in time to a three section 1,000 tons per day custom mill. It handled custom ores, from Colorado, Idaho, Utah as well as its own ores from Pioche, Nevada.

As the mill grew it had to have more water than the 500 gpm that it got with the purchase of the old mill. To get additional water the Combined Metals, in 1925, purchased the farm, orchard and mine to get the remaining 500 gpm of water from the mine. The combined Metals never had any idea of running the orchard and farm except until it found a leaser. It did find during the time it ran the farm that the water from the tailings pond was superior irrigation water for the orchard. It contained minerals that the orchard needed. Immediately after the Company started using the water from the tailings pond on the orchard the trees turned from a sickly yellow to a brilliant green, the apples stopped dropping and got back their flavor. And though later on when the Bluestone and Honerine sections of the mine started mining below the tunnel level and the water flow from the mine was ample for the mill, orchard and farm, the Company did not find the orchard profitable and pulled it up.

The success of the Bauer flotation plant did not stop the leaching plant idea. In fact the success of the flotation stimulated the leaching program. The Combined Metals Reduction Company with the urgent cooperation of the Natinal Lead Company continued with the leaching research, the design and the testing of processes and equipment. Then in 1933, after eight more years of study, design and testing since the alkaline flotation circuit replaced the first leaching plant, the National Lead Company approved the construction of a new complete leaching pilot plant at Bauer. When this pilot plant was ready for testing the National Lead Company sent four metallurgists to check the test. This pilot plant ran continuously around the clock twenty-four hours a day for four months. After this test run and complete check the National Lead Company gave the Combined Metals Reduction Company the go ahead with the design of a new leaching plant.

The conditions in 1923 that originally brought the Combined Metals Reduction Company to Bauer had all changed by 1938. That first plant that the Company built at Bauer had to have a supply of water, electric power, a close supply of sulphuric acid, common salt and coal of which Pioche, Nevada, at that time, had none within 350 miles. By 1938 those conditions had changed. In 1935 the newly organized Lincoln County Power District got the Government's approval and a loan to build a 200 mile 66,000 volt power line from the Hoover Dam to Pioche, Nevada. This power line, completed in 1938, gave the Caselton camp cheap electric power and cheap power gave a supply of water from the new Caselton shaft. Cheap electric power and a supply of water made possible a flotation plant near the shaft. The Caselton flotation plant was completed in September 1941. Up until then all the Company's Nevada ores had been milled at Bauer, that is, from 1924 to 1941, seventeen years. Upon the completion of the Caselton flotation plant all Nevada ores went to Caselton. But the Bauer flotation plant with its ores from its Honerine mines and the Butterfield mines was soon loaded up with custom ores. With these changes the main Company offices, which from the beginning had been at the Bauer plant, were moved to Salt Lake.

The sudden death of James A. Caselton in 1940, the National Lead Company's real sponsor of the Combined Metals Reduction Company, and a new Board of Directors of the National Lead Company, all young men, who advocated that the National Lead Company get out of the mining and smelting and stick to the paint end of the Company's business, brought the sale of the National Lead Company's interest in the Combined Metals Reduction Company. At the same time the National Lead Company sold their interest in nineteen other mining companies.

The above part of this report tells why the Combined Metals Reduction Company acquired the old gravity mill at Bauer and later acquired the Honerine mine. Now some history of the Bauer mines.

The Honerine is an old mine, one of the oldest in Utah. It is in the Rush Valley Mining District, Tooele County. Rush Valley and the mountains east were first a military reservation laid out in 1855 by Lieutenant Steptoe contiguous to Camp Floyd for grazing the army's stock. The camp was known first as the army's Stock-Town, later as Camp Relief, then by the people as the Stockton District. Lieutenant Steptoe reported lead-silver ore in the mountains as early as 1855. General Connor who succeeded (by then) Colonel Steptoe in 1862 also reported lead-silver ore there. The first civilian house was built in Stockton in 1864 and by 1866 the town had 40 families and 400 inhabitants. General Connor with his officers built a lead smelting furnace which was not successful. Over the period 1864 to about 1878 a number of lead smelting units followed General Connor's furnace. A few of the later ones, at least at that time, were considered successful. In that day steam was the only power. Small steam plants 30 HP, 50 HP, 100 HP combination mine and concentrating plants were spread out all about the Stockton district. There was one 200 HP spread and one 400 HP spread in the area. Of course there were plain just man units and plain man and horse units. The records of the Six Hundred level show that, even with pioneer equipment that the mines then had, in those thirty odd years, before the turn of the century, the Stockton District, now Bauer, produced over 250,000 tons of ore. In 1872 a narrow gauge railroad was built out from Salt Lake to Terminal, now Bauer. Though the railroad had to serve all the mines in the whole district it was never extended beyond Terminal (Bauer). It continued to operate for thirty-four years until the Salt Lake and San Pedro, now the Union Pacific railroad, went through in 1906 from Salt Lake to the Pacific Coast.

At the turn of the century a group of men who had just sold the Annie Laurie gold mine near Richfield, Utah, took over and consolidated the group of mines of Terminal (Bauer) and formed the Honerine Mining and Milling Company. It was the same group who at about the same period, built the Milner Dam on the Snake River and opened up the Twin Falls Irrigation Project. Whence came the same names of the towns on the irrigation project as stopes in the mine, the names of company officials, Buhl, Murtaugh, Kimberly, Scheu and Filer. This new group changed the name of the camp from Terminal to Buhl. W. F. Snyder was made manager and E. J. Raddatz was made superintendent of the development of the mine.

This new company built the gravity concentrating mill, dug the Honerine tunnel and developed the 1200 tunnel level up to about the 9500E coordinate, the Katherine porphyry dyke. The practice of this group of men was to develop a mine, then sell it, which they did with this property and had done with the Annie Laurie mine at Richfield, Utah, and did with the Twin Falls Irrigation Project. This Twelve-Hundred tunnel development confirmed the belief that the rich lead-silver ore bodies found on and above the Six-Hundred, the water level, continue down and through the Twelve-Hundred level. During the years 1904 and 1905 while developing the mine it produced 43,000 and 40,000 tons of ore.

About 1906 the Honerine Mining and Milling Company sold the property to the Bullion Coalition Mines Company headed by B. F. Bauer. The new company changed the name of the camp from Buhl to Bauer. Later, this new company acquired the East Honerine Extension, the properties beyond the Katherine porphyry dike, coordinate 9500E, and proceeded to drive exploratory Twelve-Hundred level tunnels into this new territory and open up new ore bodies. All these drives continued to be productive.

Sometime about 1913 the new comany sunk the Hundred-Five shaft, coordinates, 7250N — 9500E, 400 feet deep to mine and explore the Sixteen-Hundred level. They installed a 2200 cfm air driven tandem compound plunger pump to handle the water they expected. This air driven pump at the end of a 2000 foot air line did not work out. Even with part load it continually froze up. By 1915 they got electric power to the district and into the mine. But the electric power, as it was there in 1917, was so unreliable that the mine gave up pumping and instead of continuing on the lower levels shut the whole mine down.

When the Combined Metals Reduction Company took over the farm, orchard and mine January 1, 1925, it made J. H. Buchler mine superintendent. Immediately leasers started in the mine. At that time horses pulled the one ton, end dump, plain cast iron bearings mine cars, the same cars that the former companies had used. Buehler started right off to unwater the Hundred-Five shaft. He started with, his life time favorite, Cameron single cylinder piston air driven sinking pumps. When 200 feet down he did not have room in the single compartment shaft for enough Cameron sinkers to handle the flow of water. In time he got electric power again in the mine then went to a direct connected Weinman centrifugal pump set horizontal on a floating wood platform. When Buchler reached the bottom he cleaned up and repaired the tandem compound sixty-four foot long air driven pump that the former company had installed but was never able to use successfully. Buchler did not make it work either. Finally electric station pumps were installed. To make them safe from flooding during power outages they were installed in a water tight compartment equipped with water tight steel doors.

Buchler left in the late summer to be superintendent of Bristol Silver Mines. Bill Stewart was made superintendent, then left for an Alta job. Bill Young was made superintendent. January 12, 1927, J. C. Ingersoll was made superintendent and Bill Young was made geologist. February 5, 1929 two sets of timbers in the tunnel caved and plugged the tunnel and shut off the flow of water. The mill needed the water. Ingersoll to open up the eight inch air line to release the water used fifteen sticks of powder and brought in fifteen more sets of timbers. Ingersoll was replaced by Russell Campbell.

The first and only hoist the Combined Metals Reduction Company ever installed in the Honerine mine was in December 1929, a 5,000 pound rope pull, 400 feet per minute, 75 horsepower hoist, at the Hundred-Five shaft. Fifteen years later when the Calumet began sinking this hoist was moved to the Calumet shaft and equipped with a 125 HP motor.

August 1928, the Bauer camp got 44,000 volt electric power direct from the Utah Power and Light Company's Salt Lake Plant over a power loop. One leg of the loop came over the mountains by way of Bingham and the other leg came by way of the Saltair highway. From then on the Bauer mill and mines very seldom had a power outage.

The mine leasers found that the former operators on the tunnel level had left the oxidized lead-zinc-silver ores. Since the Combined Metals Reduction Company could not handle oxidized ores in the flotation plant it gathered equipment from the old gravity plants about the place, viz: a jaw crusher, rolls, jigs and tables and built a fifty tons per eight hours gravity plant. The company ran the plant the first year then turned the plant over to the leasers who during the next fifteen years processed 250,000 tons of oxidized lead-zinc-silver ores through the plant which concentrated to 85,000 tons.

By 1928 the company replaced the horses in the mine with Mancha Little Trammers, 20 cell storage battery locomotives. A year later the company sent the 20 cell locomotives to Pioche, Nevada and installed 40 cell Mancha locomotives in the Honerine mine. Then in time replaced the twelve-pound rail in the mine with fifty pound rail. One of the biggest improvements was in building the two-ton Timken bearing side-dump mine cars equipped with automatic spring pull couplers.

Before the Honerine 1200 foot level tunnel was driven all the mining in this district was above the Six-Hundred level, then the water level. And as mentioned above, the workings were many and varied. The haulage and drainage 1200 level tunnel was driven during the period 1900–1904 means that the mines were worked on and above the Six-Hundred level from 1864–1900 = 36 years. A search of state and government records, though the records are somewhat hazy and scattered, show that the production of this group of mines, above the water, the 600 level, during that 36 years was over 275,000 tons.

The following is the production record of the Honerine mine during the time that it was owned by the Honerine Mining and Milling Company and the Bullion Coalition Mines, from 1900 to 1923, during which time the Honerine Tunnel was driven and the Hundred-Five shaft was sunk from the 1200 to the 1600 foot level.

Year		Tons	Year		Tons	Year		Tons	Year		Tons
1904	—	43,210	1908	—	1,612	1912	—	11,121	1916	—	24,500
1905	—	41,621	1909	—	5,291	1913	—	14,123	1917	—	10,641
1906	—	30,262	1910	—	7,516	1914	—	19,139			
1907	—	47,007	1911	—	10,321	1915	—	19,415	Total		285,779

The following is the production of the Honerine between the coordinates 8500N and 7500N during the years 1925–1942.

Year		Tons	Year		Tons	Year		Tons	Year		Tons
1925	—	13,511	1930	—	15,475	1935	—	12,648	1940	—	309
1926	—	28,682	1931	—	8,273	1936	—	16,447	1941	—	346
1927	—										

Year		Tons	Year		Tons	Year		Tons	Year		Tons
1941	—	30,448	1932	—	794	1937	—	15,270	1942	—	384
1928	—	15,394	1933	—	347	1938	—	7,253			
1929	—	8,801	1934	—	187	1939	—	307	Total		174,876

The following is the preduction of the Calumet during the years 1941–55.

Year		Tons	Year		Tons	Year		Tons	Year		Tons
1941	—	42,105	1945	—	32,447	1949	—	33,873	1953	—	24,184
1942	—	37,996	1946	—	32,094	1950	—	14,630	1954	—	22,956
1943	—	41,583	1947	—	32,010	1951	—	25,740	1955	—	16,238
1944	—	43,991	1948	—	40,154	1952	—	20,802	Total		460,803

The following is the production of the Bluestone during the years that it was worked, 1926–36.

Year		Tons	Year		Tons	Year		Tons	Year		Tons
1926	—	16,000	1929	—	26,002	1932	—	23,227	1935	—	22,849
1927	—	20,100	1930	—	19,248	1933	—	25,200	1936	—	20,048
1928	—	25,410	1931	—	29,388	1934	—	19,729	Total		247,201

The following is the average metal contents of the production over the period the property was worked:

	Tons	Gold	Silver	Lead	Zinc
Six Hundred Years 1862–1900	275,000	.071	11.11	25.2	Tr.
Honerine Mining & Milling Bullion Coalition Years 1900–1917	285,779	.035	13.07	25.08	Tr.
Combined Metals Between Coordinates 8500N and 7500N Years 1925–1942	174,876	.072	8.95	24.06	2.0
Calumet Years 1941–1955	460,803	.067	7.23	9.85	6.7
Bluestone Years 1926–1936	247,201	.10	8.29	24.15	Tr.
Total — Over	1,443,659				

The Combined Metals Reducation Company has added properties to its original purchase until the company's holdings contiguous to the Bauer plant cover an area two miles by four miles — eight square miles — over 5,000 acres, all 5,000 acres rated profitable productive mining property.

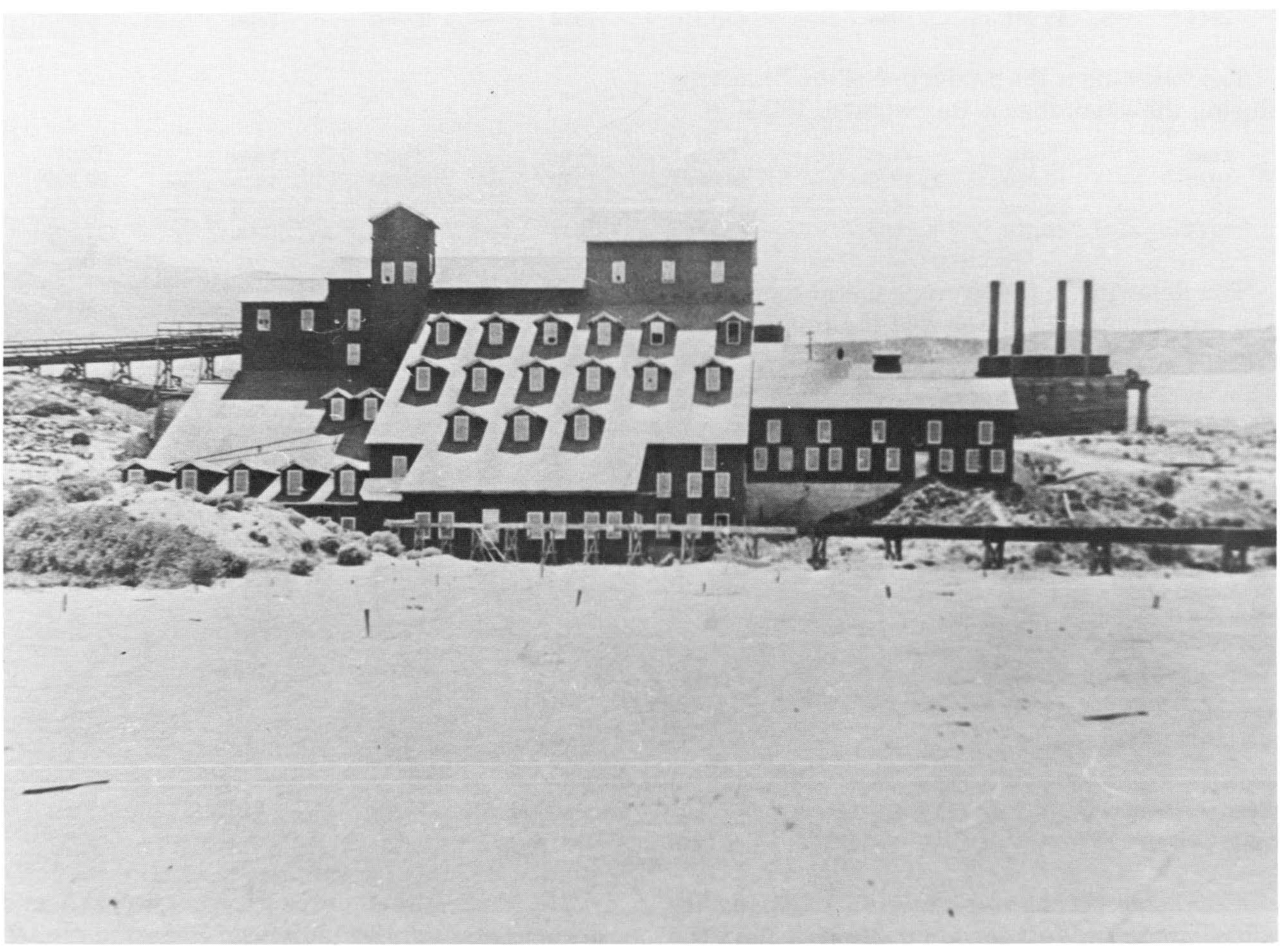
All these Bauer properties are worked and drained through the 1200 level Honerine tunnel. The first mile of the tunnel is through the old Lake Bonneville sand bench and has to be timbered sand tight the whole mile. Originally the tunnel sets were 7′ × 7′. Over the last thirty years the sets have been repaired and shored up until there is just clearance for the 36″ wide storage battery locomotives. The tunnel needs retimbering and widening to allow the use of at least five ton cars and larger locomotives. The original 12 pound rail already has been replaced with 50 pound rail. The track has a grade of half of one percent so that a train of empty cars has the same pull going in the mine as a loaded train has coming out. There must be by this time a material much better than timber for lining this mile of tunnel. The rest of the mine uses very little timber.

Water has always had an influence on the mining in the Bauer mines. Before the Honerine tunnel was driven, before the year 1900, all the mining was above the Six-Hundred level, then the water level. After the tunnel was driven, for the next thirteen or fourteen years, until the Four-Hundred shaft was sunk, all the mining was on and above the tunnel level, then the water level. When they drifted out from the shaft and developed a flow of water the management shut the whole mine down. Since 1928, since the Combined Metals Reduction Company pioneered and automated the turbine-mixed-flow-pump for shaft pumping, mine water has not been the expense and burden it formerly was. The total flow of the mine is 1,000 gpm. This flow can be taken from three or four places by as many automated pumps.

In the past, taking electric power underground has always been a hurried and consequently a makeshift expensive job. Electric power should be a studied job and by all means should be taken through a drill hole and not down an old shaft.

Likewise ventilation should be a studied job. Up until 1940 the mine dependend on natural draft. After 1940 the company installed a makeshift fan job. It got the mine by but not entirely satisfactorily or dependably.

Bill Kelsey



Gravity Mill Ore Concentrater built by Bullion Coalition Company in 1910. Later redesigned for flotation process of sulphide ores in 1927.

CHAPTER 5

CALUMET MINE
COMBINED METALS REDUCTION COMPANY

Stockton, Utah
September 1, 1956

Since the discovery of ore in the hills northeast of Stockton by General Connor's troop in the 1860s, mining has been almost continuous in that area. The ore was lead-silver-gold and the shoots apexed on or near the surface. Smelters were built and mining companies formed. The names of the early companies are nearly forgotten, but the better known of the later ores are Honerine, Galena King, Bluestone Lime and Quartzite, Argent, Ben Harrison, and Calumet.

The ore shoots were replacements in steeply dipping limestone beds. As mining proceeded at depth two factors retarded operation; first, the presence of water, and second, the sulphide ore containing high percentages of zinc.

At the turn of the century a consolidation of a number of the mines was made and the Honerine drain tunnel (1200 level) was driven for two and a half miles to cut beneath the principle working at 1,000 to 1,200 feet below the surface. In recent years nearly all mining in the area has been done through the Honerine drain tunnel.

At the portal of the drain tunnel is the Bauer Camp. This is located six miles south of Tooele, Utah, and is 40 miles to the west and south of Salt Lake City. It is within the Rush Valley Mining District on the west slope of the Oquirrh Range.

General Facilities

A paved road enters the camp from Highway U-36 and most employees drive to work from their homes in Tooele, Stockton, and Grantsville. Key personnel live in 16 dwellings in the camp. Utah Power & Light Co. supplies electric power at

Calumet Mine, Combined Metals Reduction Company, Stockton, Utah Mining Property

	Patented	Unpatented	Total	Patented	Unpatented	Total
Honerine Mining Claims	93		93	791.212		791.212
Galena King Mining Claims	20	1	21	83.764	5.000	88.764
Peerless Group		12	12		210.000	210.000
Bullion Coalition Group		24	24		420.170	420.170
Ben Harrison Claims	21	2	23	292.810	40.000	332.810
Ben Harrison Land				33.330		33.330
Black Diamond Claims	4		4	21.025		21.025
Mill and Campsite				640.000		640.000
Farm				1761.500		1761.500
Calumet Group	30	1	31	181.613	8.000	189.613
Wright–Muirbrook Group	9		9	49.040		49.040
Silver Coin	8		8	86.503		86.503
Joe Pulli		8	8		160.000	160.000
South East Calumet		35	35		440.000	440.000
Total	185	83	268	3940.797	1283.170	5223.967

44,000 volts to the Bauer sub-station at .88¢ per KWH. Camp water is from the drain tunnel. The flow is 700 gpm. Compressed air for mine and surface plants is supplied by a 2,700 cuft/m electric-driven compressor. A steam plant with five 150-HP boilers supplies heat and steam power. There are three research laboratories, assay laboratory, warehouse, machine shop, boardinghouse, and offices.

The plant is served by a branch line of the Union Pacific railroad. There are freight or truck services daily when required. An 800-ton per day capacity flotation mill treats the ore from the mine and custom ore from different localities. Concentrates are shipped to Tooele, Utah, and Great Falls, Montana.

Combined Metals Reduction Company purchased the Honerine and other mines from the Bullion Coalition Company in 1922 and since that time has acquired the major properties in the district.

Geology

The Oquirrh range is narrow, less than 10 miles in width, by 40 miles in length. Eight miles to the NE of Bauer are the lead-zinc and copper mines of the Bingham District, eight miles to the SE of Bauer are the Dry Canyon — Ophir lead-zinc-copper camps, and eight miles further to the south is the Mercur gold camp.

The sedimentary rocks of the Rush Valley Mining District are the Oquirrh Formation, which is a member of the Pennsylvania period. They consist of quartzite and limestone beds. The limestone beds are two to 50 feet in thickness and are separated by quartzite beds 200 to 400 feet in thickness. The beds have been tilted to 75° from the horizontal. They strike generally E-W and dip to the north.

Quartz-monzanite porphyry dykes cut across the bedding, striking generally N-S, and standing at steep angles. In the area of the Calumet workings porphyries are fine grain, dark in color, and occasionally sill out near the limestone beds.

The major structures that influence replacement ore bodies in the limestone are 1) strong bedding fissure. This is usually on the footwall of the limestone and probably made when the bedding was tilted; 2) mineralizing fissure cutting across the limestone bedding. Thus in the Rush Valley Mining District there are several limestone beds standing at steep angles striking E-W cut by N-S mineralizers. One mineralizer may make ore on several limestone beds. A horizontal log from south to north:

	Feet	
Iroquois		2.5
Quartzite	150	
Muscatine		7
Quartzite	390	
Calumet		5
Quartzite	2400	
Honerine		8
Quartzite	500	
St. Patrick		8
Quartzite	180	
Hercules		4
Quartzite	400	
King		30
Quartzite	1920	
Wild Cat		10
Quartzite	200	
Ben Harrison		30
Quartzite	200	
Black Bear		50

The Ben Harrison Mine is approximately 6,000 feet north of the Calumet Mine but on the same N-S mineralizing fissure. There are several non-productive limestone beds that are not listed in the above log.

Ore shoots are frequently the width of the limestone and may extend along its strike for a hundred feet or more. Many of the ore shoots apexed on the surface and some have been followed down the dip for 2,000 feet. The big shoots of the Bluestone Mine apexed 800 feet below the surface and in the Calumet workings the shoots on the Muscatine limestone have their apex 800 to 1,000 feet below the surface.

Production

In 1930 when ore shoots in the Honerine had been mined to such depth below the 1200 tunnel that further sinking was no longer practical, the Combined Metals Reduction Company obtained a lease on the Calumet Mine. Due to a large porphyry dyke or stock between the Honerine and Calumet limestone, the drain tunnel did not drain the water from this workings. The greatest depth to which the old Calumet Company had mined was their 700 level where the presence of water, small ore shoots, and zinc sulphide made the operation unprofitable.

The Combined Metals Reduction Company extended the drain tunnel to cut under the old Calumet Mine and since 1935 that workings has been the chief source of mine production.

Records indicate the following production from the property since 1922:

	Tons	Au	Ag	Pb	Zn	Market Value Today
Bluestone	281,211	.069	6.94	24.15	Tr	$13,649,982
Honerine	183,342	.035	5.13	15.10	4.64	5,973,282
Calumet	647,565	.072	7.23	9.85	6.70	16,577,664
	1,112,118					$36,200,928

Records of operations of the old companies are not available. Summary of Combined Metals' development and production during the past 28 years is as follows:

Year	Dry Ton	Au	Ag	Pb	Zn	Production	Operating P & L	Devel. Feet
1925–40	367,973	.066	5.86	12.58	6.31	$ 3,584,331	$139,454	17,059
1941	42,105	.067	7.20	10.22	6.83	441,952	78,066	5,261
1942	37,996	.072	7.12	9.37	7.41	442,088	58,983	4,200
1943	41,583	.062	6.41	8.02	6.83	664,795	133,567	4,772
1944	43,991	.061	5.80	7.51	7.11	630,180	92,187	2,820
1945	32,447	.057	7.19	9.46	7.18	651,815	178,102	2,151
1946	32,094	.055	6.97	9.45	5.88	641,973	131,088	3,316
1947	32,010	.058	7.37	9.74	6.57	716,959	100,171	3,615
1948	40,154	.069	7.83	10.13	5.01	1,061,580	265,677	3,591
1949	33,873	.063	7.12	9.07	4.53	633,869	(112,722)	3,386
1950	14,630	.075	7.91	10.44	7.35	318,415	(191,312)	465
1951	25,740	.063	8.84	11.77	3.89	724,780	3,649	2,374
1952	20,802	.048	10.15	13.98	2.69	612,743	(49,912)	4,172
1953	24,184	.058	9.60	13.44	2.66	489,210	24,307	1,220
1954	22,956	.057	8.96	12.43	3.86	466,403	5,354	1,304
1955	16,238	.060	8.93	11.83	3.51	348,310	(150,734)	1,304
	828,776	.063	7.08	11.34	5.66	$12,429,403	$705,925	61,010

The loss in 1952 was the result of a fire in the Calumet shaft near the surface. The 1955 loss was due to low production and high costs that resulted from getting behind with development.

This Company has mined ore shoots on the Calumet limestone to the 2100 level, 1,000 feet below the 1200 level, and shoots on the Muscatine limestone to 1,350 feet below the 1200 level. Ore shoots on both limestones are continuing downward.

Mining, Calumet–Muscatine

From the 1200 level a shaft was sunk on the Calumet limestone to the 2100 level. The shaft is on a 75° incline. At 125-foot intervals levels were driven. Except for a 400-ft crosscut to the Muscatine limestone, the drifts followed the two limestone beds; 800 to 1,000 feet of drift were necessary to develop the known ore shoots on each limestone. On some levels the small Iroquois limestone was developed for a few feet along the bed.

Ore shoots are sufficiently close and of such section that 50% of the drifting on the Calumet and Muscatine beds is in ore. Although there is some benching of ore into raises and some open stope mining, most of the ore is mined by shrinkage. Some timber is required when the broken ore is removed.

From the 2100 level a second two-compartment shaft was sunk. This one on the Muscatine bed. This shaft is down 400 feet and the 2200, 2300, and 2400 levels developed on the Muscatine limestone only. The Muscatine limestone is 400 feet in the footwall of the Calumet bed.

The ore hoisted from the Muscatine shaft is transferred by haulage motor on the 2100 level to the Calumet shaft where it is hoisted to the 1200 level.

Electric Power

Electric power for the mine is supplied by overhead line to shaft collar on the surface at 11,000 volts. This is brought to the mine workings through cable at 2300 volts.

Compressed Air

Compressed air is supplied by 2,700-cuft electric-driven compressor at the Bauer plant.

Haulage

Haulage is by storage battery locomotive. On the 1200 tunnel level 40-cell battery motors are used. On the various levels in the mine the Mancha Little Trammers are used; they have 20-cell batteries.

Water

There is a water flow of about 350-gpm in the Calumet Mine. It has not increased as the workings have gone deeper. Ingersoll Rand motor pumps and Pomona deep well pumps are in use.

Ventilation

A 50,000-cuft fan is used on the surface to supply air to the workings. Several other fans are used to properly disperse the air throughout the mine. The temperature is about 85° F with high humidity.

Miscellaneous

In drifting, jumbo-mounted automatic drifters are in use. Mucking machines are used for loading broken muck. Tungsten carbide bits are used on timkin rods.

Ore Reserves

Mine development for many years has been such that there has seldom been more than three years' reserve in sight at one time. However, the continuity of the ore shoots has been such that their size and grade could be projected with reasonable accuracy for two or three hundred feet below the lowest workings.

Ore shoots extending downward in the Honerine and Bluestone are below 700 to 1,000 feet of water. They are not considered as reserves, although at some future date they may be of interest. The vertical projections attached show the continuity of the ore shoots over a considerable depth.

Ore Section and Grade of Calumet Shoots, 2100 Level

Between the 1900 and 2100 levels the large East shoot wedged out between faults and small prophyry dykes so that the size and grade of ore shoots shown on the 2100 level is smaller and lower grade than on the levels above. This may be only a local condition and with a level or two in depth may be back to the old size and grade. The last few shipments made by a lessee sinking on the no.2 West have average 10% Pb and 12% Zn.

	Section	Au	Ag	Pb	Zn	T Ver Ft
No. 2 East	5x50	.09	7.90	12.3	3.4	31
No. 4 East	5x30	.07	3.05	3.8	2.5	19
1807	5x17	.02	5.46	6.9	5.1	11
No. 1 West	7x60	.06	3.85	5.7	6.9	52
		.066	4.14	7.3	5.0	113

Muscatine, 2400 Level

The grade and section of ore shoots on this level are somewhat lower than on the level above. The no.3 and no. 4 West shoots appeared to be turning to pyrite on the 2300 level, but on the 2400 level these shoots are larger and of slightly better grade. The no. 1 East that cut out on the 2400 level appears to be coming back in the shaft bottom 40 feet below the 2400 station.

2400 Level

	Section	Au	Ag	Pb	Zn	Fe	T Ver Ft.
No. 1 East	Appears to be coming back in shaft bottom						
No. 2 East	5x4	.01	6.18	8.8	.8		3
No. 3 East	96x5	.05	5.64	7.5	2.0	31.0	60
No. 4 East	40x6	.07	7.40	10.4	1.0	28.0	20
No. 5 East	15x4	.10	7.00	8.8	9.5		8
No. 6 East	58x6	.10	8.46	10.6	6.4		44
No. 1 West	60x4	.02	10.65	15.7	1.6	27.2	30
No. 2 West	102x6	.02	3.49	6.1	5.9	32.9	75
No. 3 West	52x4	.05	5.80	8.6	4.1		26
No. 4 West	45x4	.06	8.00	11.0	3.0		22
		.045	5.89	8.3	3.6		298

For the purpose of estimating the ore reserve in this part of the Calumet Mine now being worked, the average grade of the ore shoots on the last two levels will be used. The Calumet shoots are projected down the dip 366 feet to the 2400 level and the Muscatine shoots from the 2400 level for 375 feet to the 2700 level:

	Ag	Ag	Pb	Zn	Value/Ton
Calumet 2000-2100	.06	5.28	8.5%	5.3%	$15.00*
Muscatine 2300-2400	.04	8.18	11.3%	3.1%	20.00*

*Pb, 16¢ a lb; Zn, 13.5¢ a lb

Value of ore reserves that could be developed by crosscut to and drift on Calumet limestone, 2400 level, and by sinking Muscatine shaft 375 feet from the 2400 to 2700 level:

		Tons		Per T	Total Value
Calumet:	366′ × 113 T/V Ft =	40,000	@	$15.00	$ 600,000
Muscatine:	375′ × 300 T/V Ft =	112,500		20.00	2,250,000
		152,500		$18.70	$2,850,000

At the present time production is almost entirely from the 2400 level. Due to the few stopes on each level it is difficult to carry on development work and mine more than 1,800 tons per month from one level. Overhead and other fixed costs are rather high, so on an 1,800-ton-per-month production the mine is operating at a loss. By opening the shoots ont he Calumet 2400 level and opening two or more levels on the Muscatine, the mine production could be doubled.

There are several good prospects that merit development but have been passed up for lack of funds. The most attractive at the present time are as follows:

1. *1900 Level, West Muscatine.* On the 1200 level a drift was driven to the west from the Calumet–Muscatine workings. This drift was started on the Muscatine, passed through a 600-ft porphyry intrusion and then again into the Muscatine limestone bed.

This drift on the Muscatine beyond the prophyry cut a shoot 150 feet long by eight feet wide (no. 1 West). The east 30 feet of this shoot was lead-zinc ore and the remaining section was pyrite. A portion of this shoot was mined to 300 feet above the 1200 level. Company operations mined some low-grade mill ore and a lessee mined 1,500 tons of ore assaying .05 Au, 7.5 Ag, 13% Pb, and 6% Zn.

To the west of no. 1 West the limestone bed was 10 feet in thickness, blue-gray, and of very good quality. A second shoot was opened 3′ × 60′ in section; the grade .10 Au, 3.44 Ag, 4.9% Pb, .6% Zn, 38.8% Fe. Chutes were built but the ore was too low-grade to mine.

A few feet to the west a third shoot was opened, 3′ × 50′ in section, all pyrite. To the west of this shoot the limestone is bleached and siliceous.

Map D-1509, Vertical Projection of Workings on the Muscatine Limestone, shows most ore shoots apexing between the 1200 and 800 levels. Some of these were all pyrite on the 1200 level but good ore a few feet below the level. There is a possibility here that developing these shoots by a drift from the 1900 level of the Calumet Mine could produce 155,00 tons of ore. It is also possible that a mine equal to the Calumet could be developed in this area.

Estimate of cost for this development appears high because of approximately 300 to 500-gpm of water west of the big porphyry.

2. *Bullion Development,* King limestone below 1200 level. Sink 250 feet of winze and drift 300 feet to cut projection of known ore shoot. A small ore shoot was followed to the water level 150 feet (−50°) below the 1200 level. Below the water level the shoot appeared to be getting bigger in size. At 250 feet of greater depth the shoot may be of important size and grade, and if so there are other mineralizers in the area that could produce ore shoots. Attention is called to map D-648 which shows the Bluestone and other workings. It will be noted that Bluestone ore shoots had their apex only a few feet above the 1200 level.
3. *New Stockton.* In the areas of heavy mineralization on the Ben Harrison limestone, 1200 level, it is proposed to drill the best showing at a depth of 400 feet. A total of six holes with an aggregate depth of 2,511 feet is proposed. This work is in the area where lessees have mined near the 1200 level 795 tons of 17% lead ore. This is virgin country as no work has been done on the Ben Harrison limestone either above or below the 1200 level (map D-1516).
4. *West Muscatine.* Continue the 1200 West Muscatine drift to the west 3,000 feet. This

work would cut across the projection of several known mineralizers. The area is entirely virgin. Surface is covered with wash.

5. *East Calumet or Muscatine development,* 1200 level. Drift 2,500 feet to the east from the Calumet shaft to cut an area through which the "Pulli" mineralizers pass. This country would be entirely virgin as no working in the Honerine–Calumet Mine extends that far to the east.
6. There are also a number of small projects that merit development work.

The area has been in production for 90 years. Shoots have been followed from the grass roots to 2,000 feet in depth. Many shoots have been found that did not extend to the surface. There is no reason to believe that all ore shoots in the area have been found. The ore in sight will do much to help carry mine operation while development for new ore is carried out.

In addition to sinking the Muscatine shaft three levels and drifting to the Calumet on the 2400 level, the proposed development projects would cost as follows:

	Feet	Est Cost
No. 1. 1900 level, West Muscatine	1,500	$123,800
2. Bullion development, King limestone below 1200 level:		
Shaft	250	
Drift	300	55,800
3. New Stockton, 1200 level drilling	2,500	22,800
4. West Muscatine, 1200 level	3,000	115,000
5. East Calumet, 1200 level drift	2,500	75,000
6. Small projects	1,000	30,000
		$422,400

It is anticipated that Government assistance could be obtained on some of the projects listed above.

S. E. Craig
General Superintendent
Utah Operations

CHAPTER 6

BLUESTONE LIME AND QUARTZITE MINING COMPANY

The Bluestone Lime and Quartzite Mining Company was founded and controlled by Phillip C. Kirk (1882–1936) and his brothers Joseph and Jack. Their properties included the Tip Top Mine, the Kirk Shaft, and the Kirk Stope.

The Bluestone was located on a rich mineral line that created huge ore deposits on the King Lime. It was one of the most productive formations in the district. During the years it operated 1926–36 it produced 247,201 tons of high grade smelting ore, valued at $13,649,982 in terms of 1956 dollars (Re Production ch.4).

The Bluestone ore shoot did not extend to the surface. It was crosscut at the 1200 foot level and was mined down to the 2100 foot level. Phil Kirk first worked the Bluestone from a shaft started at the surface. When stopped by water he drifted under the ore shoot from the 1200 foot level. Mining below the drain tunnel level (1200 feet) was expensive and required constant pumping of large volumes of water. In order to do the development work and to finance the purchase of equipment needed, Phil Kirk and Ed Snyder of the Combined Metals Reduction Company developed a working agreement to get the job done.

Phil Kirk was not a geologist or a mining engineer. He was a Hard Rock miner. He had worked in the Dry Canyon mines and in the mines in the Stockton area. He apparently was a keen observer and learned the geological facts of life the hard way. He was also an entrepreneur and acquired the Bluestone through the lease purchase method.

He made enough money by 1928 to build and equip the Kirk Hotel in Tooele. He employed his relatives who wanted to work in the mine. Employees who were not relatives were required to live in his hotel and eat at the hotel restaurant.

He was a taskmaster and expected full production from his miners. However he was generous and always ready to help them in times of need.

Circumstances precluded Kirk from fulfilling his agreement with Ed Snyder and the Combined Metals Reduction Company took over the Bluestone Lime and Quartzite Mining Company.

Phil Kirk died in 1936. The hotel was acquired by Nate Anderson and his sister Millie Jones. As of 1986 it is still operated by the Jones family.

Bauer Union Officers: left to right — George Wilde, Union Organizer, William Edwards, Walter Lauritzen, William Marett, Harry Park, Glen Elkington, Milan A. Hendricksen.

CHAPTER 7
UNIONS

Until the New Deal Era, under Franklin D. Roosevelt, the labor force at Bauer was not unionized. Prior to that era the following unsatisfactory working conditions were reported by former employees of CMR to the author.

—Nepotism: Preference was made to relatives in the form of higher wages and better work assignments.

—Pay Scales: Different pay scales existed for the same work. For example, relatives received higher pay for the same job as did non-relatives.

—Working Hours: A set time for miners to leave the mines was not established. Occasionally miners were kept waiting for hours for a man train to haul them out. Eleven hour days for eight hours of pay were reported.

—Lack of warm dry change room for miners. It was reported that miners had to return home wet, summer or winter.

—Workers Bus Line: Miners reported service unsatisfactory and too expensive.

—Working Conditions: Several accidents and fatalities occured. Until ventilation was improved, *bad air* was common.

—Equipment Problems: Improperly engineered hoists, tramway chutes caused operating and maintenances problems.

—Mine Layout: Straight manway shafts and ore haulage shafts were not always provided. As a result one man riding the bale of an ore bucket up a crooked shaft forgot to duck and died of a broken neck (Proctor).

—Proper time for miners to *count their shots* was not always permitted. Thus, Dave Adamson drilled into a missed hole and was killed.

—Communications with management was bad. They could not negotiate for improvements.

The organization of a union in the mid-thirties improved working conditions and morale. For example:

—A change room near the portal of the tunnel was built.

—Standard pay scales were established.

—Portal to portal in eight hours time was established.

—Workers took over bus lines and also set up small insurance benefit fund.

—Mine safety practices installed and inspections made. Mine rescue teams and training programs established.

—Management negotiated with union representatives. No strikes occurred.

—Morale improved.

—Improved, more reliable equipment, was installed, which facilitated transportation and mine operations.

It was the unanimous opinions of all former CMR employees interviewed that the union was beneficial and that it did not adversely affect production.

Aerial view of Bauer, from ENE. Picture taken before Resin Plant and Panacalite Plant were built in center foreground, above RR Trailer and below road, now (1983) was excavated for sand and gravel.

CHAPTER 8

MINE SAFETY AND MORTALITIES

Prior to the advent of rock drilling equipment that used water to eliminate drilling dust, many miners contracted a lung disease called "Miners Consumption" or "Silicosis." Some of these men subsequently died of silicosis. Woody Proctor, Lynn Price and Big Martin Anderson were some of these victims.

Federal and State mine safety laws and the Fair Labor Practices Act, forced mine operators to eliminate "drilling dry" to provide good air, and to install safer mining procedures. Subsequently Bauer had a well trained mine safety and rescue team.

The rescue team was composed of maintenance employees and miners. They were required to undergo annual examinations to demonstrate their competency. Some members who served on the team were Glen Elkington, Robert Fox, Joseph Reed, Milan A. Hendricksen.

Mining is one of the most hazardous of occupations. This is due to the inherent hazards of falling rock, poor light, cramped working space, handling explosives, cave-ins and equipment failures.

These hazards were compounded at Bauer because of crooked shafts and tunnels, poor equipment, frequent power failures and exposure to lead and silica dusts.

A partial list of the names of men that were killed at the Bauer Mine and who are buried in the Tooele Cemetery include the following:

David M. Adamson	March 1931
Blaine Gillespie	31 January 1939
Mel Gressman	13 September 1946
Art Harwood	23 September 1935
Dave Matson	27 December 1937
Neva Proctor	8 August 1927
Jack Wexels	2 July 1940
Mike Smith	2 July 1941

The employees of the Bauer Mine and Mill Complex were a close knit group. They were always eager and willing to help one another in time of hardship or need. Here is one example of that spirit.

Dave B. Matson was killed by a premature mine blast in the Palace stope on December 27, 1937. He had a wife and eight children. There was no life insurance or workmans compensation because he was not an employee. He was an independent leaser. The Combined Metals Reduction Company had no contract obligation to compensate his widow for his death.

Daves widow Esther Taylor Matson was living at 254 East Utah Avenue in a basement home. Upon Daves death she had no income or financial resources.

With the concurrence of the Bauer Officials and employees, Alex A. Gillespie and W. D. Holt of the Quorum of Seventies of the L.D.S. Church met with the Utah State Industrial Commission to get help. The commission finally decided the widow was eligible for payment of $1000.00 and $75.00 a month.

The Bauer Officials provided an architect and the building materials to finish building the Matson home. This consumed the $1000.00. The seventies, employees, and neighbors provided the labor to build the house. It was completed in 16 days.

With the $75.00 a month and some income from some home products sales, Esther raised her family and maintained her stature in the community as a respected and contributing member. She states the people of Tooele are the greatest. It is a great place to live.

This charcoal kiln was in Soldier Canyon in 1962. The kiln has evenly spaced openings to control the air in making a high carbon fuel from pine logs. Charcoal was used in smelter furnaces in the Stockton area. Other kilns were located in Vernon, Pine Canyon, Tooele City, and Settlement Canyon. When coal became available the use of kilns was discontinued.

Left to Right: Don Rowberry, foreman, Lowell Park, Jim Vowles, Frank Beacham, Jim Taylor, George Simpson, Harold Anderson, Ruel Evans, Leo Remington, Lloyd (Gus) Shields seated.

CHAPTER 9

MINING OPERATIONS IN THE RUSH VALLEY MINING DISTRICT

The Rush Valley Mining District is concentrated in approximately 3 square miles north and east of Stockton. A map of the mining claims reveals that there was approximately 200 claims.

Prior to formation of the Bullion Coalition during 1910 and the driving of the Honerine drain tunnel there was no unified or organized method of developing or mining of the ore bodies. Each operator was on his own and dug shafts following ore shoots that outcropped on the surface.

As each operator struck water he was forced to pump, abandon his claim, sell it or to unite with the Honerine Coalition.

The lack of a long range mining plan culminated in a situation where some ores were handled 7 or more times between the ore face and the mine portal. This resulted in high cost operations.

CHAPTER 10

MILL OPERATIONS

The key asset that the Combined Metals Reduction Company (CMR) had was its milling expertise. Johnny Green developed the processes of fine grinding and selective flotation that made Bauer mill an outstanding success.

Neil Christensen and Henry Hansen, chemists and assayers contributed to the mill success by their applied knowledge of chemistry and metallurgy.

In many cases CMR out bid other mills for custom work. Mines in Idaho, Nevada, Montana, and Canada shipped ore to Bauer for milling.

They refined the selective flotation process to an art. Three flotation circuits were used. One to "pull" the lead sulfide, a second one to "pull" the zinc sulfide and a third to "pull" the iron sulfide which also contained the gold.

Jim Vowles, a mill operator for many years (1940–1957), tells of an incident concerning gold.

It was necessary and customary to take samples of concentrates shipped to the smelter. Careful assays were made and control samples retained for reference.

When the smelters received shipments of Bauer concentrates they also took samples to determine values and the metallurgy to apply in the smelting process.

It was discovered that the smelter assays did not match CMR assays in gold content. The smelter assay office reran their assays on the shipments and found they were valid. Bauer did the same thing, they found gold the smelter did not. Sometimes the differences were as much as ½ an ounce of gold per ton. In 1983 dollars that could amount to as much as $20,000 per 50 ton car load shipment.

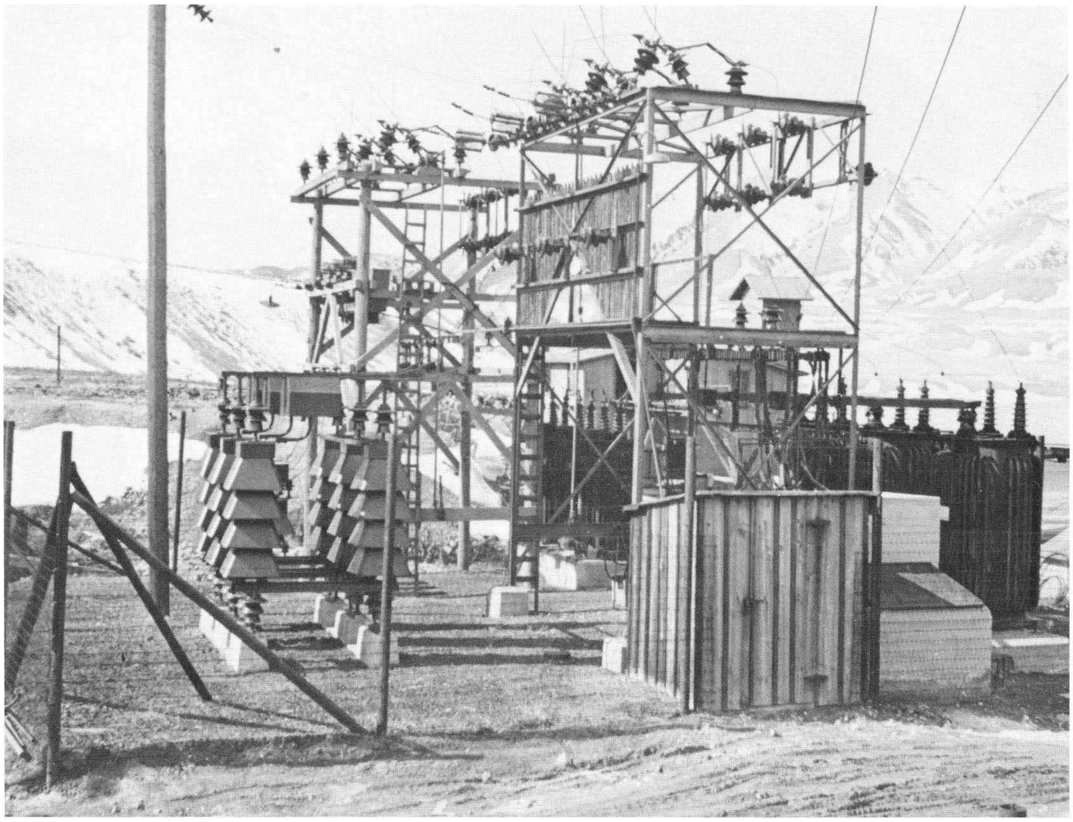
Careful investigation revealed that gunny sacks were used to stuff the cracks in the gondola car door closings. These sacks were burned and the gold recovered by unauthorized personnel.

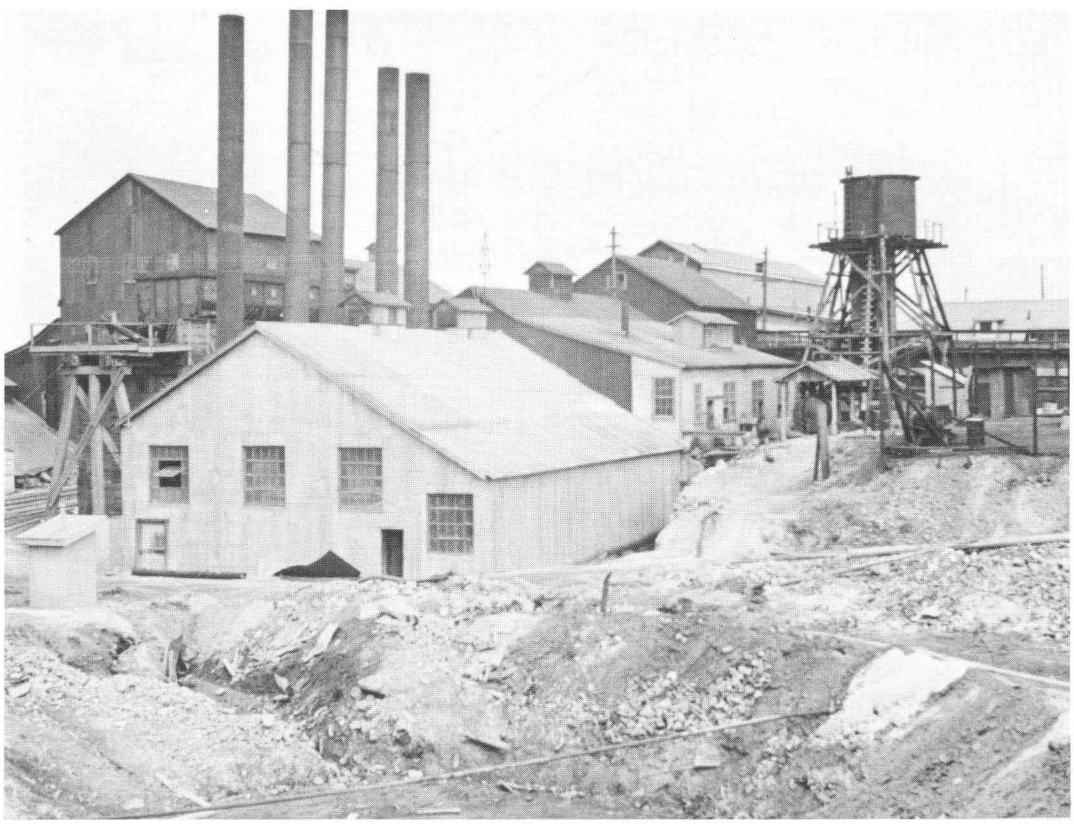
It was concluded that, gold being heavier than the sulfide lead silver and zinc ore, migrated to the bottom of the car and into the sacks. This migration was caused by vibration that occured when the rail cars were moved.

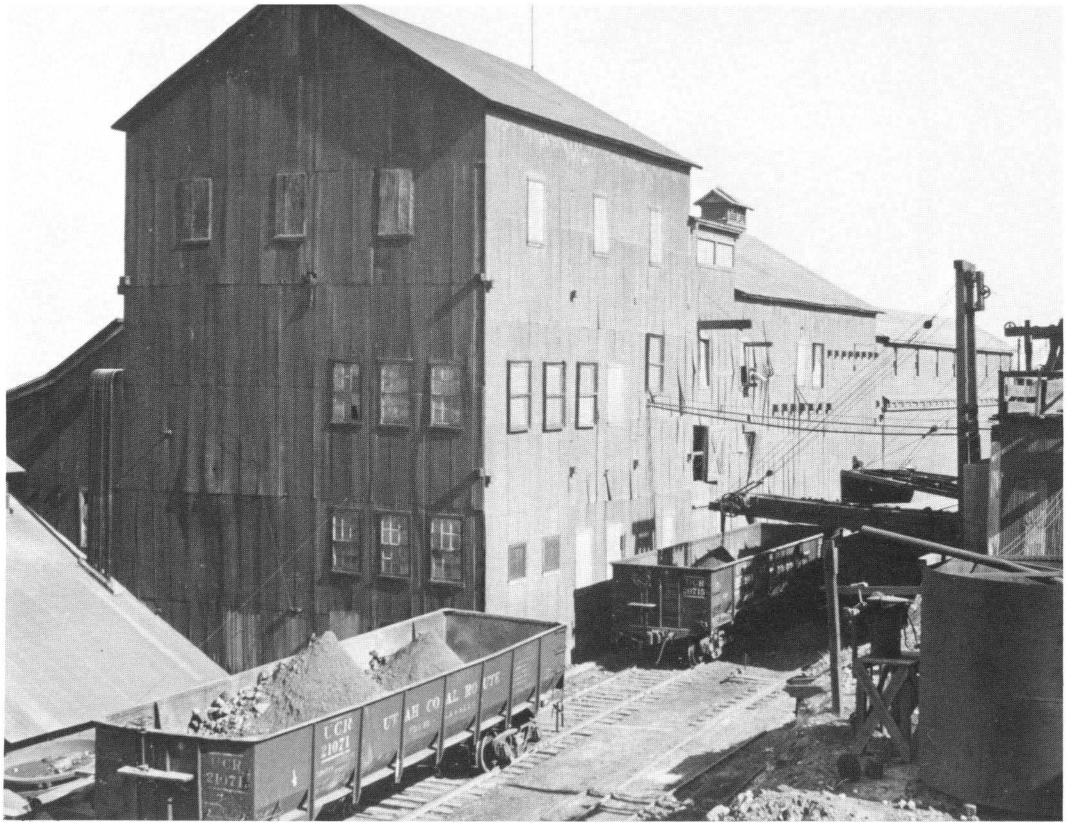
The following 29 pictures, taken by Johnny Green, show some of the mill operations, foreman and operators.

Scale House crude ore to Mill

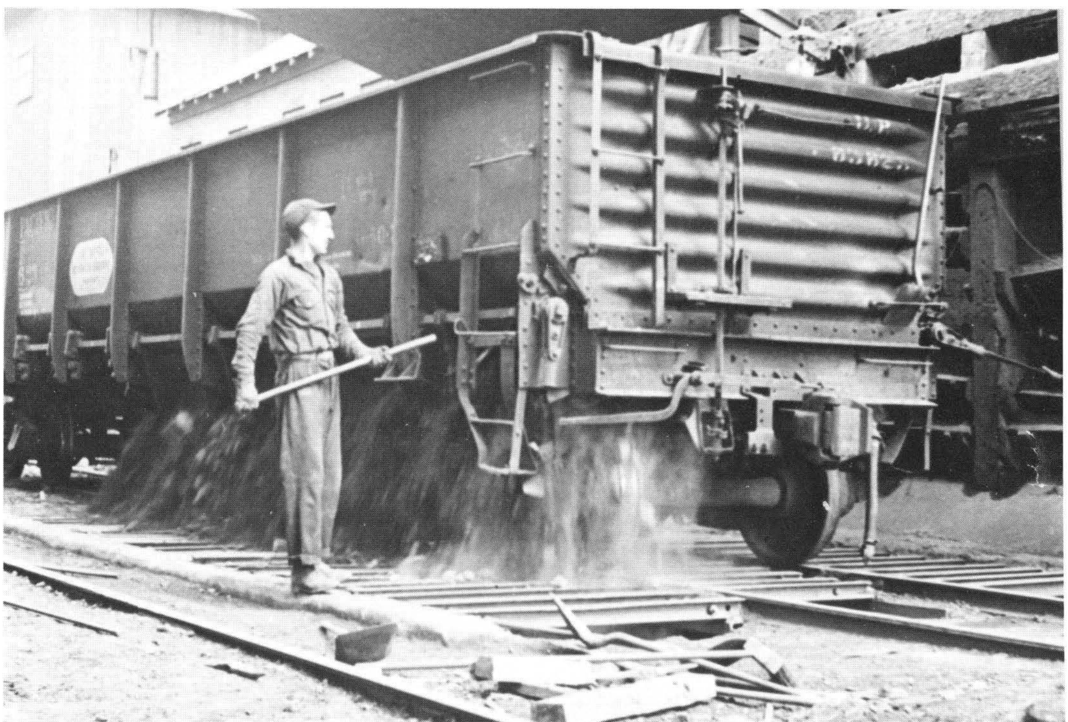
Mill Ore Bin Building


Power Sub Station


Steam Plant

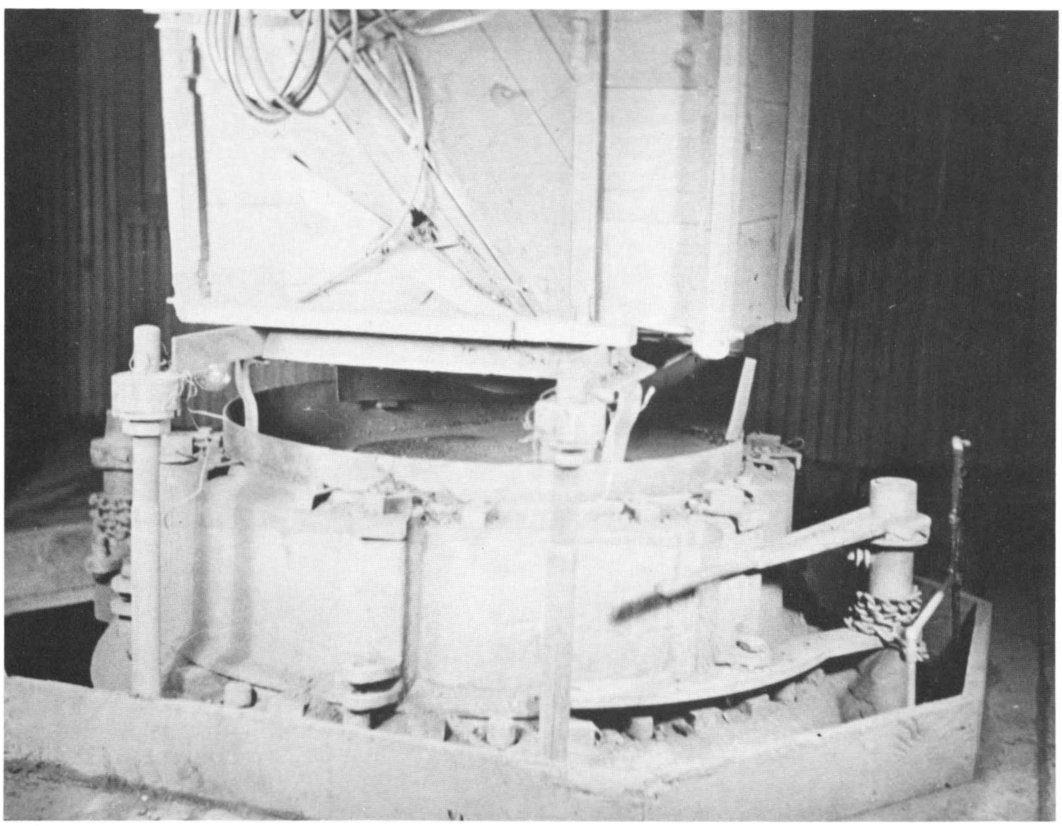


Ore Bins (Calumet Ore in Cars)

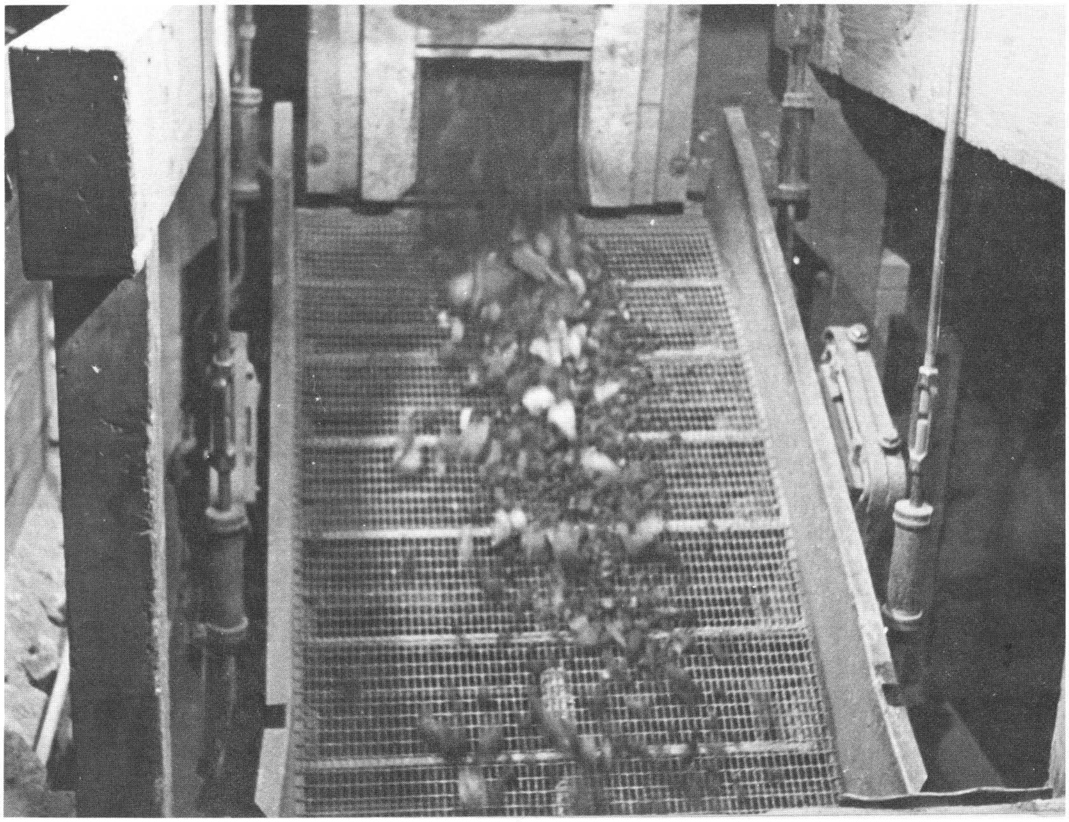


Lee Bracken dumping cars

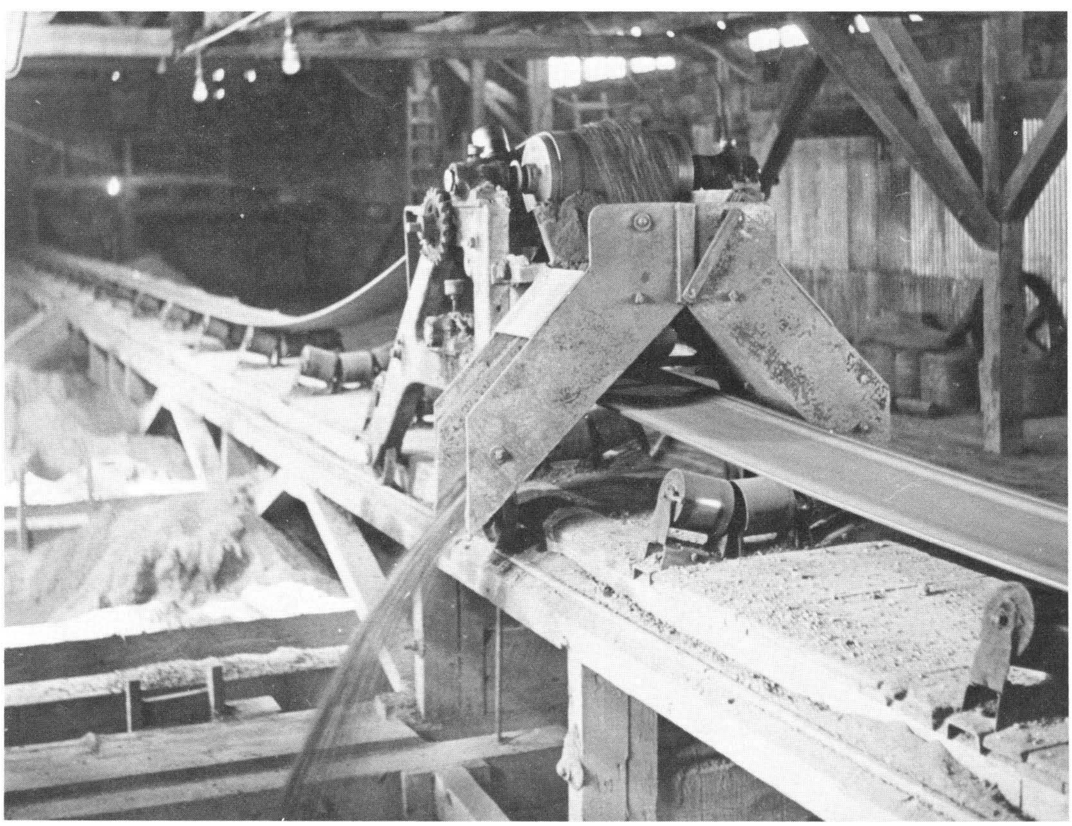
Pan Feeder/Conveyor from Hopper to Jaw Crusher



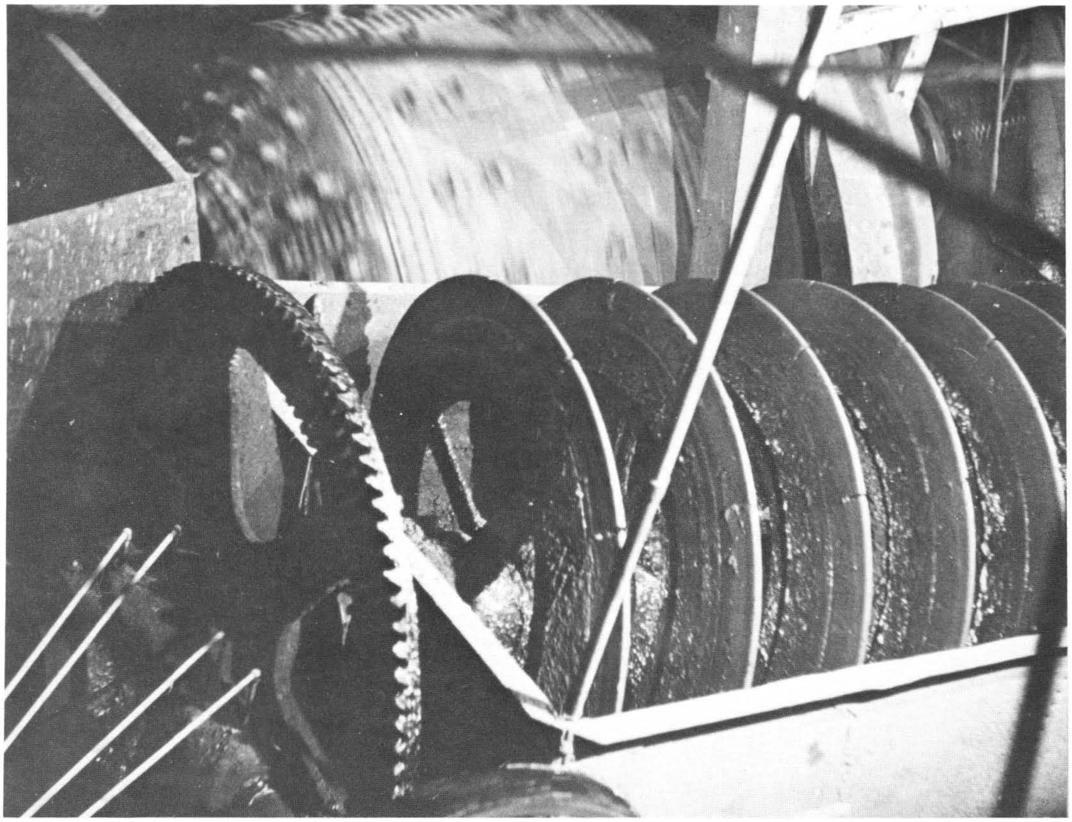
Symonds Cone Crusher



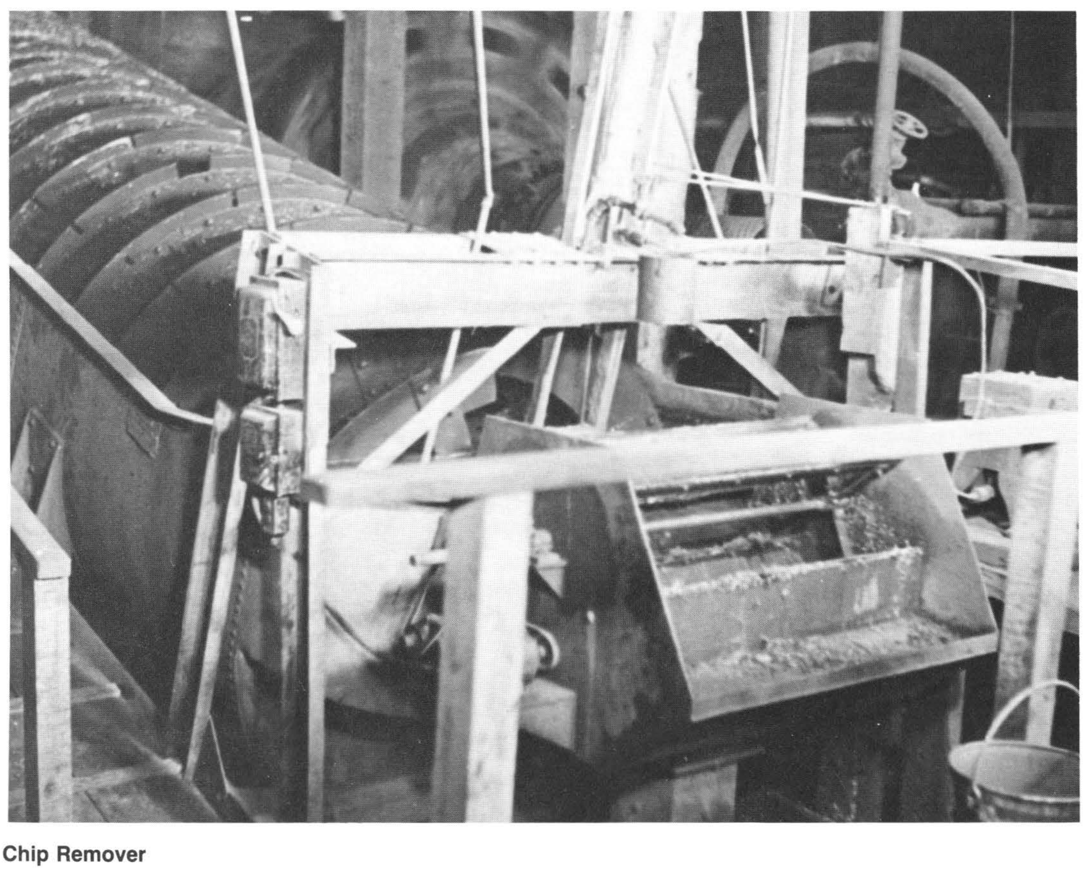
Vibrating Screen between Jaw Crusher and Cone Crusher.



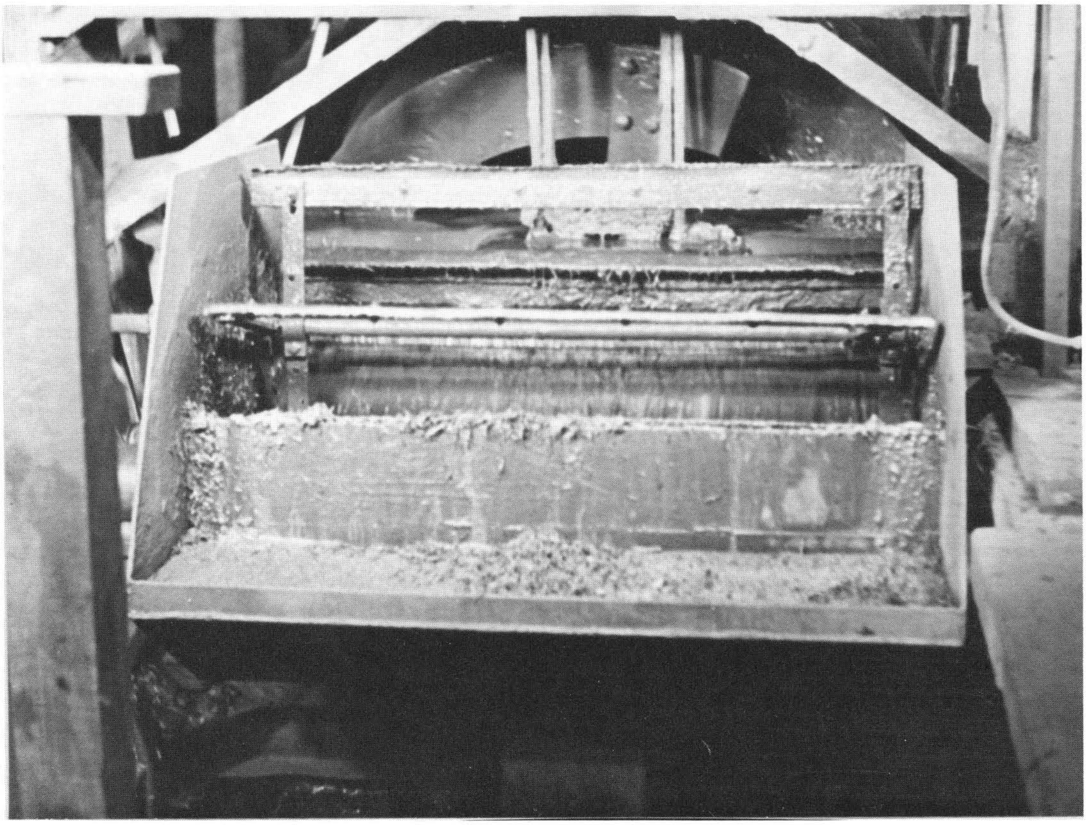
Ore Bin Conveyor Distributor



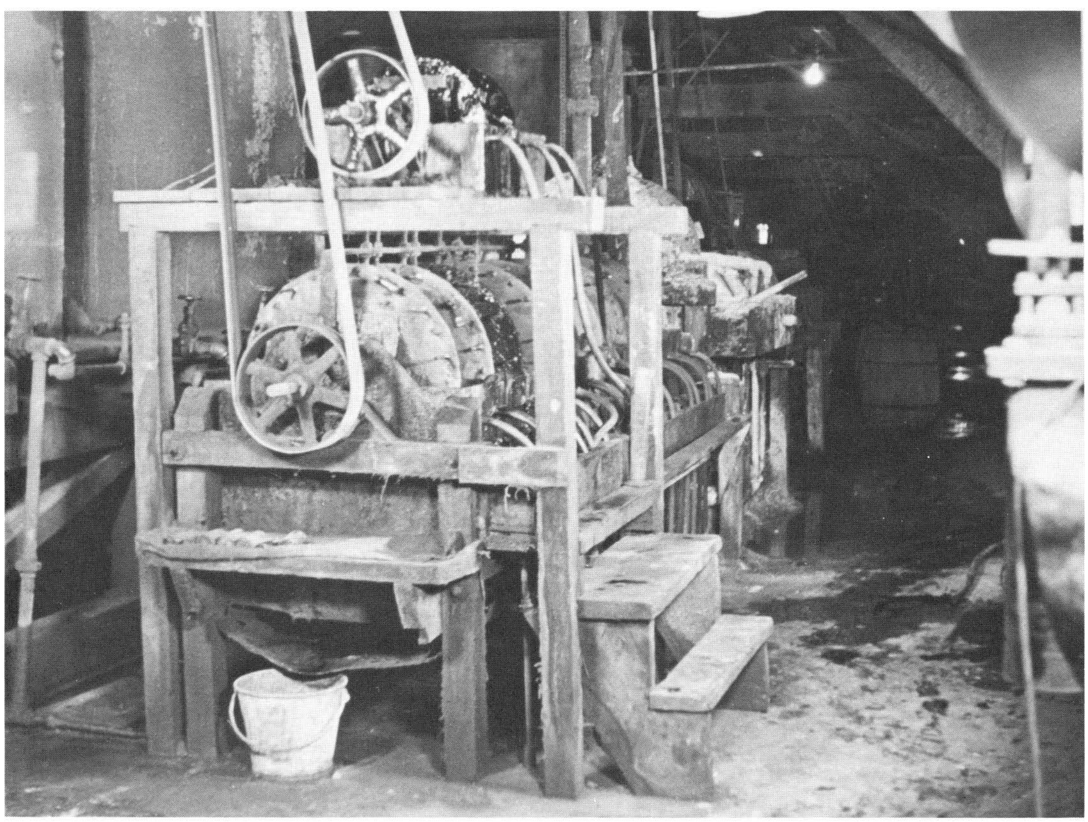
Ball Mill Classifier



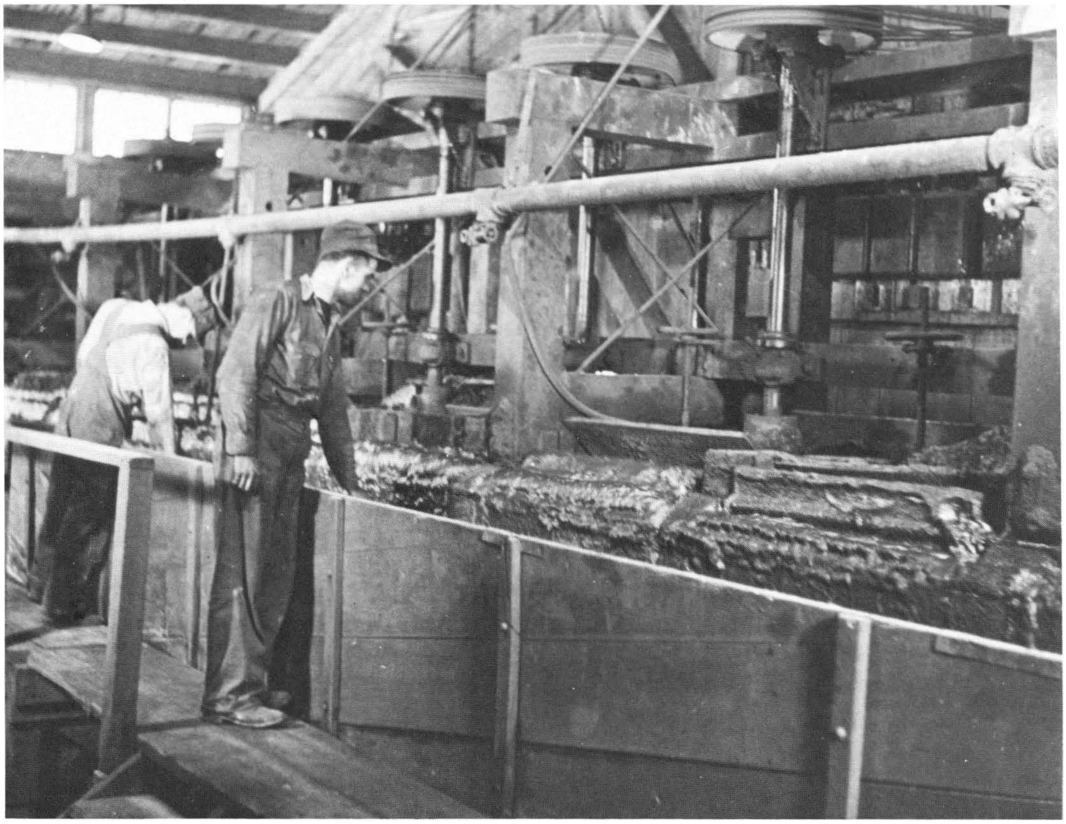
Chip Remover



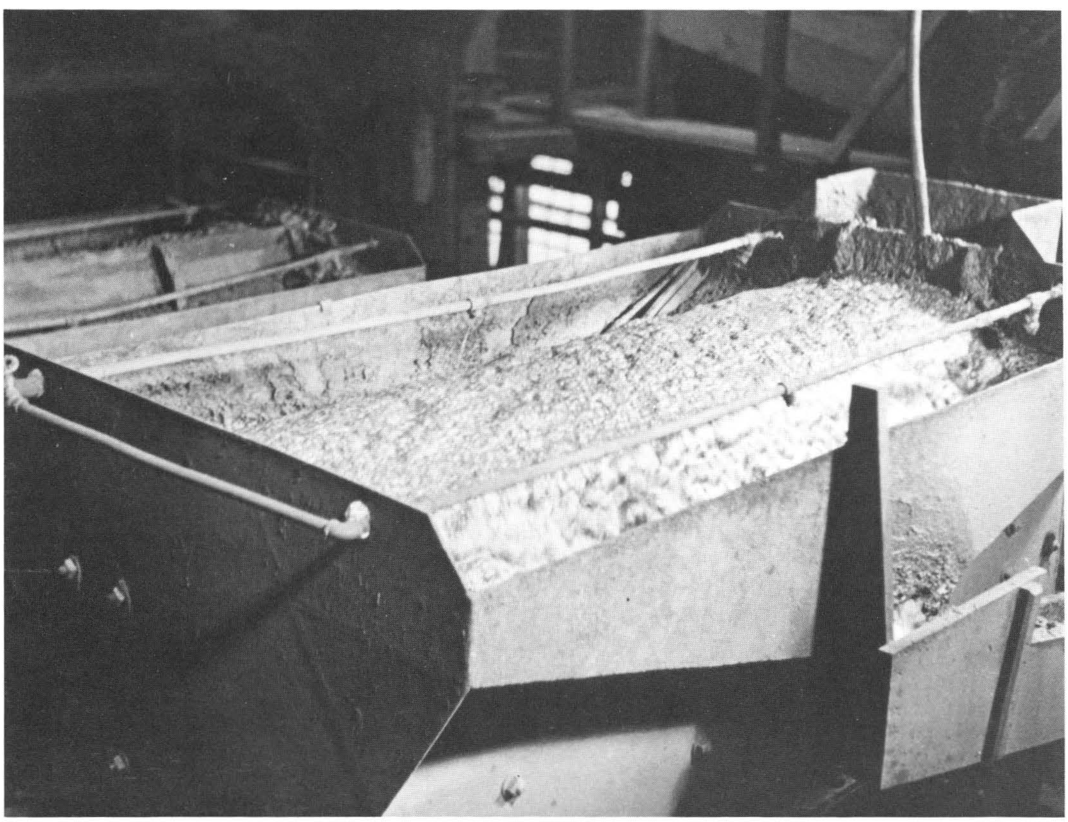
Chip Remover



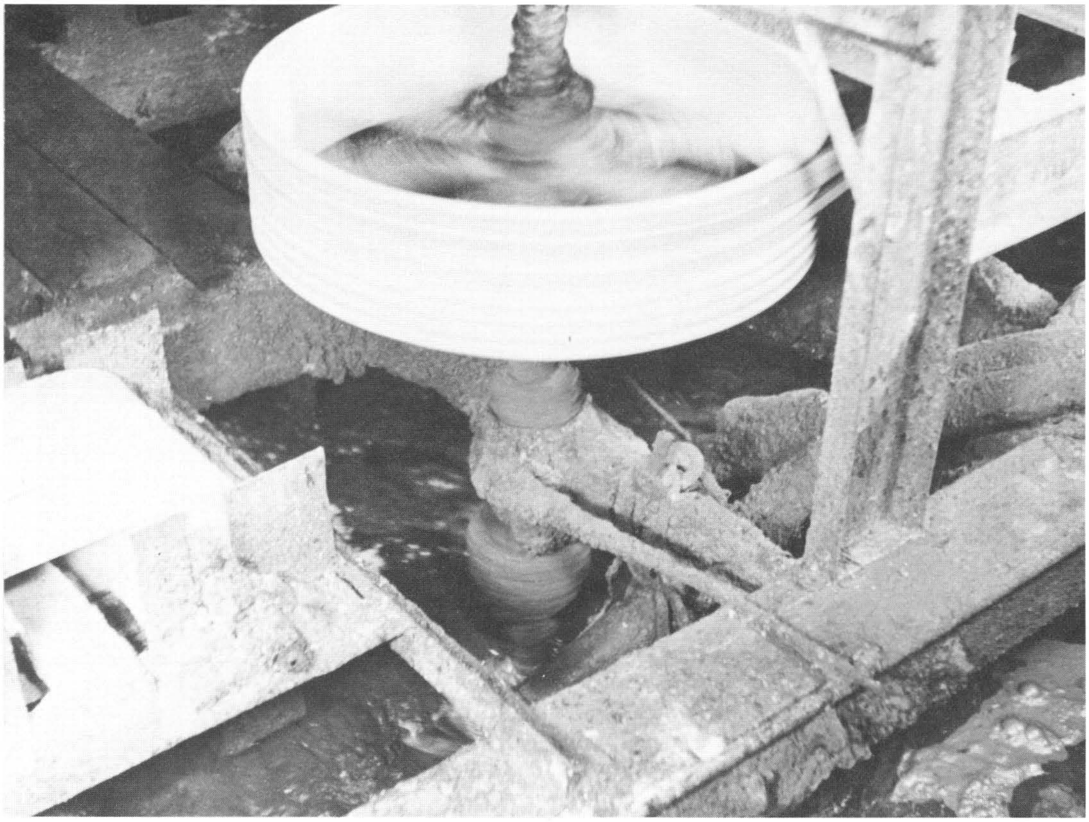
Reagent Feeder



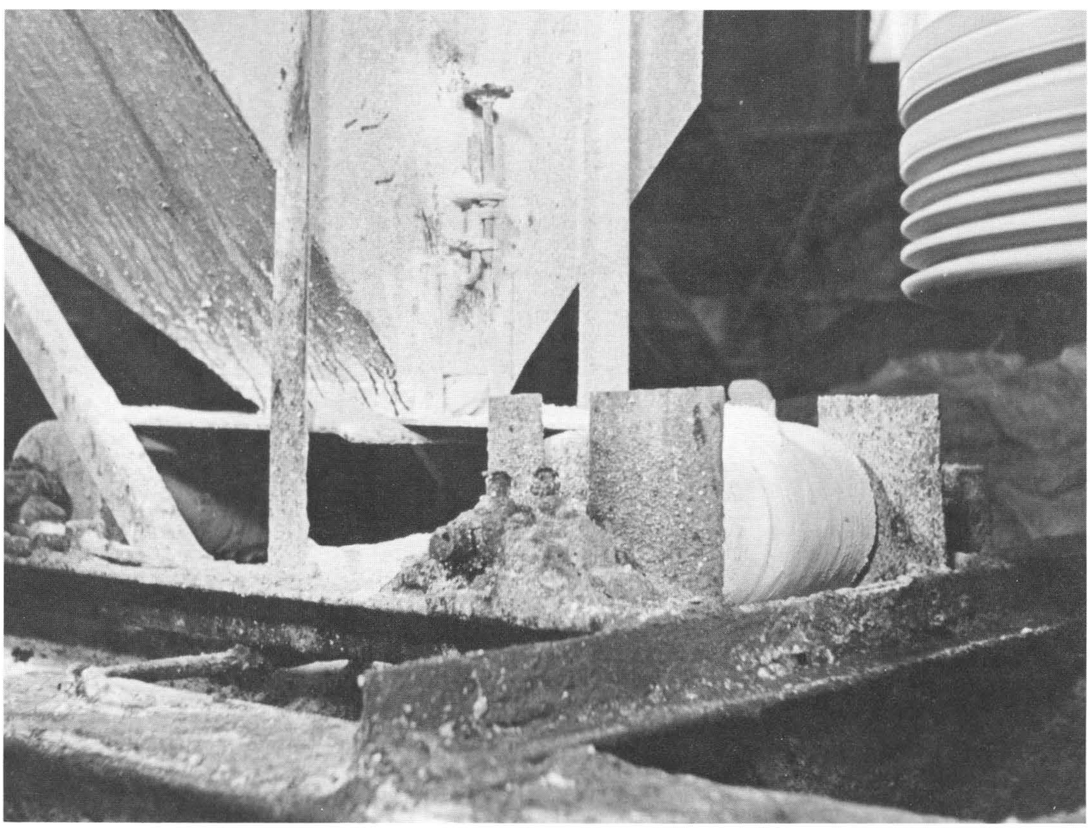
Lead Circuit Flotation Cells



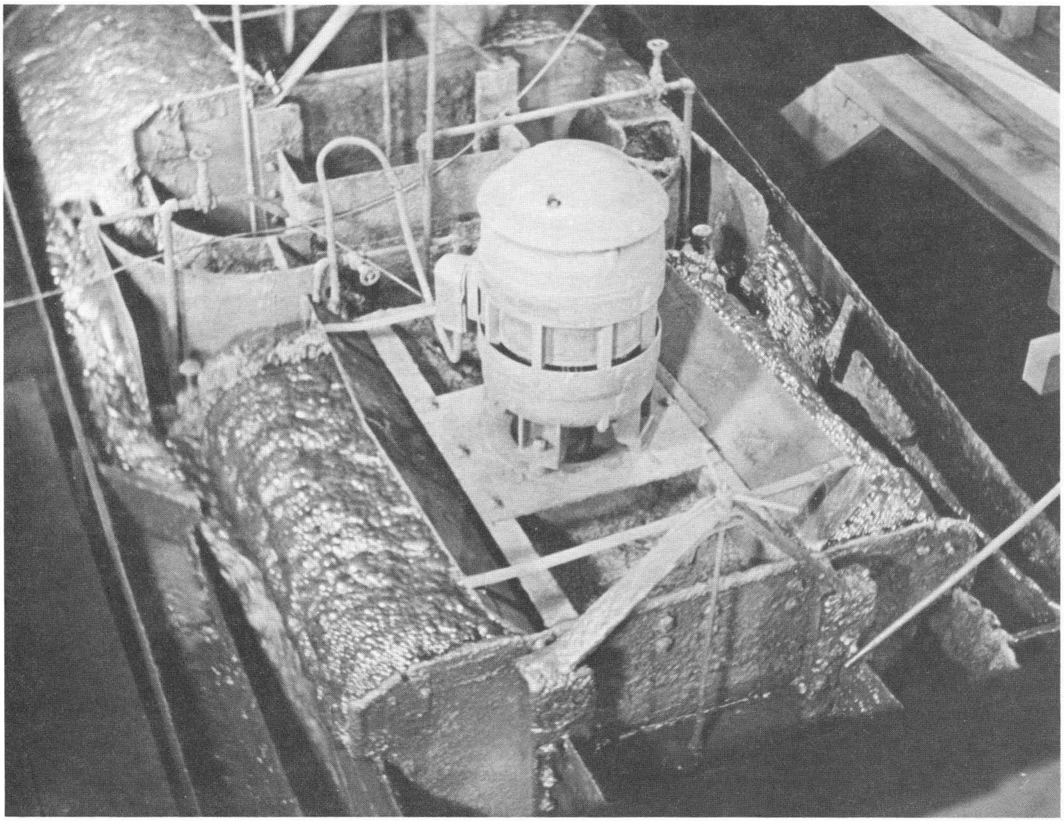
Zinc Froth Flotation Cells



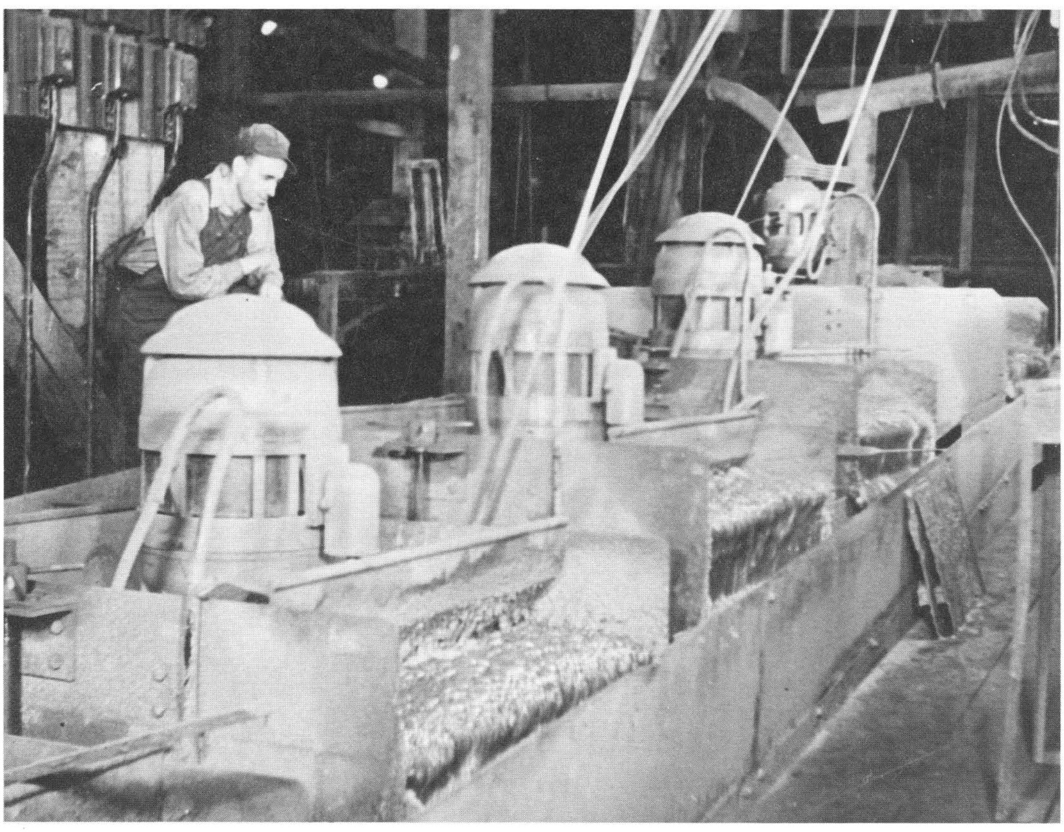
Agitator Flotation Cells



Lime Feeder to depress Iron Flotation



Flotation Cells Denzil Remington (Shift Boss)



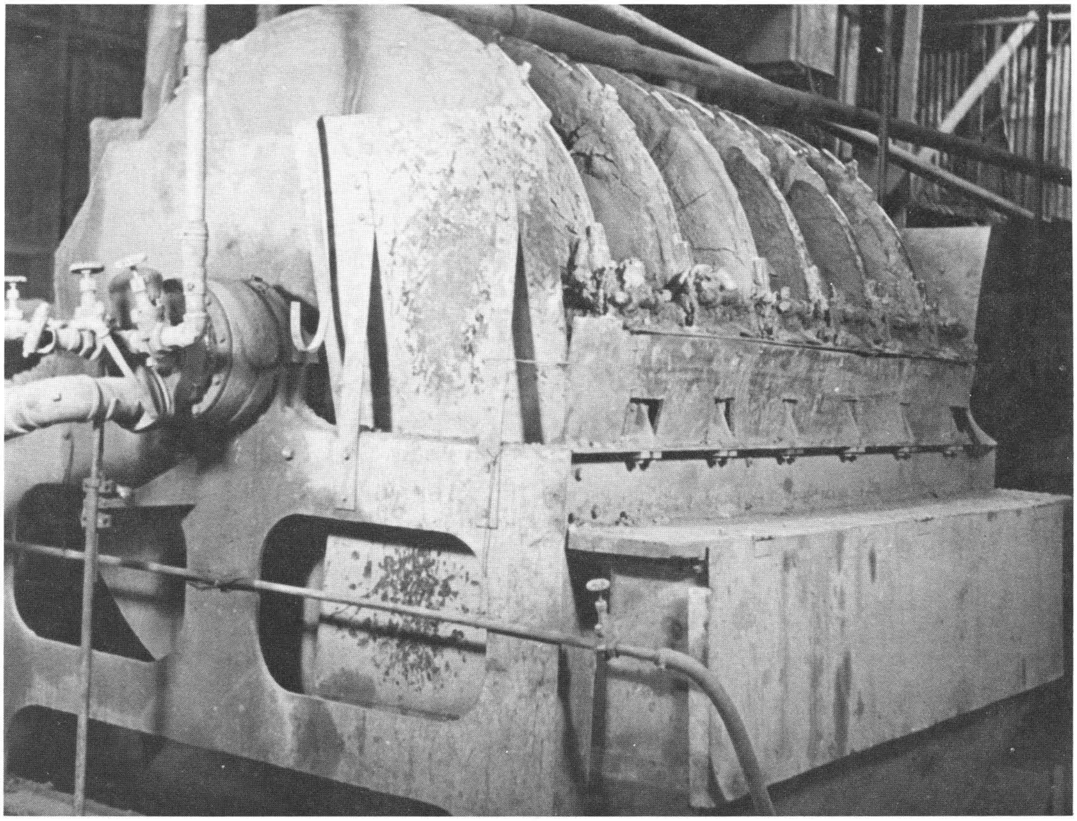
Lead Froth

Rail Switching Yard

The Ole Swimming Hole (Mine Water)

Flotation Cells Iron Circuit

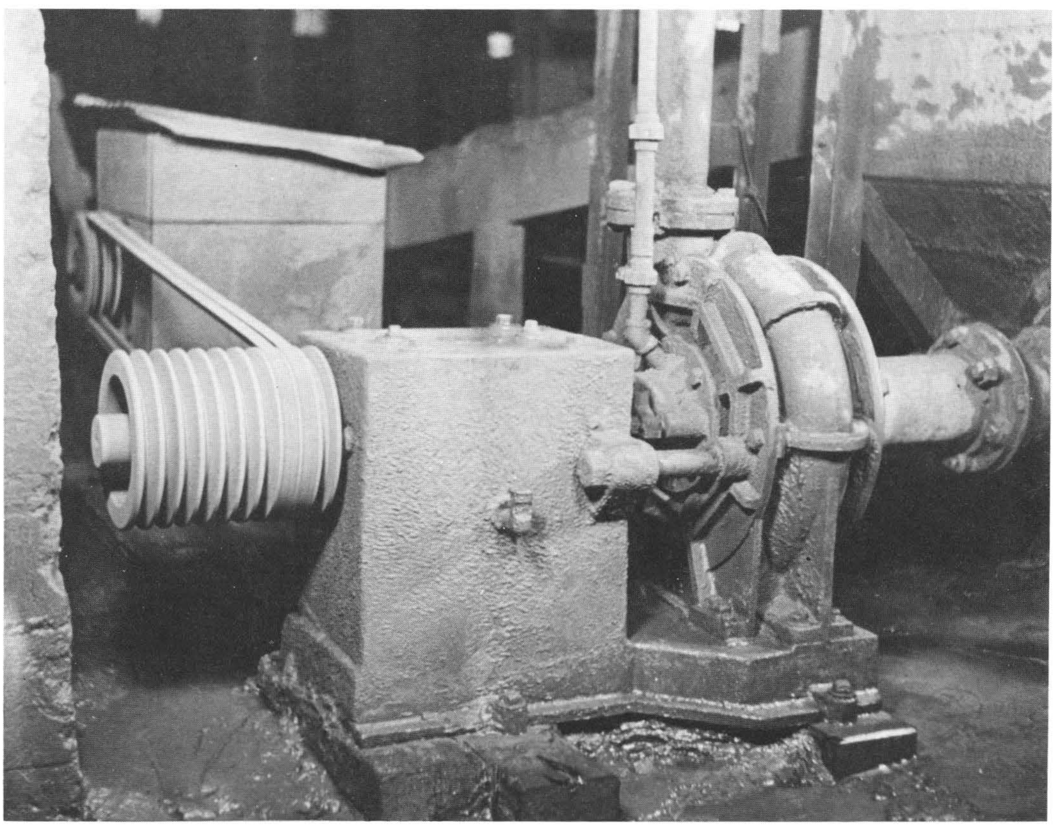
Flotation Cells Close Up



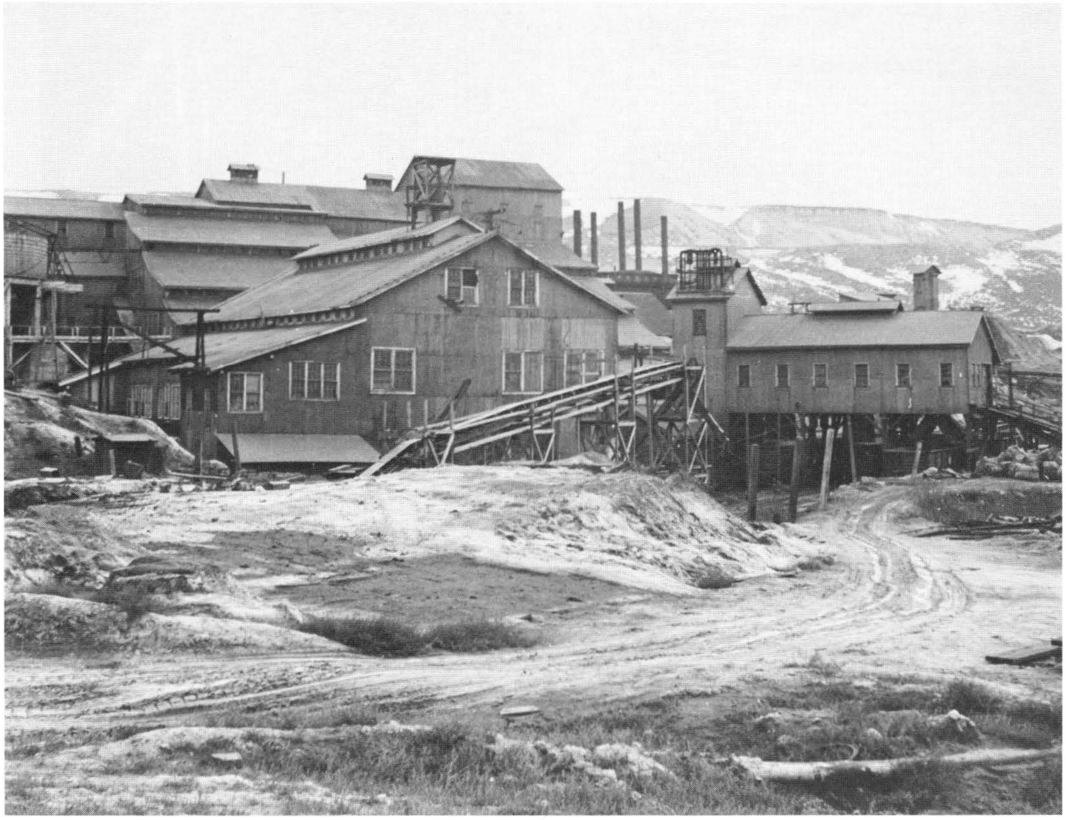
Lead Filter

Zinc Filter

Flotation Cells

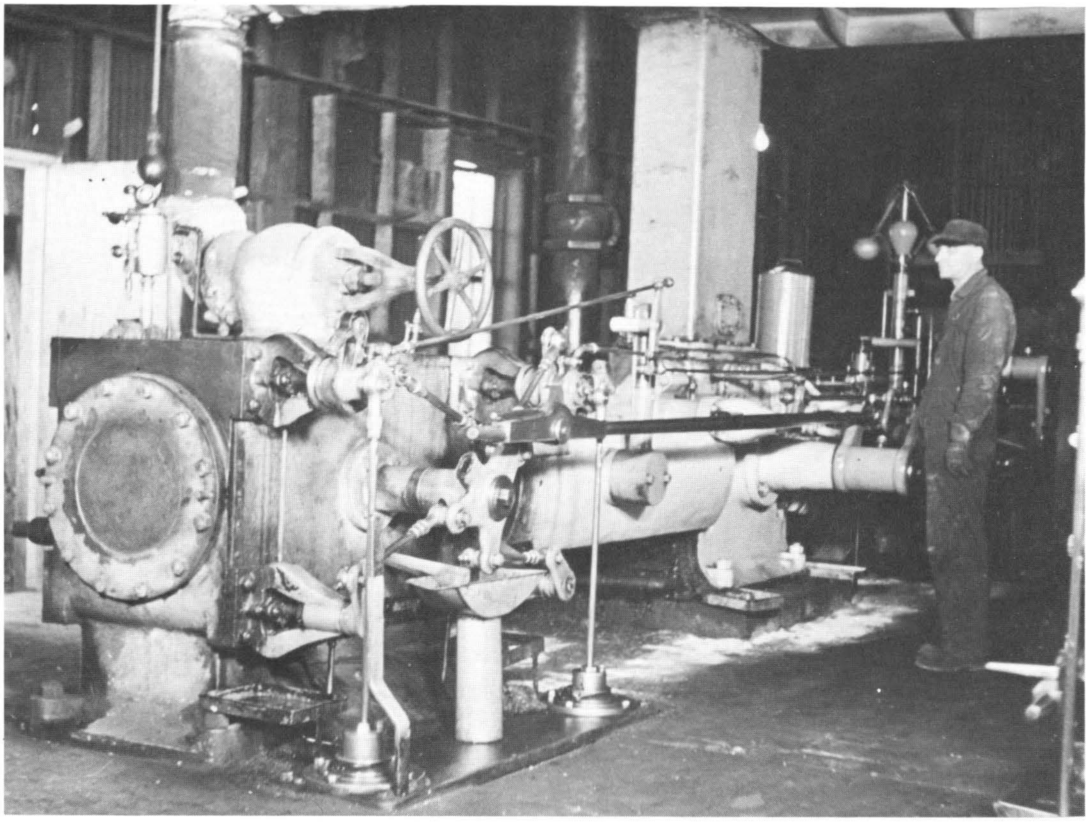


Pumps to return Concentrate to line

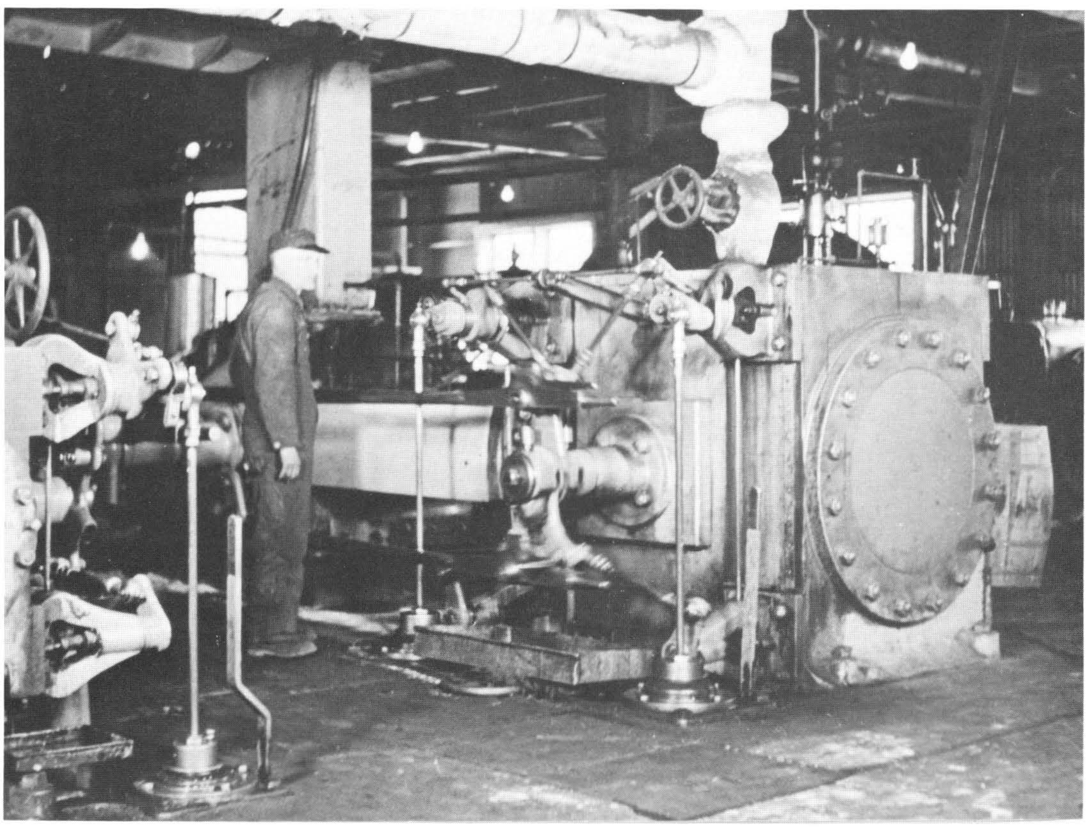


Mill and Filter Building

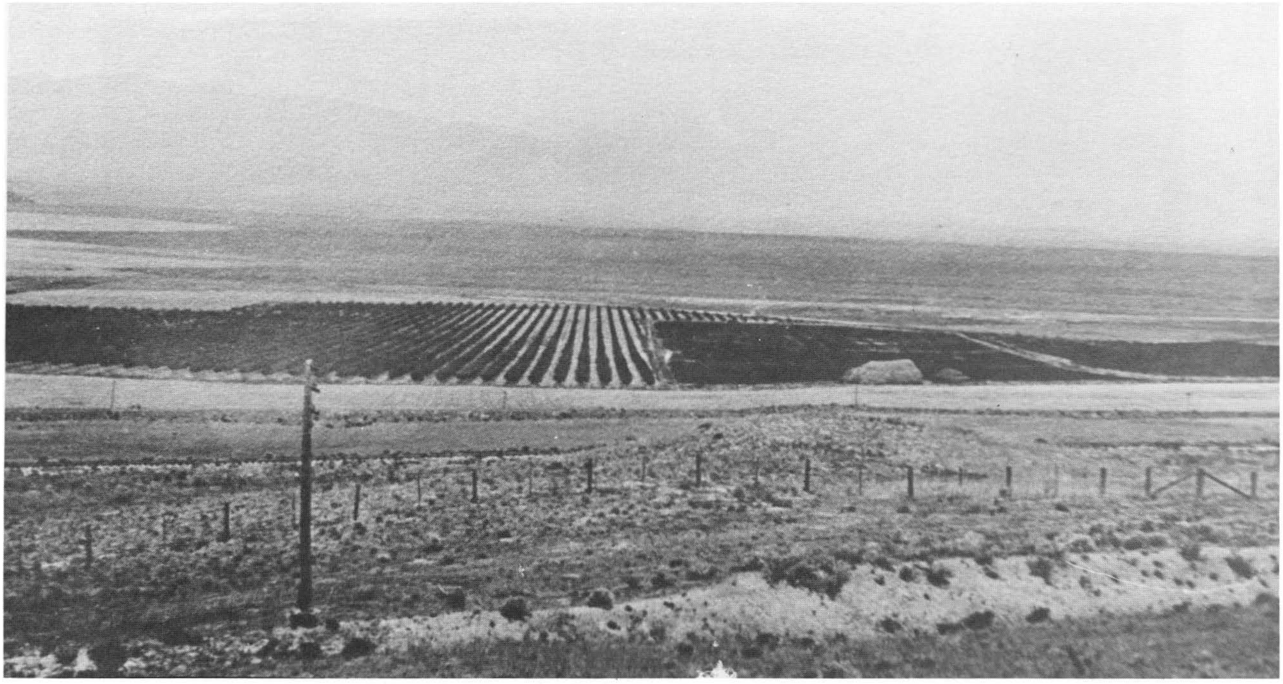
Filter Building finished



Air Compressor steam driven (Alfred Hiss)



Air Compressor steam driven (Charley Hiss)



Bauer Orchard (1910–1938). F. M. Shields reported that there were 19,000 trees 95% apple. First operator of orchard was Charles Crockwell. Size of orchard segments 17, 10, 23, 125, acres total 175 acres.

CHAPTER 11
RESEARCH AND DEVELOPMENT

The Combined Metals Reduction Company (CMR) through its technical staff namely Johnny Green and Neil Christensen, made significant advancements in the milling and processing of lead silver ores.

The methods they developed of fine grinding and selective flotations soon became standard operation procedures for the industry. They also developed a leaching process for ore reduction using acid, salt and lime.

Combined Metals, maintained an investigation and research attitude that produced such products as Panacalite from perlite and resin from coal.

However, the research done on the leaching project was not commercially successful (as of 1955). The leaching project consumed an immense amount of time and capital. Subsequently other companies have developed successful leaching procedures that reduces ore to metal.

CHAPTER 12
THE BAUER ORCHARD

Water from the Honerine tunnel produced enough water for industrial activities and to irrigate a 175 acre orchard.

Most of the fruit was apples, there were 19,000 trees. Every fall at harvest time school children and people from Stockton and Tooele harvested apples.

A large underground storage and sorting cellar was built and used. Crated and boxed apples were shipped in carload quantities.

The orchard was first managed by Charles Crockwell, and subsequently by a Mr. Fairbanks. It was a famous enterprise and was the largest in the state.

The orchard died in 1938 when water pumping stopped in the Bluestone mine.

It was reported that the minerals in the mine water promoted lush growth of the greens. However, the mine water contained arsenic and was not used for human consumption.

Bauer 1954 (approx) mine portal and change room left center, Mill upper left. Resin Plant near dikes and black coal piles. Remains of orchard upper far right. Dwellings center and right. Union Pacific Railroad Trailer foreground.

Bauer Plant foreground. Union Pacific Railroad, mine portal and change rooms.

CHAPTER 13
THE LEASERS AND DAVE MATSON

by Orrin P. Miller
and Claude Atkin

Based on ore samples of specific areas and from assays of mine production and mill runs, the mine foreman and geologist determined where mining should be attempted.

However, experienced miners learned that ore deposits were associated with the system of faults and fissures that were interspersed in the beds of limerock. Thus, even when the company abandoned an area, the miners would continue to prospect around it searching for small ore bearing fissures which they thought could be opened up into larger ore bodies of commercial value. Miners approached management for leasing rights.

Leasing became an important part of CMR Mining Operations. The company benefitted because the leasers did the development work at their own expense and risk. The leasers, if successful, made "big money." For example Charlie Anderson made enough money in a relatively short time to buy a Lincoln Zephyr automobile. Leasers compensation was based on a sliding royalty scale dependent on ore values. They were charged for use of equipment, materials used, transportation, milling, smelting etc. It was reported that a 25% of net return was a very profitable lease.

The leasers on two occasions provided ore for the mill when known ore reserves were depleted.

DAVE MATSON

In 1937, Dave Matson and Claude Atkin were granted a lease on the old Connor Mine at the 1600-foot level. Dave was foreman of the day shift. His crew was composed of Hoist Man, Wayne Mallet of Tooele and Mucker, Bill Mallet. Claude Atkin ran the swing shift: Everett Welden of Riverton, Utah, was a Mucker, and Ervin Brande was Hoist Man. Third shift: Mac Welden. Miner: Jack Mullinger, Mucker and Harvey Brande, Hoist Man.

Claude Atkin's report: Below the 1200-foot level, on the Connor, we were sinking the incline shaft 15 feet, plus a 10-foot sump under the track for an electric pump. We would then bench off the ore body, which was 14 feet wide and extended north about 100 feet. A round consisting of about 18 or 20 horizontal 6-foot holes would be drilled by two men breasting the jackhammer. The five holes or lifters would be shot last so the resulting explosion would lift the muck pile away from the face so we could drill another round after mucking out the last shift's blast.

This was hard work, and water was continually raining down on whatever you were doing. The wet downpour necessitated using electric detonators instead of regular fire-ignited fuse, which would not set off the charges when wet. Another advantage of using electric caps was that after hooking them up, we could then have plenty of time to raise the small pumps up the shaft away from the blasting area, and still give our crew time to crawl on the skip to be hoisted up to the hoisting station where we would then throw a switch to set off our round. When our shift was over, the next one would arrive, muck it out, drill and blast their own round. Every shift had to muck out, drill a complete round and then blast.

But on one fateful day, December 27, 1937, Dave Matson and his crew had finished drilling their round consisting of 21 holes. (More holes than usual.) Time was getting short at the end of the shift. Dave ordered 21 primers for the 21 holes. He didn't have time to use the electric type and to get them hooked up. He decided to use the fuse instead. Dave loaded the holes with one box of powder while his helpers raised the pump out of danger. Then when it was all clear, he started lighting the fuses with his carbide lamp.

All went well with the upper holes. Dave had five holes left. These holes were lifters, and he began to have trouble lighting the fuse because water was splashing down on them, wetting the black powder. Dave knew he needed to get out of there quickly. He tried to recut the fuse to expose the dry powder. He tried it once more, but it was too late. The first explosions hit him head on and blew him back about 20 feet. His helper, Bill Mallet, was blown clear back into the pocket away from further explosions, which probably saved his life.

Wayne Mallet, the Hoist Man, was frantically waiting for the signal bell to hoist the men to safety when he heard the blast. He knew what had happened. One can imagine how he felt knowing that his brother Bill was down there with Dave. He called for help at the 1200-foot station and men were lowered to the scene. Dave appeared lifeless. The men found Bill Mallet in the sump pocket, and he was stil conscious.

Claude Atkin and his crew were just coming on shift as the man train emerged from the mine. Claude had heard nothing of the accident until Sam Craig, Mine Superintendent, told him. Dr. Mayo, the company Doctor, pronounced that Dave had died instantly. Bill Mallet suffered concussion, damage to his liver and shock, but survived.

The hardest thing Claude had to do was to tell Dave's wife, Esther, that her husband had been killed. They were the best of friends. The money we had in the bank was turned over to Esther. It was all we could do aside from helping her build her house.

As a result of the premature explosion, the mine had become flooded when the pumps went out. Claude's crew of two men, three shifts per day took 21 days of steady pumping before the mine could be re-worked.

We proceeded mining once again but the State Mine Inspector closed the mine as unsafe after Harvey Brande broke his leg in the chute due to the damage caused by the rising water.

After this, Claude leased with Wayne Mallet and Fred McGary, which was unsuccessful, then quit to go to work at the Tooele Smelter, about 1938.

Claude F. Atkin
325 South Main
Tooele, Utah 84074

CHAPTER 14
BANKRUPTCY

During the 1950's low lead prices and imports of lead and lead ore, and the decreased use of lead in paint caused hard times for the lead mining industry. This situation plus the high cost of mining ore at Stockton caused CMR to lose money in their lead mining and milling operations. The result was bankruptcy and CMR went into receivership.

Anaconda purchased from the receiver the Bauer operation. However they did not exercise their option on the Calumet group of claims. These claims were purchased by the reorganized CMR for $50,000.

The reorganized CMR is 10% of the original CMR and is listed on the Intermountain Stock Exchange (1983).

CHAPTER 15
ANACONDA AT BAUER

In 1968 the Anaconda Company purchased the majority of the holdings at Bauer from the receiver. The price was $400,000 and is recorded in Tooele County records.

During the decade of the seventies lead prices remained low. For example it was costing International Smelting and Refining Co. 18¢ a pound to produce lead and the sale price was 14¢ per pound. IS&R was a subsidiary of Anaconda.

Anaconda lost, along with Kennecott, billions of dollars when Chile nationalized their copper properties.

Under a shortage of capital situation Anaconda elected to develop its copper properties in Pine Canyon and Carr Fork intead of rehabilitating Bauer.

The IS&F smelter in Tooele which belong to Anaconda was closed in 1972 and dismantled. The Bauer mill, shops, change room and other pertinent buildings were dismantled.

As of 1983 only the laboratories, storage building, assay office, boarding house, and dwellings remain.

Ivan C. Droubay the last remaining supervisor for CMR moved out of Bauer in 1982. His donation, to the Tooele County Museum, of pictures and documents makes possible the compilation of this history.

Gravity Mill Ore Concentrater built by Bullion Coalition Co. 1910. Later redesigned for flotation process of sulphide ores in 1927.

CHAPTER 16
THE FUTURE OF BAUER

As of May 1983 water still flows from a 10 inch pipe at the mine portal. This supply of water would support a small agricultural operation or an industrial enterprise.

The Honerine tunnel is caved in in places where it cuts the gravel of Stockton Bar. The tunnel would have to be reconstructed and widened to accommodate an efficient transportation system.

At present underground equipment by now is unserviceable due to age and water damage.

Sam Craig states in chapter five that it would require an expenditure of $422,400 to develop the Calumet mine again.

The price in 1983 dollars for lead is 22¢ per pound. The demand for lead outside of the nuclear reactor industry is low due to current recession, foreign imports of lead and lead ore that are unrestricted and are produced by labor far below the cost of American labor.

The introduction of acid from the surface into the ore bodies and recovering the metals by leaching methods is not considered feasible because the limerock would neutralize the acid.

It is recognized that there may be other unknown obstacles to revitalizing the Rush Valley Mining District and Bauer.

Considering the above comments it is concluded by the writer that the Rush Valley Mining District (Stockton) and Bauer as a metal producer is hopeless.

CHAPTER 17
KIRK HOTEL

by Orrin P. Miller

The Kirk Hotel was built in 1929 by Phillip C. Kirk (1882–1936). It is located at 57 West Vine, Tooele, Utah. Prior to the construction of the hotel the property was owned by William S. Marks and prior to that by Apostle Francis M. Lyman.

Lyman had a large palatial home, which was situated just west of the hotel. East of the hotel site was the old Tooele Opera House. The hotel site was formerly a large grove of silver maple trees.

As originally built, the hotel had a ballroom on its front third floor, a billiard room in the basement and a restaurant in the east wing.

Millie and Garth Jones acquired the hotel in 1934. They subsequently remodeled it by adding a third floor on the wings and converting most of the hotel rooms into apartments.

When the hotel was ready to be furnished a train load of furniture was spotted on the old Tooele Valley Railroad track and unloaded directly into the hotel.

Phil Kirk was a hard rock miner who worked in the mines at Dry Canyon and Stockton. He was a keen observer and learned of the geological formations the hard way.

During 1926 he acquired the Tip Top mine, by the bond and lease method from Charles E. Mitchner. He drifted in on the 1200 foot level of the Honerine tunnel to the ore body and struck it rich. He incorporated his mining activities under the Bluestone Lime and Quartzite Mining Company.

Phil made a working agreement with the Combined Metals Reduction Company for transportation of the ore out of the mines, for power, compressed air, and for mining tools and equipment to operate the Bluestone mine.

During 1933, Combined Metals obtained control of the Bluestone mine. From 1926 until 1935 the mine produced 247,200 tons of high grade lead silver smelting ore. It was valued at $13,469,982 in terms of 1956 dollars. Mining, operating expenses, transportation and smelting costs absorbed a large portion of the money. Phil, however, received enough money to build and equip the hotel and make some mining investments in Nevada.

Kirk Hotel

CHAPTER 18
THE CARR FORK PROJECT

by Frank C. Dunlavy

Only a ridge of the Oquirrh mountains separates the Carr Fork Project above-ground workings from the huge Kennecott open pit. Below the surface of the ground the two properties are even closer.

To trace the history of Anaconda's Carr Fork Project one must go back to the year 1909, the year when the International Smelting Company, a subsidiary of Anaconda began to build a custom smelter four and one-half miles from the city of Tooele, Utah. If the smelter had not been built in that location International would not have been active in the area. To quote from "A Short History of the Tooele Smelter," by the present author: "The Carr Fork Project was the culmination of a process began in the mid 1930's whereby International began acquiring mining properties west of the big open pit. Five of the companies in which Anaconda had interests subsequently consolidated to form National Tunnel and Mines Company. International commenced driving the 27,000 foot Elton tunnel in 1937, completing the project in 1941. The company continued to operate until 1947, delivering ore to the Tooele concentrator, where it was concentrated and the concentrates run through the copper smelter. In 1947 Anaconda acquired all of the National Tunnel and Mines assets and lands, including the Carr Fork claims."

A twenty year exploration program on the properties eventually prompted extensive core drilling and assaying. By 1973 drillers had delineated the Yampa and Highland Boy ore bodies that are the basis of the Carr Fork Mine.

In 1974 the Carr Fork project began developing the mine and constructing the concentrator complex. It was decided to build the mill in the steepest part of Pine Canyon where the slope of the ground would allow gravity flow to be utilized.

Four circular, concrete-lined shafts were drilled to service the mine: the production, service, fresh air and exhaust air shafts. New equipment was ordered where needed and some used equipment was obtained from other Anaconda properties and was rebuilt. Anaconda engineers designed the flow sheet and Bechtel Corporation provided construction management.

The Carr Fork deposits lie under the western flank of the Oquirrh mountains at a depth of 610 meters to 1830 meters and have an over-all dimension of 900 meters times 1,000 meters.

The drilling of the four shafts, the underground development of the mine, the building of roads, and the construction of the concentrator entailed considerable labor. And the expenditure of a great deal of money. It was estimated in 1974 that the total cost of the operation would be about $216 million; and subsequent events showed costs running very close to estimates.

Carr Fork was in full production by the fall of 1979.

To those readers who want to know the details of the Carr Fork operation a complete report has been made in the January issue of the 1979 Engineering and Mining Journal. For the average reader who does not require this detail but is interested in what went on at the project, we can summarize the operation in one paragraph.

Suffice it to say that, after the ore was mined and hoisted from the mine up the production shaft, it was fed into a powerful crusing complex. Next, the crushed ore was transferred to a 36-inch conveyor belt and advanced to the rod mill. Here a finer grind took place previous to an even finer grind in a ball mill followed by a regrind mill. By now the ore had been reduced to 100 mesh.

A 17 cell "rougher" flotation circuit was followed by a "cleaner" circuit and a "re-cleaner" circuit. "Cleaner" tailings flowed to six 300 cubic feet scavenger cells and eventually discharged to tailings disposal.

At first the resulting concentrates were shipped by rail to Anaconda, Montana; but this proved too expensive as the world price for copper was still depressed.

A sad commentary on our modern American economic situation might be made at this point. Anaconda had a potential market for its copper concentrate just around the corner of the Oquirrh mountains at the Kennecott smelter; yet, for most of its three-year production period, Carr Fork built a special road and trucked its concentrate to the nearest Union Pacific railroad siding, then by rail to the Pacific Coast, and then by boat to far-off Japan. Did this make sense? Yes, because by so doing they got a better price. Because of more automation, newer plants, and lower wages paid to Japanese workers, American plants just could not compete with Japanese plants. This same problem exists also in the steel industry, and to some extent, in the auto industry, resulting in laid-off employees and shut-down plants.

Two or three interesting things used at the Carr Fork project might be mentioned here. First, the metric system was used exclusively at the mine for all measurements. Carr Fork is thought to be the first U.S. Mine designed from the beginning around the metric system. Management thinking was that the country will eventually convert to metric measure, so starting out with metrics would be a plus. Conversion at a later date would only create problems, and maintaining a set of records and maps in both English and metric units would be burdensome.

Second, an IBM 270-138 computer, with more than 21 CRT screens were installed throughout the complex providing quick access to the computer by the various departments. The data processing group serviced engineering, geology, accounting, office services, personnel, payroll, purchasing, materials control, maintenance and project control.

The third interesting feature of this operation was the head-start program for training miners which was inaugurated here. As underground miners were in short supply, Carr Fork started a training program whereby local residents could be trained to do the necessary work in the mine. Trainees for underground work were screened carefully and on the average, about eight new trainees were selected each month, receiving pay from the start of training. After graduating, they were normally paid the going rate for third-class miners. The curriculum included four major topics: drilling, blasting, ground support and mucking. Of course, mine safety and first aid were taught throughout the course. This basic training took about four months.

Even while Carr Fork was working to achieve full production the company began to have troubles. In a massive take-over the Atlantic–Richfield Company had gained control of Anaconda in 1981 — and in this same year copper prices had fallen drastically. In November Carr Fork was forced to lay off 100 workers. Six months later the largest reduction in Tooele County history hit Carr Fork as 700 employees were handed blue slips. Then the work force was gradually reduced to a group of 43 workers.

On May 14, 1984 a massive mudslide at the top of the canyon claimed the life of one man and filled the service shaft. Then on May 17, Atlantic–Richfield Carr Fork laid off 35 workers, leaving only 8 employees on the job. The Carr Fork Canyon was closed under a restrictive order from the Federal Mine Health and Safety Administration.

Whereas the Tooele Smelter helped sustain Tooele's economy for sixty years, the Carr Fork Project (with the expenditure of over $200 million dollars) was only in production for three years, although a small crew was working for the previous five years.

No one can estimate the total impact on the community during these years between 1974 and 1982 of up to 800 men bringing home paychecks (or of the taxes paid by the management;) but it is a fact that many homes were built in Tooele at this time with the local businessmen sharing in the bounty of cashed checks.

So the community lost a great deal of revenue. Many individuals lost not only their jobs but also their homes; and many were forced to leave the community.

Another thing Carr Fork and the community of Tooele lost was an annual "Fun Day," which was held once a year at the entrance of the old Elton Tunnel.

When the Elton Tunnel was operating back in the 1940's, the company and personnel combined to have what they called "Tunnel Day" — a festive get-to-gether for sports, contests, and the consumption of food. This annual day was resurrected by Carr Fork for Personal and Public Relations. Under the title of "Miner's Day," the workers and their families (and many interested townspeople) congregated at the mouth of the old Elton Tunnel and something was provided for everyone. Contests in drilling, mucking and the handling of equipment for the miners, tugs of war and other contests for the crews, live fishing in a shallow pond, miniature train rides and wagon rides for the children, and lots of food sold by the Tooele Lion's Club for everybody were on the agenda. Townspeople, unconnected with Carr Fork, were invited to attend: and this annual day soon became a community affair and grew in size and diversity each year.

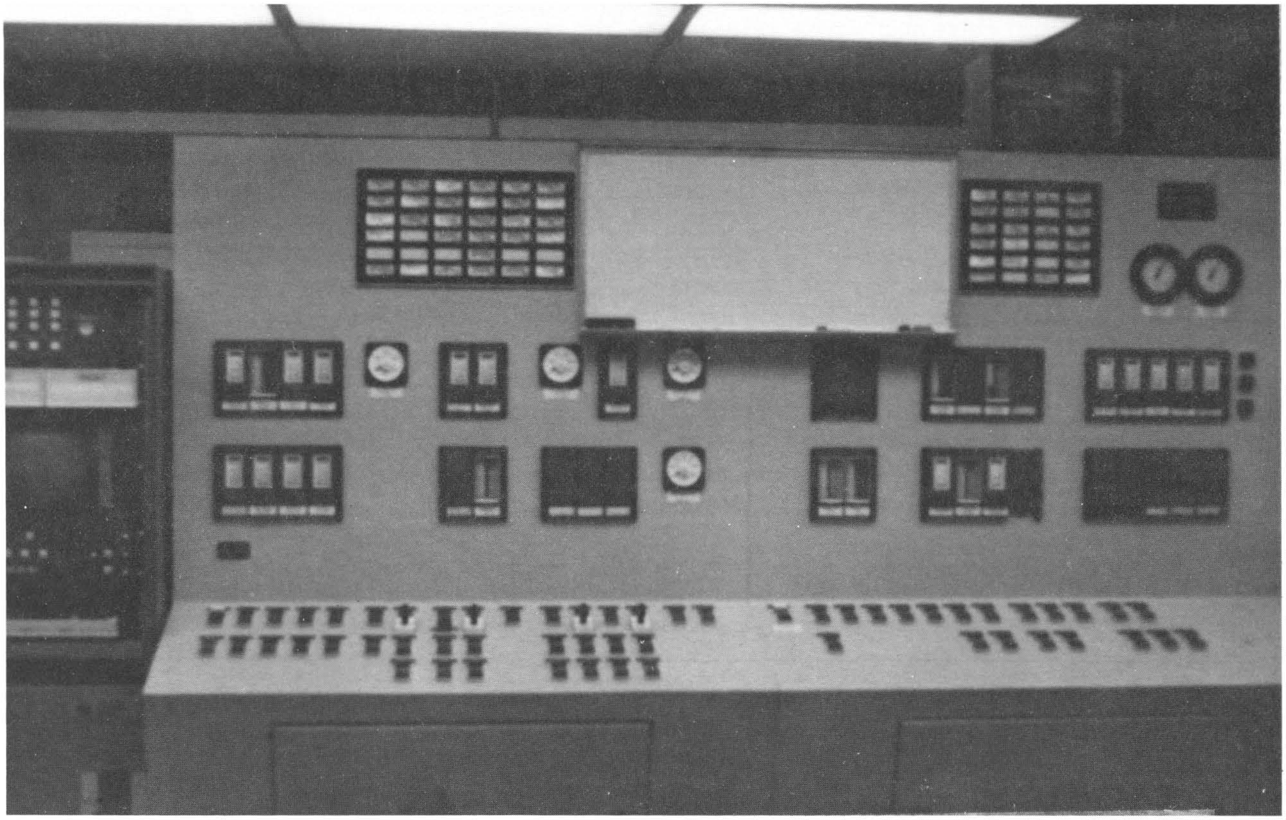
This report has been very difficult to finish as every few months some slight bit of information about Carr Fork has come to light — some more men have been laid off or something else is about to happen.

There seems no likelihood that Kennecott contemplates development of the underground ore bodies in the near future as the Utah Copper Division has been shut down since last spring (1985) — after having lost hundreds of millions of dollars in the preceding few years.

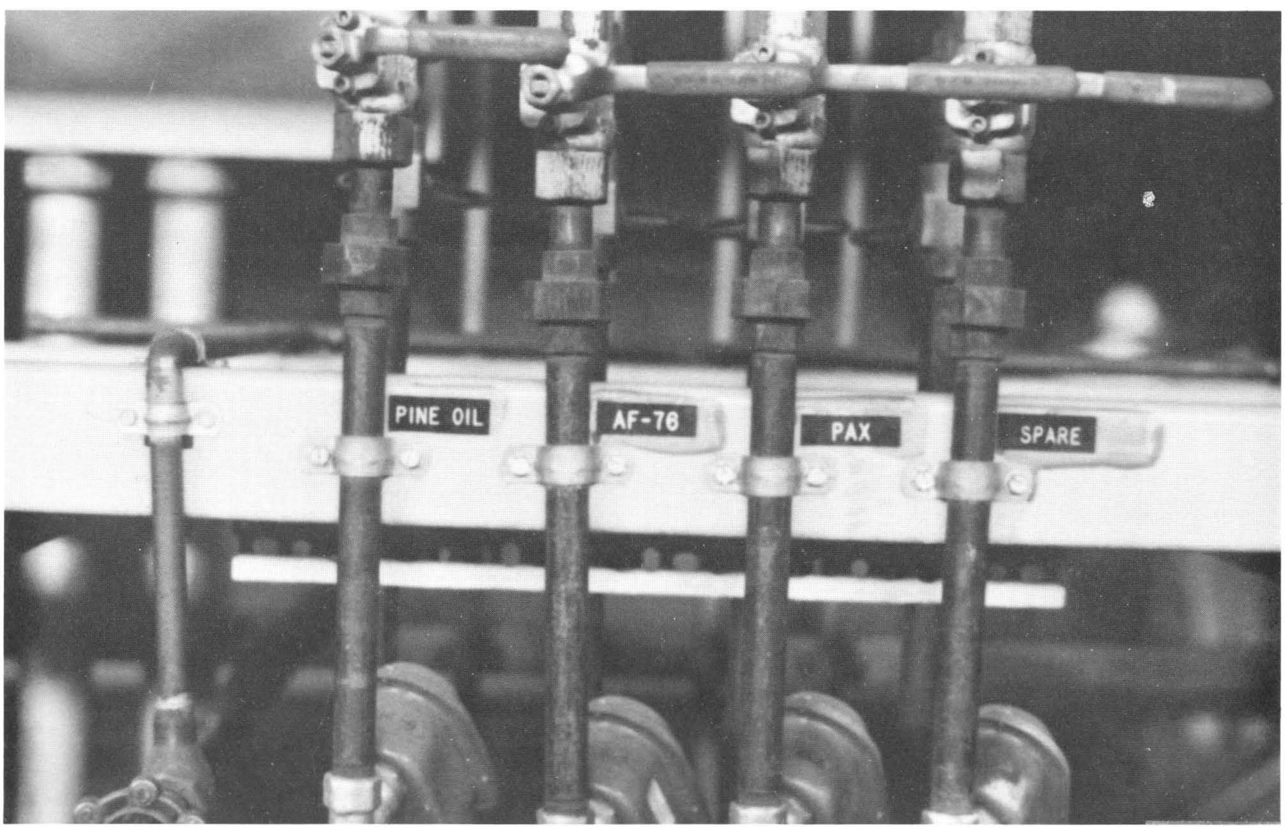
It has been long rumored in mining circles that Kennecott had a standing offer to purchase from Anaconda all of the underground ore bodies just west of the huge Bingham open pit — so now, since rumor has become fact, we will hear no more of Carr Fork as a mining company as this property is now just a part of Kennecott.

The mill in Pine Canyon (including offices and other buildings both in Pine Canyon and at the old International Smelting company site, together with air shafts, hoists, drys, railroads, much mining equipment, water lines, settling tanks, a large flotation mill, chemical laboratory, etc., is now being sold and shipped out to other mining districts — some to as far away as New Guinea.

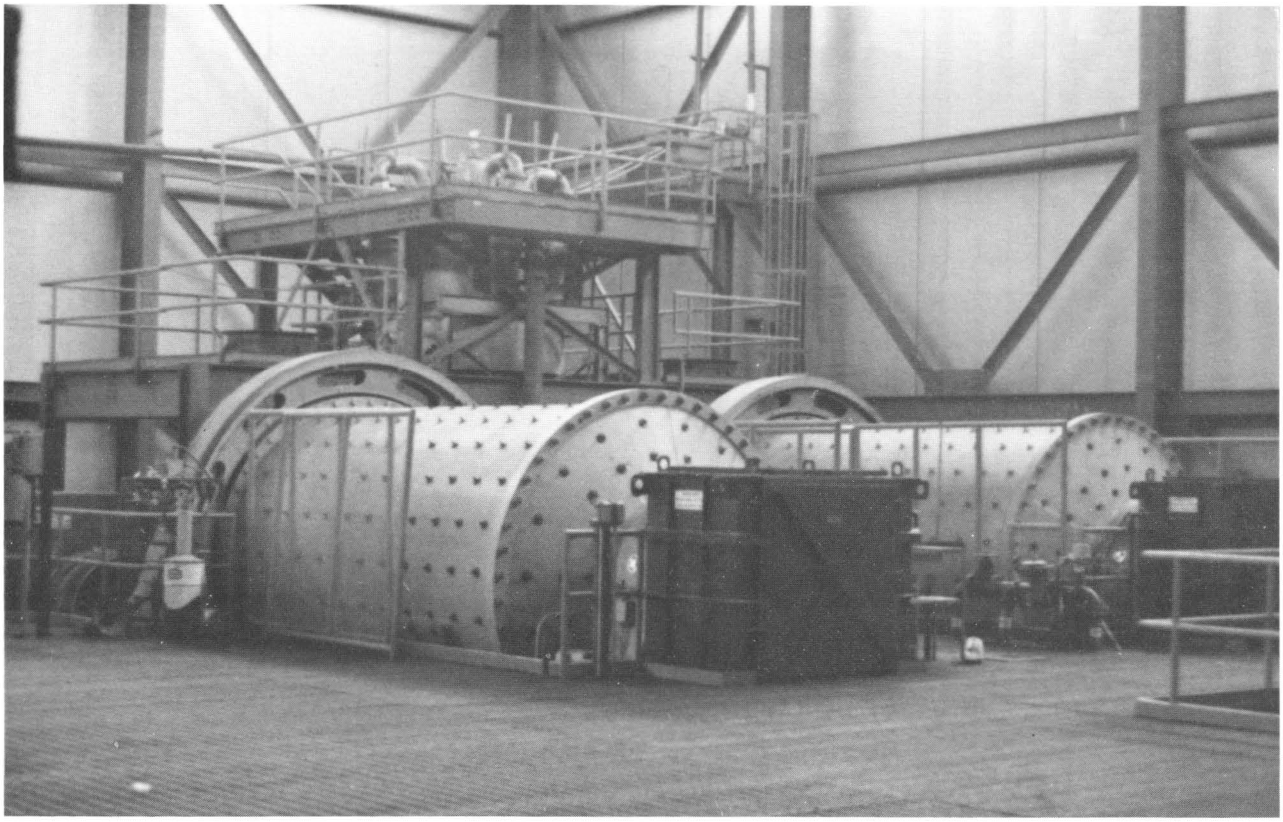
Anaconda Miners Day



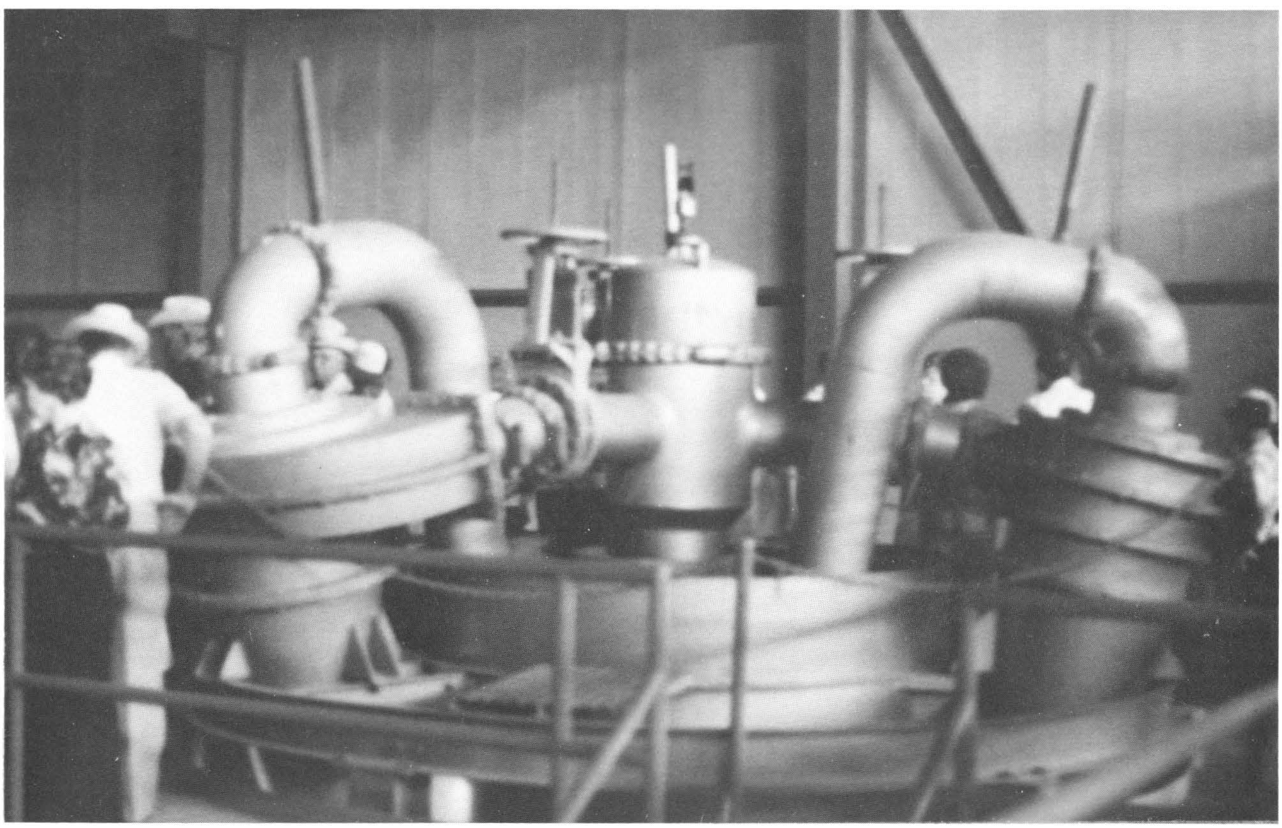
Computer control panel Carr Fork Mill 1983.



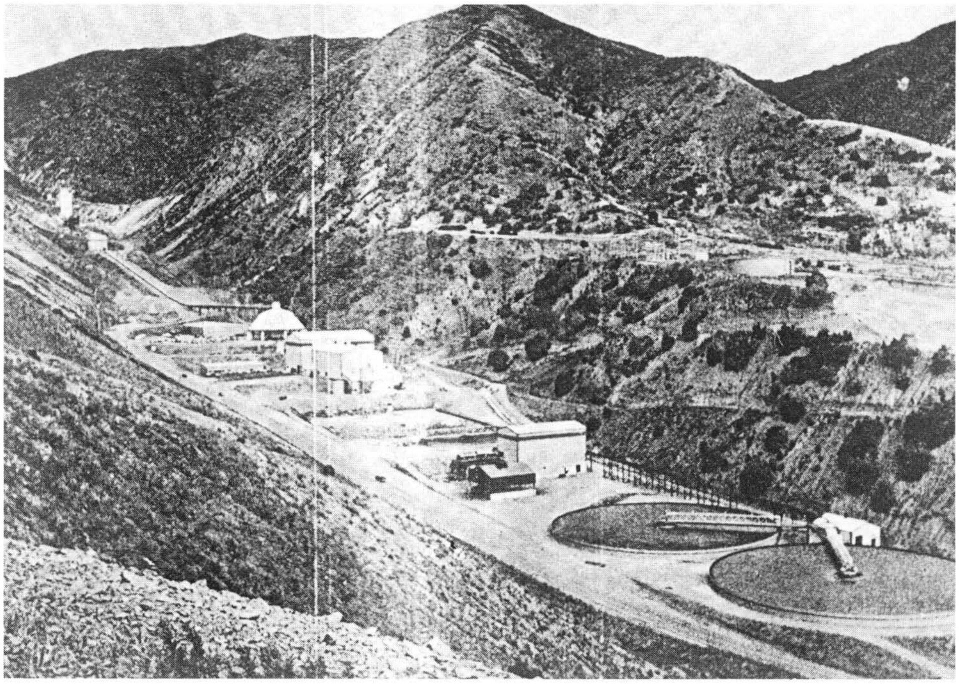
Control valves flotation Cells Carr Fork Concentrater Mill 1983.



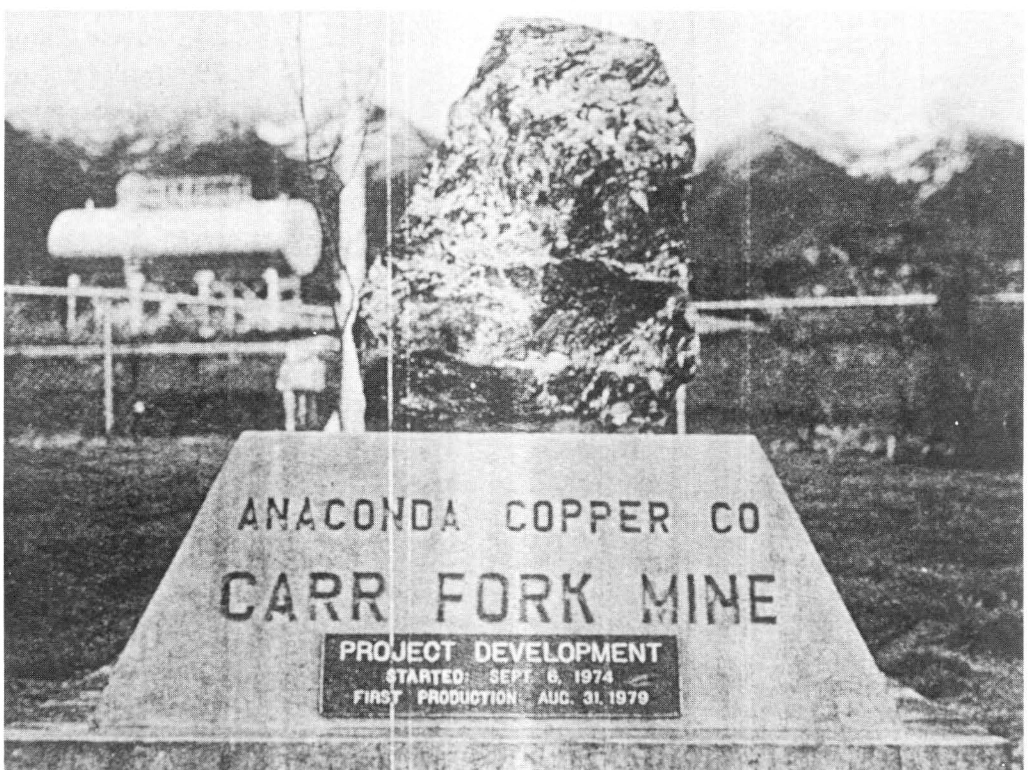
Carr Fork milling equipment 1983.



Classifier Carr Fork Mill 1983.



Carr Fork Project Mine and Mill upper left.



PART II SMELTING

Initial construction stage Tooele Smelter.

CHAPTER 19
THE TOOELE SMELTER

by Frank C. Dunlavy

The smelter near Tooele, Utah, lasted for sixty years — a long time for a smelter to be in operation. During that period of time the International Smelting and Refining Company, through its Tooele facility, paid out millions of dollars in wages, plus more millions in taxes, and provided jobs for thousands of workers. It was responsible for the town of Tooele doubling its population the first ten years of the smelter's operation. Through its policy of providing jobs on week-ends and during vacation periods for hundreds of high-school and college-aged boys it made college education possible for uncounted numbers of young people in the Tooele area.

A decade after its completion, the Tooele smelter contributed about $20 million annually to the Utah economy and furnished direct employment to about 2,000 men. The company paid one-sixth of the taxes in Tooele County, supported five-eighths of the county population, and purchased $15 million worth of ore annually, mostly from mines in the surrounding area. The plant annually treated 750,000 tons of ore and produced 72,000 tons of lead bullion, 10,000 tons of blister copper and numerous by-products, including 9,000,000 ounces of silver.[1]

Both agriculture and industry played important roles in Utah's early economic development. The original settlers created a self-sufficient and balanced economy but, after 1869, the dimensions of the economy began to change and the reasons for this change are of great interest. It was the completion of the transcontinental railroad in 1869 that brought significant change to the Utah economy. With the railroad providing cheap transportation, large numbers of new-comers were attracted to Utah and the mineral wealth found here. Many mines were developed and several small smelters were built, mostly in the Salt Lake City area.[2] Smelting practices before 1900 seldom suffered any restraint. What went up the stacks or leaked out of the furnaces (this included several acids, toxic dust, unburned hydrocarbons and large quantities of fly ash and other particulate matter) did not matter to the mining and smelting companies. A group of farmers in the Salt Lake City area brought suit against all the smelters in their region, claiming that crops were turning brown and livestock were dying because of smelter pollution. The final decision in the long court fight went in favor of the farmers, and by 1908 nearly all the smelters in the area had closed. The only plant that survived, the Murray Plant of the American Smelting and Refining Company (ASRCO) did so by withdrawing from the suit and paying farmers a cash consideration.[3]

About this time (early 1907) the International Smelting Company (later to be known as the International Smelting and Refining Company) was formed, backed by the Anaconda Copper Company, and it was decided to build a smelter on the West side of the Oquirrh mountains, away from the populous Salt Lake valley.[4]

A near-perfect smelter site was discovered during a thorough topographic survey of the region. Located at the mouth of Pine Canyon, 4½ miles East of the town of Tooele, the sloping topography

[1]Salt Lake Mining Record 15 May 1928 pp 9, 10. thereafter cited as SLMR.

[2]Journal of the Society for Industrial Archeology, hereafter cited as JSIA.

[3]Engineering and Mining Journal 11 Jan 1908 p 122, thereafter cited as EMJ.

[4]JSIA pp 32, 33.

of the site facilitated the gravity flow movement of materials. Equally important, prevailing winds carried smoke and gases up the canyon and away from inhabited areas.[5]

International purchased all the farms near the proposed smelter, and took long-term options on most of the land within a two-mile radius. Outright purchases totaled over 2,000 acres and the cost of purchase and option exceeded $35,000.[6]

The first team of engineers involved in the construction of the new plant arrived in December of 1908 and immediately began to survey a railroad route from the San Pedro, Los Angeles and Salt Lake Railroad main line to the smelter site some seven miles away. With the completion of this line (named the Tooele Valley Railroad) and even before it was finished, work on the 200-acre smelter site began. The copper plant was the only installation originally anticipated, with plans calling for extensive storage bins, a sampling mill, a calcining plant, reverberatory furnaces, converters, a power plant, and numerous smaller departments. These structures required a total of 9,900 tons of structural steel. The Oscar Daniels Company of Chicago directed construction of the Tooele smelter, which required 200,000 cubic yards of excavation by steam shovel and mule teams and over 26,000 cubic yards of plain and reinforced concrete. It is some measure of the work involved in smelter construction to note that the 350-foot main smoke stack alone required over 1,750,000 bricks for its construction.[7]

Howard M. Smith was one of the many men sent down from Anaconda, Montana, to help in building the railroad and the smelter. Mr. Smith was a clerk and office worker. He kept a diary during the years 1909 and 1911. Before the railroad was finished Mr. Smith rode horseback along the route, checking personnel and noting time worked. After completion of the railroad he attended all the various constructions of the smelter. Being an amateur photographer, he took many pictures (developing them himself) and these pictures form a complete record of the period from the start of construction to the firing-in of the first reverberatory furnace. His son, Wilbur, presently living in the Salt Lake Valley, has these pictures in his possession. Some of the entries in this diary are interesting and factual. Herewith are a selected few entries from Howard Smith's diary:

Jan 27, 1909	Arrived Tooele, Utah today.
April 1, 1909	First train on T.V. Ry. Eng. 3605, freight to Middle canyon trestle.
June 8, 1909	Sold first ticket on T.V. Ry to C. R. McBride. 20¢
Oct 21, 1909	601 men on roll today, exclusive of monthly roll.
Nov 16, 1909	Total concrete placed to date 6092.2 cu. yards.
Jan 5, 1910	5 degrees below zero, 16 inches snow at smelter. 10 inches snow at Tooele.
Feb 27, 1910	Big stack completed at 4:04 P.M. Stack 350 feet high to top of brick, 350 feet 6 inches to top of tile.
July 14, 1910	First ore received from Highland Boy over tramway.
July 25, 1910	Governor Spry of Utah started fire in #4 reverberatory furnace at 1:00 P.M. took photo.
Aug 5, 1910	Sample mill started today.
Aug 7, 1910	First charge dumped into #4 reverb.
Aug 8, 1910	Started first fire in roaster today.
Feb 11, 1911	Work on plans for lead plant started.

Some of the dates given in this diary are important as they were written as they happened, and not from memory in years after.

As Howard Smith's diary records, construction of the railroad began in the winter of 1909, and by October 21 there were 601 men on the payroll — exclusive of the monthly roll for salaried employees. Many of these men worked at surveying, at grading the roadbed, at laying ties and rails, at hauling materials by team and wagon (automobiles and trucks were a rarity). Still others were employed in laying the foundations for many different departments and of constructing the 350-foot stack.

An aerial tramway was also constructed to transport the ores from the mines of the Utah Delaware Mining Company, and other mines, in the Bingham District. The tramway was 20,000 feet long and was built by the Trenton Iron Works. The loading station was located at the Highland Boy mine and the ore was delivered in buckets of 1200 pounds capacity, spaced 200 feet apart, and traveled at the rate of 600 feet per minute. The ore was dumped into the smelter terminal bins. Later, after the concentrators were built, special terminal bins were built for this department just short of the main terminal building. From the main

[5]The Mining World 19 Nov. 1910 p 943.
[6]Tooele Smelter Business Office File. TSBOF.
[7]SLMR 15 Aug 1910 p 17.

terminal bins the ore was drawn into special 50-ton motor dump cars, weighed, and delivered to the smelter receiving bins.[8]

Perhaps the reader will not object if the writer recounts a personal experience associated with this aerial tramway. I worked for International for forty-three years, mostly in the lab, but also all over the plant when things were slow. I rode on this aerial tram several times. It was my first ride that I would like to tell about. This ride occured in about 1929 or 1930.

I can, over fifty years later, still vividly recall this frightening experience. First, I had to climb the narrow iron stairway of the five-story Tooele-side terminal and look down some 75 feet through the wide opening or window where both the incoming and outgoing buckets were moving. I noticed that the four-inch steel cable to which the ore buckets were affixed seemed to be alive as it vibrated up and down and side to side. I paused for a moment to watch as the buckets coming in were switched one by one onto a circular siding and, still moving, were guided by a workman, then braked over one of the large (2,000 ton capacity) receiving bins. The main cable continued to the end of the building, then curved around so that it was now travelling in the opposite direction. After the ore was dumped from each bucket into the bins, the bucket was returned to the main cable and was sent on its way back to the Bingham terminal to be reloaded. The motion of the entire four-mile cable could be arrested at either the Bingham or the Tooele terminals — or from three way-stations located along the route. The middle way-station was located on the very top of the mountain and was plainly visible from the Tooele terminal. I was informed that this station was 1,800 feet higher than the top of the Tooele terminal building and 1,450 feet above the loading station located at the Highland Boy Mine.

The buckets, made of heavy steel plate, opened at the bottom with a gate-like swinging mechanism. Most of them had been in operation for many years and were badly rusted. I was told that, after climbing into a stationary bucket on one of the sidings, I was to take a firm grip with each hand on the top of opposite sides of the bucket. One of the workers warned me that occasionally a bucket's door would be insecurely fastened and then could swing open.

"If this happens to the bucket you are riding in," the man said, "just hang on tight 'til you reach the next station. They will be watching for you and can stop the cable."

At seventy-five feet above the ground, the cable dipped sharply as it left the terminal. It was almost like free-fall, and my heart jumped up into my throat. I stared straight ahead as I did not dare to look down. After a few minutes I ventured to peek down and to look around and was actually beginning to enjoy my ride when WHOOSH! the bottom of the bucket just ahead of me opened with a bang, causing several nearby buckets to swing violently from side to side. This swinging only lasted for a few minutes, but it was too long to suit me! As I sat there swaying, though still moving forward, I could not help but be conscious of the fact that, if my bucket were to be thrown off the cable that there was no place to go but down — and the rocky hillside below me sloped steeply and looked mighty hard.

I never checked this out later; but I firmly believe to this day that my fingerprints are still impressed on both sides of the top of the bucket in which I was riding on this day.

The buckets soon got back to normal and once again I was able to relax a bit and enjoy the scenery. As we glided over the rough terrain we sometimes were close to the ground and sometimes were fifty feet above it. At one point I could look down and to the North and see a small dam with some blue water above it. The water was enclosed on three sides by heavy brush and a few tall trees. Later we seemed to be following the very edge of a stony ridge. I relaxed more and more and even let go of the bucket with one hand while I flexed my aching fingers. Then I did likewise with the other hand.

As my bucket and I passed through way-station #2, I had a brief look at the little house on the very top of the mountain where a married couple ate and slept and performed their duties as custodians; and then we were through the wooden way-station and had a birds eye view of Carr Fork and part of Bingham Canyon. A sharp dip from the mountain, a stop at the terminal — and the ride was over.

I later worked for a week on this tramway — riding the buckets every day — but I can not remember these rides, only the first ride was memorable.

THE SAMPLE MILL

Foundations for the sampling mill were begun August 5, 1910. The mill itself was finished soon after and was a standard Taylor and Brunton type, built in two sections each with a capacity of 100

[8]History of Tooele Smelter by Emil Steinbach, manuscript, hereafter HTSS.

tons per hour. The ore was conveyed to the mill by conveyor belts from the large receiving bins, crushed, mixed, and a representative portion automatically separated as a sample of the lot.[9]

This sample was further reduced in size and fineness in the pulping department. The resulting sample of a few ounces was sent to the laboratory for analysis. A corresponding small sample was also sent to the shipper, and still another sample was sent to a commercial assayer, called an "umpire." The "umpire's" analysis was compared with the smelter's answers to insure a fair analysis. To further insure this "fairness" each shipper had a representative (locally called a "moocher") to oversee the entire sampling process from ore car to final pulp.

After sampling, the ore was sent to the copper plant bins. Later, after the lead smelter was added to the copper smelter, the ores were distributed to either the copper or lead plant bins. The original copper ores came mostly by tramway from the vast copper deposits in Bingham Canyon. Later the lead ores and concentrates came by rail from Bingham, Park City, and Tintic. Most of the concentrates came from Bauer and from mines in Idaho and Nevada. By the early 1920s, as many as 85 or 90 cars from all over the West could be found unloading in the Tooele smelter rail yards.

From the ore bins (and the separate concentrator bins, as the concentrates did not require crushing) the ores and concentrates respectively were fed through chutes on to conveyor belts which elevated these materials to the feed floor of the roaster plant.

THE McDOUGAL ROASTER

This plant consisted of thirty-two McDougal roasting furnaces, each with six hearths sixteen feet in diameter. The capacity of each furnace was about 50 tons of feed per hour.

The gases from the roasting* furnaces were conducted by two brick flues to a steel and brick dust chamber, 120 feet by 140 feet by 40 feet high. The gases passed from the dust chamber into a flue-type Cottrell Precipitation Plant, where an electric discharge precipitated the remaining dust, and hence to the Copper Stack (the big one) which was 25 feet in diameter and (as already stated) was 350 feet high.

[9]Description of copper plant, lead plant, and concentrator are taken from "Description of Tooele Smelter Prepared by Staff in 1925."

*Editors Note: The combustion of the sulphur, in the copper sulphide ore, provided the heat for roasting. Pre-heating of the furnace was required for ignition. The process involved constant feed and stirring by revolving paddles.

The roasted material was discharged from the furnaces into hoppers. From these hoppers the roasted ore (called now by the name of calcine) still hot from the furnaces and as fine as flour, was drawn off in small bottom-dump cars holding four tons. These cars had inverted hopper upper parts which were held tightly in place against the bottom of the hoppers by springs, to prevent the heavy loss of the fine calcine. These cars were hauled to the reverberatory feed floor by electric locomotives.

THE REVERBERATORY FURNACES

The reverberatory furnace plant consisted of five coal-fired (but since 1928 natural gas fired) reverberatory smelting furnaces, Anaconda type, four of them having a width of 19 feet and a length of 102 feet. The fifth furance was slightly shorter. The feed to the furnace was dumped from the cars into main calcine hoppers at the bridge end of the furnace. The feed was then distributed to charge holes in the roof.

The hot gases leaving the furnaces were passed through five 700 H.P. Stirling water tube boilers. A large part of the heat energy otherwise lost at this point was recovered in the form of steam power. These boilers furnished steam for the entire plant.

The charge was fused and the copper with some iron and sulphur combined to form matte which settled to the bottom of the furnace and carried the gold and silver with it. The remainder of the charge formed slag which floated above the matte. The matte was tapped through cast iron launders into pots in the converter building. The slag was intermittently skimmed at the front of the furnace into slag pots and hauled to the dump by electric locomotives.

THE CONVERTER PLANT

The converter plant was equipped with five stands, electrically operated. The converter shells were of the horizontal barrel type, 96 × 150 inches, and lined with magnesite brick. Two electric traveling cranes handled all material, the one in the main converter aisle being 60 ton capacity and the other, in the casting aisle, of 30 tons capacity. Three converter stands were used in blowing matte. The gases from these passed through a steel flue to a Cottrell Treater, where electrical discharge caused deposition of the fume carried in the gases. The gases then passed on to a stack 6 × 140 feet. For the first few years of the smelter's operation, these converters were used exclusively for ores from the copper plant. With the building of the lead plant two additional converter stands were built and used for blowing lead matte from the blast furnace. These were connected by a steel flue with a baghouse. After filtering, these gases passed by a brick downtake to the converter stack, 15 feet in diameter and 150 feet in height.

When received from the blast furnace the lead matte was poured into these converters and blown without addition of any silicious material. The lead and zinc were volatilized and passed to the baghouse, the fume from which later was returned to the blast furance. The residue in the converter contained such copper as was contained in the lead matte and was transferred to a copper-blowing conveyer for recovery of this metal as blister copper.

The ladles of copper matte received from the reverberatory furnace were transferred by the crane to the converter shells. Silicious ore was added and the charge was blown, producing blister copper and some slag. The copper was poured into a ladle and cast in moulds, the slabs of copper weighing about 350 pounds apiece. These were loaded on a truck, weighed, and transferred to a railroad car for shipment to the refinery in New Jersey. The slag produced was granulated by running the hot material into cold water and then transferred to the lead sintering plant charge bins.

The total cost of constructing the copper smelter as of October 1, 1910 was $2,413,679.[10]

It had been anticipated that half of the Tooele copper ore supply would come over the aerial tramway from the Utah Con Mine in Bingham Canyon. The year 1910 proved to be the year the Utah Con ran out of good copper ore. This presented International with a bit of a problem — but the management was equal to the task. By using the same site and much of the same machinery for a new lead smelter, International could break into a new and profitable custom lead smelting business, at the same time that it retained the copper smelter. This decision turned out to be a wise one as copper smelting finally collapsed in 1946, but lead smelting continued profitably until 1971. Contruction started on March 1, 1911 and the first lead blast furnace was blown in one year later.[11]

Practically all of the fine material treated at the lead plant, such as concentrates, flue dust, etc., required sintering to agglomerate it before including it in the charge for the blast furnace. The various materials for the charge for the sintering plant were drawn from the 13,000-ton receiving bins by mechanical feeders adjusted to deliver the desired proportion of each to a belt conveyer which discharged them to a mixing device. From this they fell on an inclined conveyer belt leading to the feed floor of the sintering plant where the charge was distributed to the 5-ton feed hopper located above each machine.[12]

Instead of the McDougal multiple-hearth furnace used to roast copper ore, the Tooele lead operation took advantage of a very new development in lead ore roasting, the Dwight-Lloyd sintering machine.[13]

THE SINTERING PLANT

There were ten standard Dwight-Lloyd sintering machines at Tooele, each measuring 42″ × 264″. The charge was mechanically spread in a thick layer on a traveling grate. The surface of the charge was ignited by passing under an oil burner (later converted to natural gas). Ignition was maintained by the continuous drawing of air through the ignited bed by means of suction boxes connected to a Sirocco fan. Sulphur was about 12% in the charge and was roasted down to about 3.5% in the sinter. The material fused slightly and formed a clinker-like mass which was discharged at the end of the machine and fell into railroad cars. These cars were hauled to the blast furnace bins and the sinter dumped there-in to form part of the charge to the blast furnace.

Each sinter machine had a capacity of 200 tons of feed per 24 hours. Before 1928 the fuel used was oil — in 1928 natural gas was piped to the Tooele smelter and was used throughout all smelter operations. Natural gas was found to be cheaper, more efficient, and easier to handle.

The gases from the sintering plant were passed through a Cottrell precipitation plant where much of the dust was deposited. The gases passed through a flue to a brick stack 18 feet in diameter and 200 feet in height.[14]

THE BLAST FURNACE PLANT

The Blast Furnace Plant consisted of five lead blast furnaces 52″ × 180″ at the tuyeres (where compressed air was forced into the furnaces). Each furnace had 27 tuyeres, and the furnaces extended 24 feet, 8 inches from the tuyere line up to the charge floor. The charges for the furnaces were drawn from the blast furnace bins through weigh hoppers to the charge cars which were the same length as the furnaces. The charge cars were run

[10]Tooele Smelter Business Office Files.
[11]SLMR 15 Dec 1912.

[12]DTSPS pp 11, 12.
[13]JSIA TMW May p 42.
[14]DTSPS p 14.

over the top of the furnaces and the charges dropped into the furnaces.

Matte and slag were tapped from the furnaces to a forehearth, or settler, where the two products separated. The matte was tapped from the forehearth and hauled to the converters for treatment — and, of course, the slag was hauled to the dump.

Lead was tapped from the furnace to pots and transferred to the drossing plant, consisting of four cast iron kettles having each a capacity of thirty tons of lead. Originally, and for many years these kettles were coal fired. Later gas was the fuel. The lead was cooled and stirred by means of compressed air, causing the impurities (mainly copper) to collect as a dross on the surface of the bath. The dross was skimmed off, pressed in a Howard press to remove excess lead and returned to the blast furnace charge. The lead was siphoned into molds. The bars of lead bullion, weighing about ninety pounds each, were loaded onto a hand truck, weighed, and loaded into a railroad car for transport to the company's refinery in East Chicago, Indiana. It took strong men to muscle these 90 pound bars of lead from the molds to the railroad cars.[15]

In about 1928 a new drossing plant was constructed, allowing the lead to be transported by overhead monorail crane from the furnace to the drossing plant. This plant was equipped with 4 sixty-ton capacity receiving kettles and two one-hundred-twenty tons casting kettles. The lead was cast from these kettles into four-ton capacity moulds. After cooling, the bars of lead were transferred by means of a crane to gondola cars for transport to the refinery. By this means the laborious and back-breaking task of handling 90 pound bars by manpower was done away with.

This drossing plant was remodeled after August 1, 1958 when a joint agreement was consumated with the United States Smelting Refining and Mining Company whereby International did all of the smelting and the USSR and M Company did all the concentrating for the two companies. Ore shipments had been dwindling for some time and there was now no longer enough ore available for these two custom smelters to compete with one another.

The newly remodeled drossing plant contained an anode casting wheel so that the U.S.S.R. and M. lead bullion could be cast into 380 pound anodes for use in their electrolic lead refinery located at Grasseli, Indiana.

[15]HTSS Here to end of drossing plant.

CONCENTRATORS

The first concentrator at the Tooele plant was built during 1921–1922 by the Utah Consolidated Mining Company. Operation of a 500-ton per day unit was started on November 1, 1924. A second unit of 250-tons per day capacity was started February 4, 1925 and increased to 500 tons per day later that same year. This concentrator was operated as a custom unit and treated ores from as many as 15 different mines. The lead and iron concentrates were treated at Tooele and the zinc concentrates were shipped to Montana. An oxide concentrator was built in 1928. The entire concentrator facility was closed permanently August 1, 1958.[16]

Let us talk a little about the flotation process, the basis of the concentration operation. Many metallic ores are found in nature in low concentration. These are usually sulphides mixed with earthy materials known as "gangue." Before the metal in such an ore may be extracted profitably the ore must be concentrated. This concentration is often accomplished by a process called flotation. Flotation depends on the fact that the gangue is preferentially wetted by water, while the unwetted ore particles become attached to the oil-covered air bubbles. The low grade ore is ground very fine, then mixed with water, oil, and air to form a foamy, frothy mixture. The water-wetted particles of gangue settle to the bottom. The unwetted ore particles are carried to the surface in the frothy suspension of air bubbles and are skimmed off. It is possible to control the surface wetting of mixtures of desirable minerals. The minerals may be floated one at a time, and thus concentrated and separated at the same time. Let us use an example. A low grade copper ore, chalcopyrite, containing copper, iron and sulphur, is often found mixed with pyrite, a sulphur of iron. Suppose we wish to separate the two ores and recover them in concentrated form.

The raw ore is first pulverized with water in colloid mills to make a thick "slurry" which is pumped into a flotation cell along with water and very small quantities of certain chemicals. One chemical substance acts as a collector for the chalcopyrite, another causes the pyrite to be wetted. As air is blown through the cell only the copper ore particles stick to the air bubbles. They float to the surface and are skimmed off. The gangue and pyrite, both water wetted, are pumped to another cell. Here the mixture is treated with another collector chemical. This displaces the water from the

[16]HTSS.

pyrite surfaces and makes them water repellant. The frothing action is repeated and the pyrite particles are separated from the gangue.

To establish stable sources of smelter feed, the International Smelting and Refining Company acquired interest in various properties and companies in the district, and by the mid-1930s, it held a substantial interest in the area West of the Bingham pit. Five of the companies in which Anaconda (through its subsidiary, I. S. and R.) had interests subsequently consolidated to form National Tunnel and Mines Company, which developed the first underground copper mine in that part of the district.[17]

To transport ore from the Utah–Delaware Mine to the International concentrator and smelter, National Tunnel and Mines began driving the 27,000-foot Elton Tunnel in 1937, completing the project in 1941. The company continued to operate until 1947. During the next year, Anaconda acquired all of the National Tunnel and Mines assets and lands, including the Carr Fork claims. A 20-year exploration program on the properties prompted extensive core drilling, starting in 1969. By 1973, drillers had delineated the Yampa and Highland Boy properties that are the basis of the Carr Fork Mine.

THE SLAG TREATMENT PLANT

After a method of treatment was devised, preliminary test work was performed, and a pilot plant built and tested, a slag treatment plant was built and operations begun in September of 1941. This plant was primarily built to extract the zinc content of the huge slag dumps which had accumulated during some thirty years of smelter operation.

The plant consisted of a furnace, a coal dryer and pulverizing plant, flues, cooling U-tubes, a deleading kiln and other auxiliary equipment. The plant treated all the hot slag produced at the blast furnace plus additional tonnages of cold slag, flue dust and oxide zinc ore. The fume, containing lead and zinc, was driven off by the introduction of pulverized coal and air into the furnace tuyeres, and passed through a flue system and cooling U-tubes and hence to a baghouse where the dust was collected in baghouse pits. The dust was recovered from the pits by suction and fed to a deleading kiln where the lead was driven off and collected in a baghouse for recirculation to the lead plant. The zinc concentrates discharged to a cooler and through a crushing plant to a railroad car for shipment to a zinc refinery. To ensure adequate feed for the furnace the company purchased the large slag dump of the American Smelting and Refining Company, located at Midvale, Utah.

Many Tons of zinc oxide ores were bought from the Nevada area and treated at Tooele. Also, during later years, high zinc fumes recovered from Western Steel Mills were purchased and treated.

On the night of Saturday, May 9, 1942 occurred the biggest and the fiercest fire in the history of the Tooele Smelter. This fire destroyed the chemical laboratory and assay office, the Testing Department and its many records, the large central warehouse, most of the electrical and mechanical shops — and even greatly damaged a newly reconditioned steam locomotive still in the repair shop. The fire started after 1 A.M. from a leaking gas meter located behind the fireroom of the assay office, torched upward into the second story (where the old laboratory had been), and hence to the roof of the long building. By this time the fire was out of control, the simple fire-fighting equipment at the smelter, aided by a fire truck furnished by Tooele City, had absolutely no chance of containing this fire. The total loss, as estimated by company officials arriving from New York City two days later, was set at many hundreds of thousands of dollars. A complete new laboratory building had to be built and furnished, a complete new warehouse needed to be constructed and stocked, and, even though some lathes and other pieces of equipment had been salvaged, new shops had to be built and much equipment replaced. George Jackson, chemist on duty in the lab on this night, reported the fire to the night superintendent and also woke up the General Superintendent at his home in Tooele City. He then heroically made many trips into the burning building, saving the most expensive analytical balances and whatever he could carry outside before the fire got too intense. It was a frightening experience for Jackson, he being the only man in the building when the fire started.

Space in the laboratory of the Bauer Plant of the Combined Reduction Company was offered in a friendly fashion and gratefully accepted in order to continue the necessary control of the many smelter operations. Also, some space was made available in the Concentration Testing Laboratory, across the road from the fire. The smelter was only down for two days. Work was pushed on the new building and construction was mostly finished by the following September.[18]

In November of 1944 an explosion at the slag

[17]Engineering and Mining Journal, January, 1979.

[18]Tooele Transcript–Bulletin May 12, 1942.

treatment plant resulted in the loss of four lives; the most unfortunate happening in the sixty years of the smelter's history. From personal interviews with several of the people in a position to know what went on before and during this tragedy, I hereby give my own version of this sad affair.

In the summer of 1943, due to so many young men either volunteering or being drafted into the armed forces, a number of women were hired to work at the smelter. These were in addition to the dozen or so women already working in and around the main offices. These later women were hired to do men's work on day pay jobs always before performed by men. The number of women hired to work on men's jobs probably peaked at about forty.

At first about a dozen of these women were placed in the yard crew, where they raked the paths and the hillsides, making the pathways free of loose rocks, and leveling unsightly piles of dirt and refuse, of debris and weeds. Later these women were scattered throughout the plant to fill in where they were needed. Some of these jobs they could fill; others they should not have been exposed to. But, we were a nation at war — and male laborers were in short supply. So this is where the trouble began: women were placed in jobs where they never should have been. Men had always before filled these jobs and these men throughly understood that, in order to draw their pay, that they must put up with a number of unpleasant working conditions. By the very nature of the operations carried on at the smelter these men knew that they had to contend with dust and dirt, with excess heat around the furnaces and with chilling cold out on the slag dump, with potent gases and the ever present possibility of crippling injuries — and with the need, upon occasion, to exert a good deal of physical effort. The men who stayed on at the smelter had accepted these conditions; but not so the women who were now placed in some of these jobs. These women demanded, and got, equal pay for equal work — but were unwilling to perform all the duties that men had formerly performed. They would not work in places which were full of dust (such as under conveyor belts carrying finely crushed ore of lime-rock). They would not work close to the furnaces. These women would not climb a ladder, or walk where there was no guard rail, or lift anything over twenty pounds, or shovel dust or use a sledge hammer — the list is endless which details the things that these women refused to do — all the time insisting that they receive the same wages as the men on the same jobs.

Of course, there were exceptions. Some jobs the women could, and did, do as well or even better than men. For example, four women could be given the assignment to watch a moving conveyor belt and to throw out all pieces of metal, such as nails, bolts, pices of wire, etc., which might foul up the machinery. Two women out of the four would do a good, conscientious job. The other two women could not care less. They were only here on a temporary basis to do the least possible amount of work — and when the noon whistle blew they would stop whatever they were doing and wash up for lunch, leaving the belts running and making it necessary for the men on the shift to finish the run alone before they could stop to eat.

On one occasion the foreman in the sample room was overseeing an ore run from car to crusher to empty car. He noticed a length of rusty iron pipe on the conveyor belt near where one of these women was supposed to be watching and yelled at her to throw the pipe out. She ignored him — and even though he ran after the pipe it fell into the crusher before he could catch up with it. The sample mill was shut down for three days while repair crews worked overtime to fix the crusher.

Some operators around the plant, disgusted at the antics of some of these women, would have nothing to do with them. Willard Whitehouse, over at the sintering plant, himself a sober, religious, hard-working man, ordered his female helper off the job after finding out that he had to perform his own work and about 90% of the work assigned to three of four different helpers.

Apparently a few ringleaders caused most of the trouble and got some of the other women to follow their lead by telling them that the women were in the minority at the plant and that, in order for them to get their way, they must all stick together. Almost daily, somewhere in the plant, some single woman worker would get on the phone and call one of the ringleaders to complain that she had been told to do something distasteful, something that men workers had been doing for years. The ringleader would make two or three more phone calls and soon the women would start stringing down the hill to the main office building. Two benches were placed in the hallway so that these complainers would not have to stand while they waited to talk to the superintendent.

Many of the complaints were legitimate and could have been handled on the spot, others could have been avoided by fuller explanations concerning responsibilities and duties.

One woman who did try to earn her pay by attempting to do several of the more unpleasant tasks which had to be done incurred the enmity of her sisters. They argued with her and pointed out that she was the only one trying to do a man's work in every detail.

When this woman refused to listen to the other women, they put their heads together and decided that they would give her such a bad time that she would be forced to quit her job. They snubbed her, refused to work near her and, finally they concerted to embarrass her by pulling a wildcat strike. About thirty of these women, instead of reporting to their assigned departments, congregated in the main office building at the beginning of the day shift on a certain day and demanded a meeting with the management. They stated that they would not work again until this woman was discharged.

Well, they had their meeting, the plant was shut down for twenty-four hours and the problem of this woman's continuing to work for the company was settled (as are so many problems) by compromise. This woman was given a job in the Concentration Testing Department, away from the other women workers. The other women were not too happy with this solution; but after discussing the matter for an hour or so, finally agreed to come to work on the following morning. This was only after they came to realize that the company would not be dictated to.

A most unfortunate aftermath of this twenty-four hour shutdown was the occurance of the worse disaster to ever happen at the Tooele Smelter. The women cannot be blamed for this tragic event — but they did cause the shut-down, and if the plant had not been shut down at this time the tragedy could not have happened.

The shutdown occurred on November 28, 1944. A light snow began to fall before noon on that day, and it snowed all that day and most of the night, depositing about eight inches of fresh snow over all the countryside round about.

On the 29th, the following day, the crew over at the Slag Treatment Plant, (like the crews in other departments) were preparing to get started again. Heat was arrived at by starting a fire in the furnace, and ore and flux and pulverized coal were fed in. When the time came for the first tapping of the slag everything seemed normal: but, soon after the furnace was opened and the slag began to run down the launder into the slag pot, a tremendous explosion took place. Foreman Charley Berry, Ruie Green, Leonard Ayres and Carl Lindholm were all working directly above the area of the explosion — and all were badly burned. Ruie Green and Leonard Ayres died almost instantly; Berry and Lindholm were rushed to a Salt Lake City hospital, where Berry died the following day and Lindholm, who seemed to be recovering, lasted for nearly a week before he, too, expired.

In reconstructing what probably happened much had to be left to conjecture: but the prevailing opinion was that probably some blue mud (used for plugging the slagholes) had been thrown into the empty slag pot on the day before and that this mud combined with the slowly falling snow to form ice in the bottom of the pot. Then, when the hot, molten slag came rushing down the launder and hit the snow and ice, steam was formed, was imprisoned for a while; and finally broke loose with a great explosion. The entire thrust of the explosion was upward, towards the platform where the four men were working. A make-shift shield of corrugated steel to protect against the heat proved no resistance to the hot slag and steam and expanding air.

A rather bitter footnote to this tragic story was the fact, shortly after this terrible accident, that the husband of the woman who figures so prominently in this story (and who was working at the Tooele Army Depot) was transferred to another army base, and husband and wife both departed from Tooele. It would be nice if, just once in awhile, we could see around the next turn in the road of life; how much misery this would prevent!

The Slag Treatment Plant operated until early 1972, when it was decided by the big-wigs of Anaconda, back in New York, that the Tooele Smelter should go out of business. This was necessitated by the high cost of operating an antique plant, dwindling ore receipts as one mine after another closed, and the activity of the Environmental Protection Agency, which would require large expenditures to meet their standards.

The Tooele Smelter was completely dismantled, except for a few buildings like the main office building, the chemical laboratory, the general warehouse and the various shops which were contained in the new building which replaced the one destroyed in the fire of 1942. The rest of the smelter was demolished and all hauled away before the end of 1974. A note of finality was sounded to this entire operation by the demolition of the 350-foot main smoke stack and the bringing down of the 1,750,000 brick structure.[19]

I would not like to close this history of the Tooele Smelter without saying a few words about the people who worked at this plant at various times between 1909 and 1972.

To get the railroad and the smelter built necessitated sending elsewhere for men who had the expertise and the experience to commence and to

[19]HTSS

complete such an undertaking. Such men were found in the Anaconda plants in Montana. Many of them were of Irish descent, and all of them were of either Roman Catholic or Protestant faiths — this in contrast to the predominant Mormons in the community. So we look at the old payrolls and we find such names as: Kirk Bond, C. B. Burke, Bill Carter, Jack Carwile, Bill Clemo, Ed Cuduhay, Ches Erwin, J. O. Elton, Joe Jette, O. M. Kuchs, Bill Keough, Julius Kurtz, Denny Long, E. P. Matheson, Con Mahoney, Pat McCoy, Orson McKendrick, Pat McKenna, Sr., Jim Neary, Ted Russell, Dan Sullivan, Jim Thompson, Norman Winn, Bill Wraith, and others. (Note that I have, in several cases, given the short form of their first names, the names that they were known and remembered by).

Local citizenry worked at the Tooele plant in large numbers, many for years furnishing their own teams and wagons. So, over the years, the Tooele payrolls carried such last names as: Aagard, Adams, Adamson, Alsop, Anderson, Atkin, Berry, Black, Bevan, Boyce, Brown, Bryan, Buckingham, Dalton, Daniels, Dunn, Durfee, Elkington, Frailey, Gillespie, Gollaher, Gordon, Gowans, Grundry, Hanks, Hansen, Howell, James, Johnson, Jensen, Jeffries, Jordan, Lee, Lougy, Luck, Mercer, McLaws, McKendrick, Miller, Morgan, Nelson, Orme, Parks, Petersen, Powell, Rigby, Rowberry, Russell, Sagers, Scott, Simmonds, Shields, Smith, Snyder, Stephens, Tate, Warburton, West, Young, and many more.

And then came the immigrants from Southern Europe. Examine these names: Arrventries, Baudak, Bonelli, Brozovitch, Busico, Buzianis, Cerroni, de Simon, Elich, Gaspar, Gochis, Gregrerich, Joffe, Jankovitch, Karabats, Kochever, Kostello, Kargis, Leonelli, Melincovitch, Morrell, Moulas, Pezel, Punnunzio, Rinaldi, Romano, Ronkovitch.

At one time several Japanese worked at the Tooele smelter. A small colony of them lived near a spring and a clump of trees near the mouth of the present Elton Tunnel. Prior to the Great Depression there were half a dozen Japanese janitors polishing up the spittoons found in every office. Others worked at the sample mill, the sintering plant and on the track gang.

Very few blacks ever worked at the Tooele Smelter.

Professor (retired) Eugene E. Campbell has told of the "Melting Pot" or, if you prefer, the "Salad Bowl" concept of the people who were assimilated into the culture of Tooele by coming to this community to work at the smelter. Dr. Campbell was speaking at the Senior Citizen's Center on January 4, 1983 on the occasion of the 78th Annual Statehood Day Celebration, sponsored by the Utah State Historical Society. Dr. Campbell gave a good account of how these people settled in "Newtown" and for many years kept mostly to themselves, and how they kept part of their Old World culture while learning new ways in a new country; but how the barriers between the several cultures were finally broken down (largely due to the efforts of one man, Sterling Harris, the football coach of the Tooele High School, who recruited, and made friends, in "Newtown."[20]

The compiler of this history of the Tooele Smelter would merely add a footnote to Dr. Campbell's account.

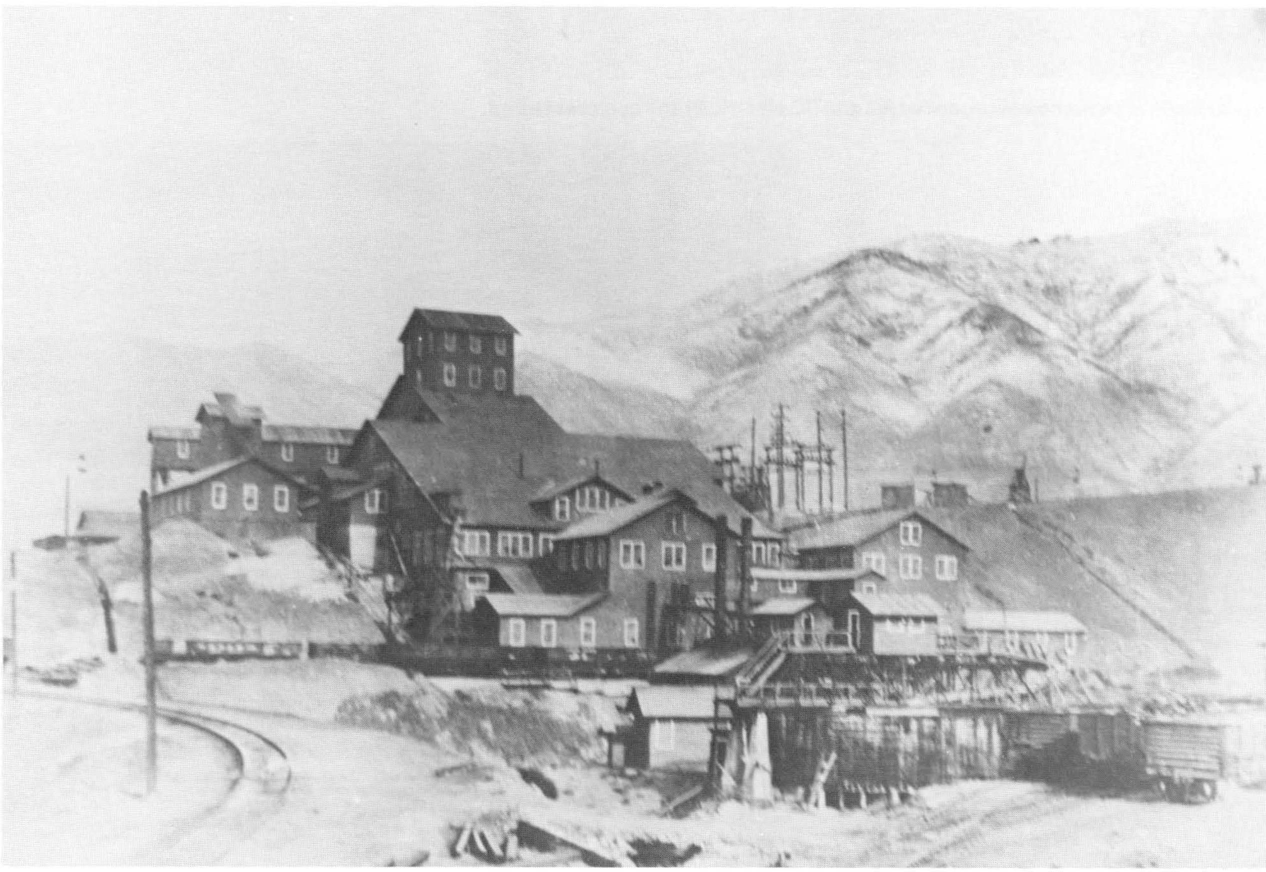
For many years in Tooele one of the most distinctive aspects of that town's celebration of the Fourth of July was the annual parade. And one of the most colorful spectacles of these parades was the participation, in the early years of the smelter, of the many diverse nationalities of these neo-Americans as they brought a little of their old countries to Tooele. The parade route usually started in Newtown, proceeded North on Broadway to Utah Avenue, then West to Main Street, then South to First South. These Fourth of July parades in Tooele contained few floats; but, instead were composed of several walking contingents. Among these groups of marchers were representatives of Italy, Greece, Croatia, Serbia, Slovokia, Austria, Montenegro, Bosnia, and from Dalmatia (most of these small countries now are part of Yugoslovia). Each of these groups carried their individual national flag, many of the men wearing the military uniforms that they had worn during their compulsory service in their native land. They also carried an American flag which they held high. As a small boy I witnessed many of these parades. I admired the few floats showing the Statute of Liberty, or Abraham Lincoln, and the red, white and blue bunting drapped over other floats — but to me the best part of the parades were the marchers from across the ocean. But, alas, as the years went by fewer and fewer people marched in the parades, the old uniforms no longer fit, and the native flags disappeared from view.

So this, then, concludes our report. There was at one time a smelter near Tooele. It was very important to the economy of Tooele for over sixty years (1909 to 1972). This smelter provided work for thousands of men and a few women. It helped

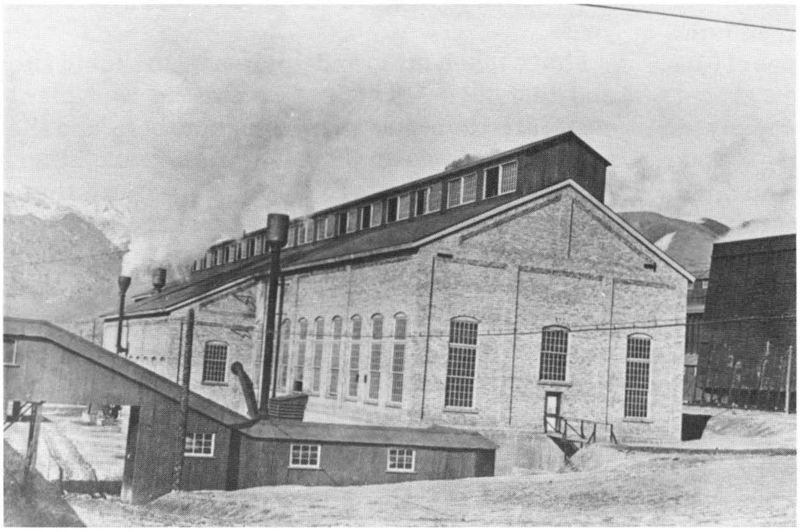
[20]The "M" Factors in Tooele's History. Manuscript. Copies were given most members of the Tooele High School Class of 1933 at their 50th Reunion.

hundreds of boys secure a college education. It paid millions of dollars in taxes. It trained hundreds of craftsmen. It is not without a sense of loss that I write these concluding words. You cannot work for over forty years for the same company at the same plant without it becoming a part of you. The T. V. (the Tooele Valley Railroad) chugging up or coasting down through the center of town — where are you now? The four and a half mile trip from home to the smelter, for years by shift train, then by bus, and finally by car pool, how many trips did we make in all those years? I can never forget the many happy associations or the friendships with a few fellow workers over those years.

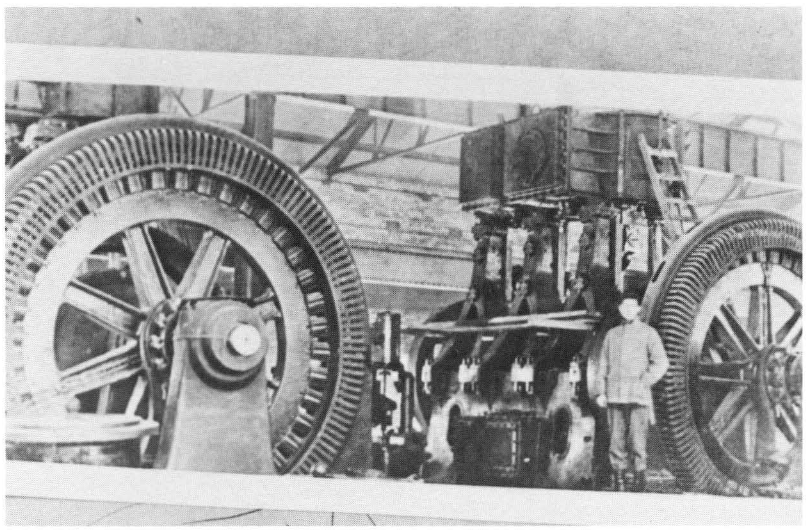
I have taken my grandchildren up to the old site and told them, "There is where the lead plant stood, and the copper plant was over there, and the concentrator was up there." "Where, grandfather, where?" they asked. To the untrained eye there was nothing left. Perhaps it had all been a dream? But it was no dream to me. It was real to me, it had been a part of me. I look eastward from Tooele and say: Au Revoir, smelter, auf Wiedersehen, adios, and arrivaderci. You are no more.



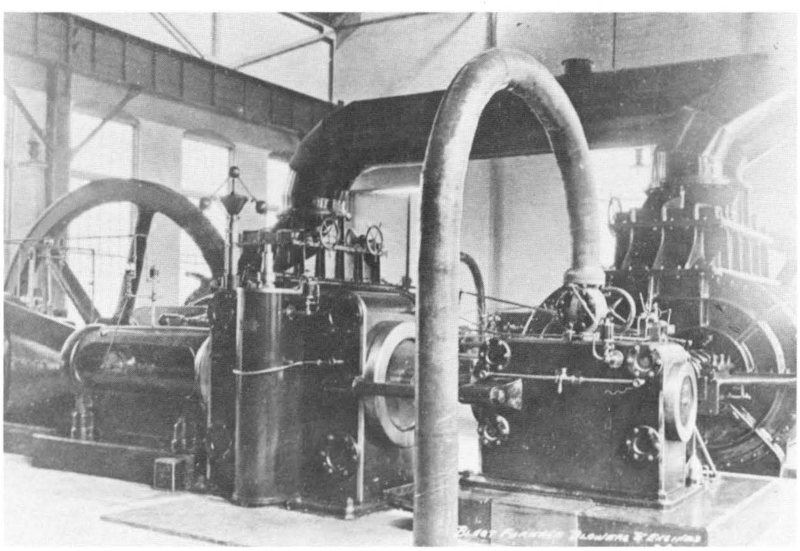
Concentrator Mill, Tooele Smelter.



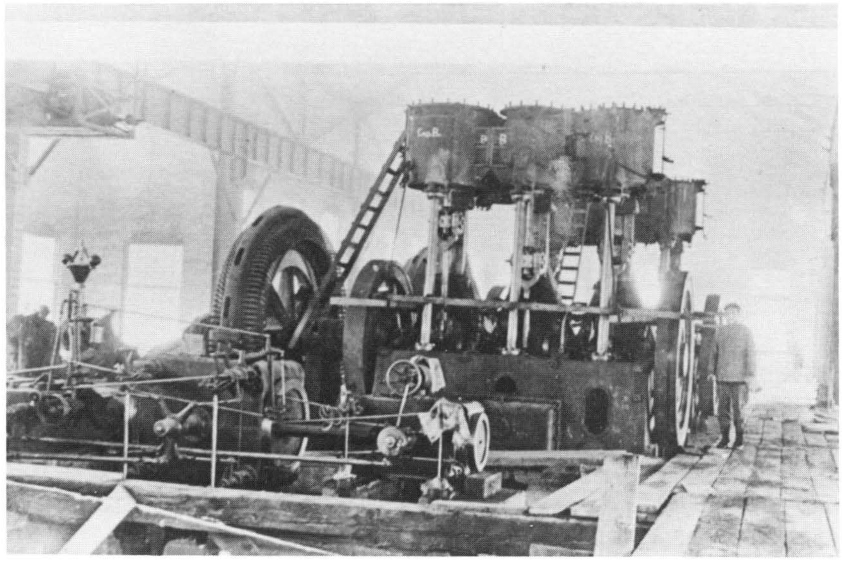
Tooele Smelter powerhouse produced AC and DC electricity and compressed air.



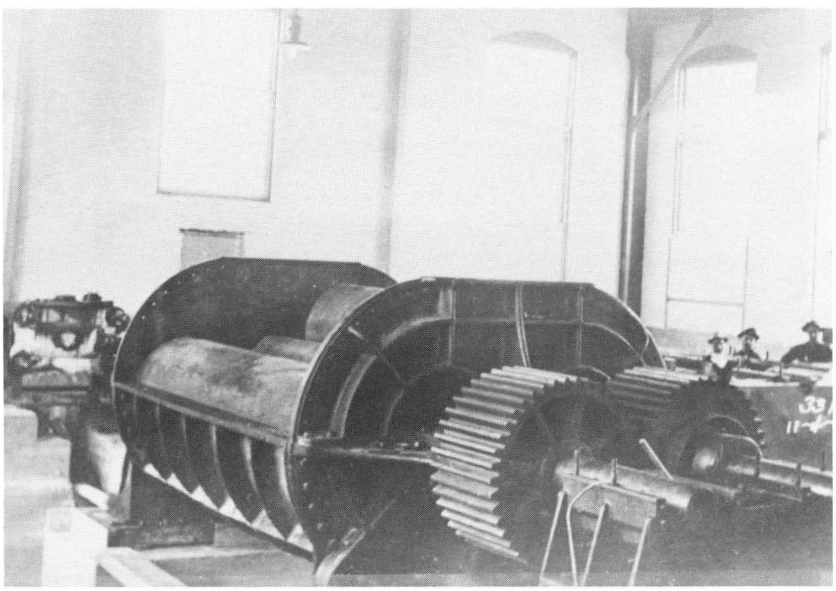
Vertical cylinder steam engine for AC power.



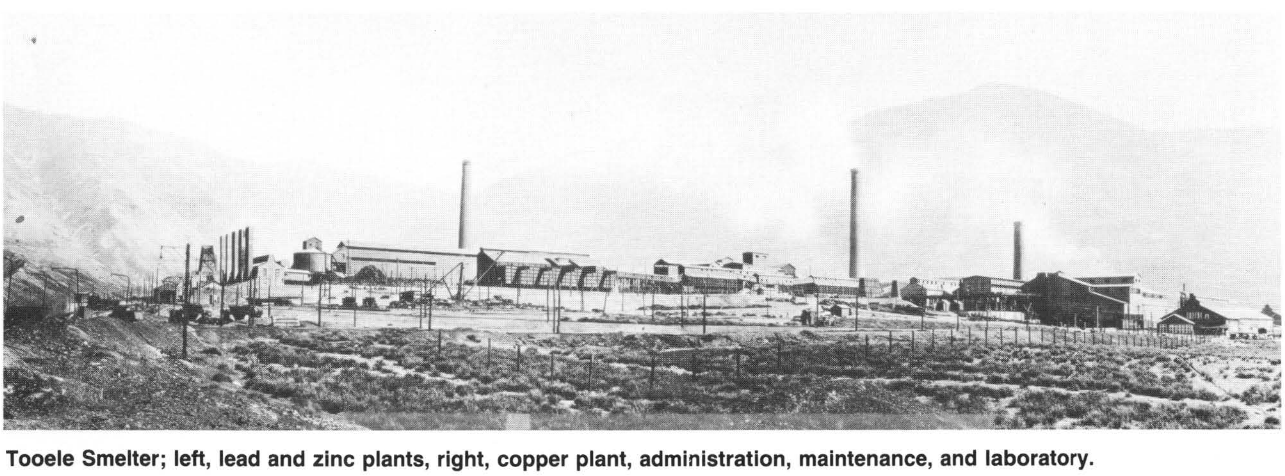
Nordberg steam power DC generator.



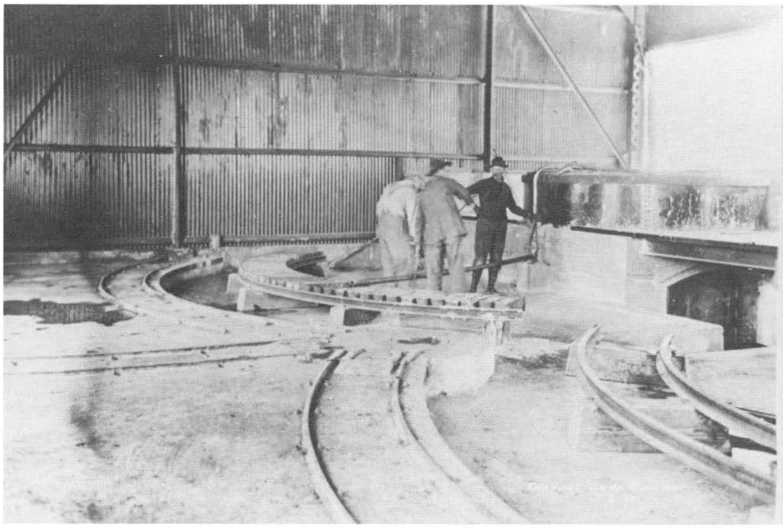
Vertical steam powered engine for DC generator.



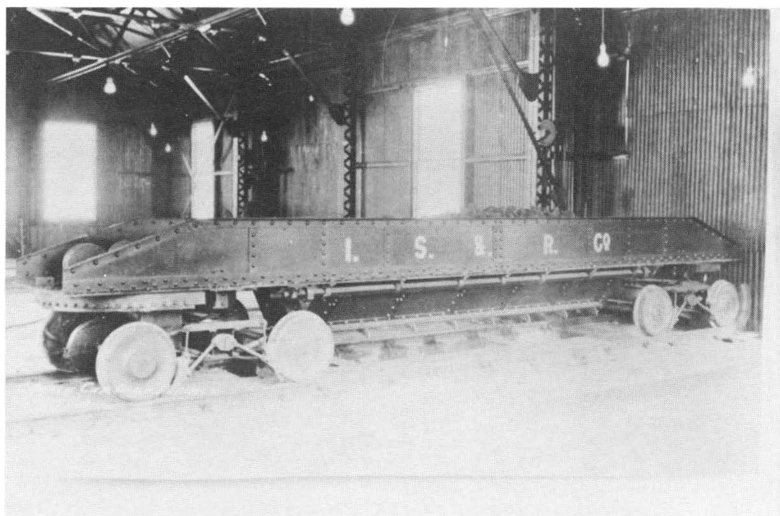
Air blower for air to Blast Furnace.



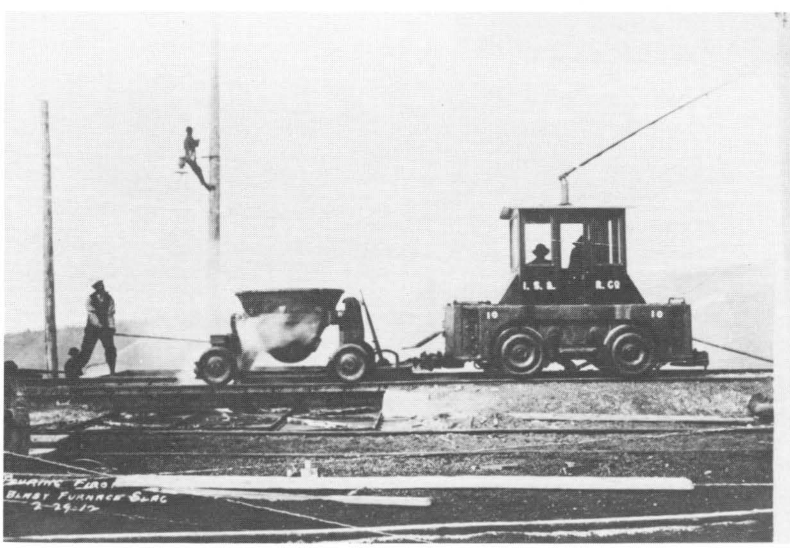
Tooele Smelter; left, lead and zinc plants, right, copper plant, administration, maintenance, and laboratory.



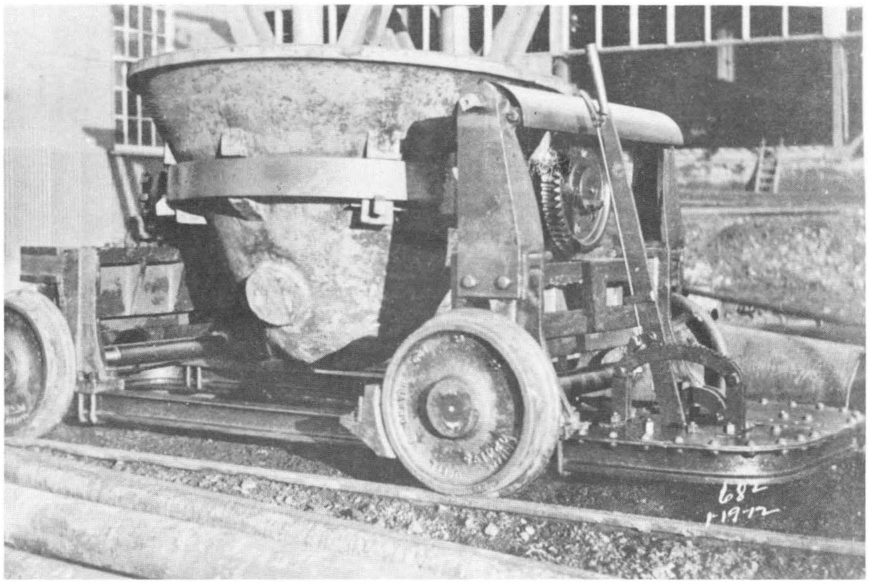
Blast furnace charge floor.



Blast Furnace Charge Car

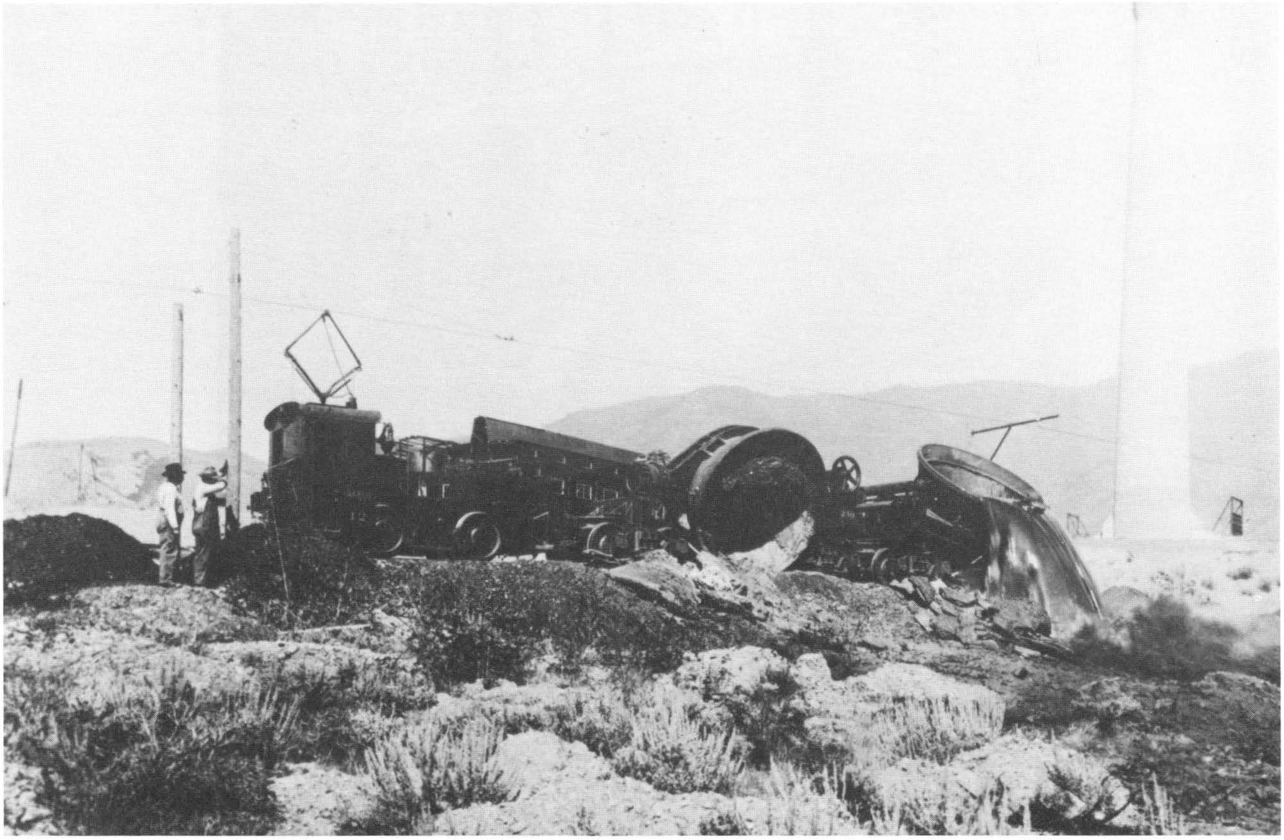


Dumping slag pot.

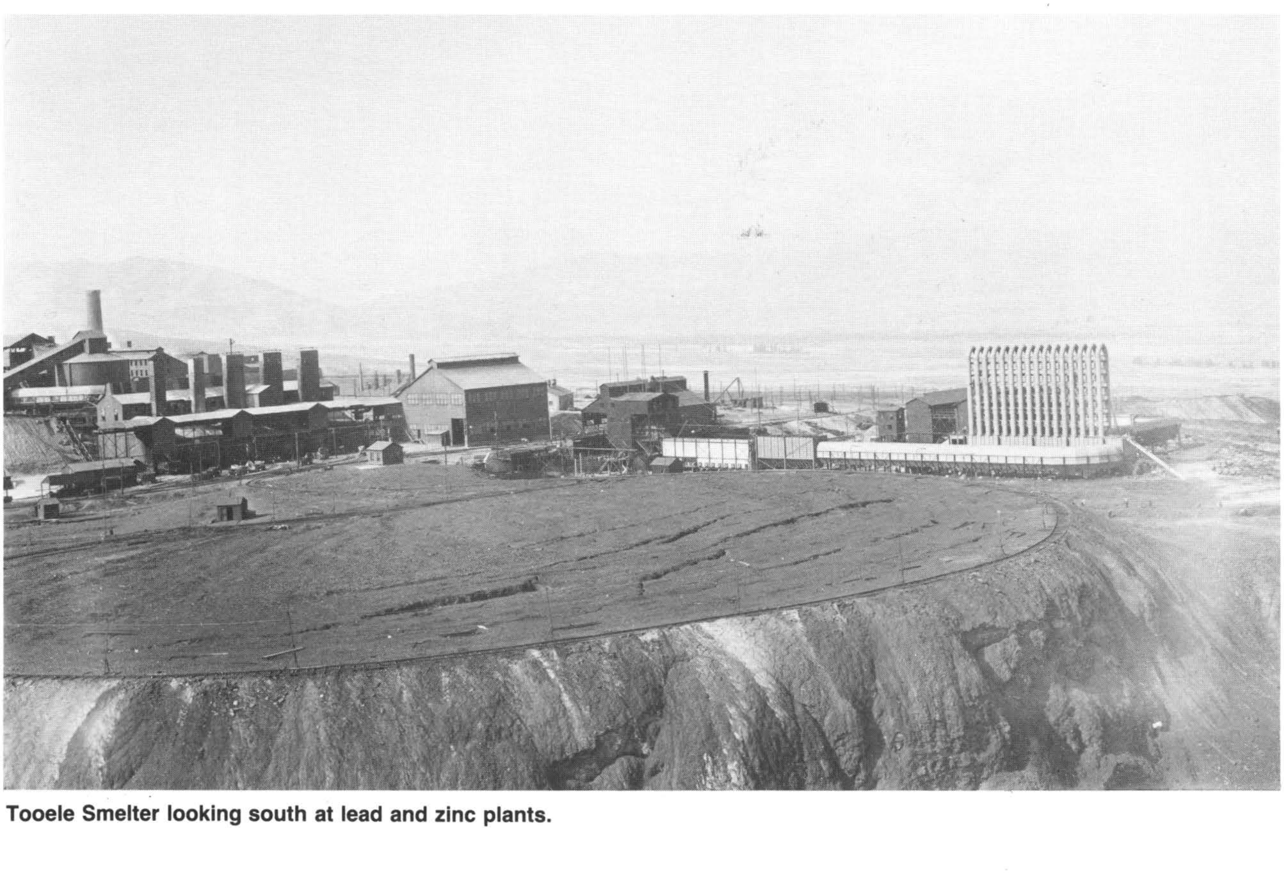


Slag Pot

Blast Furnace Drossing plant, lead ingots weight 4 tons each.

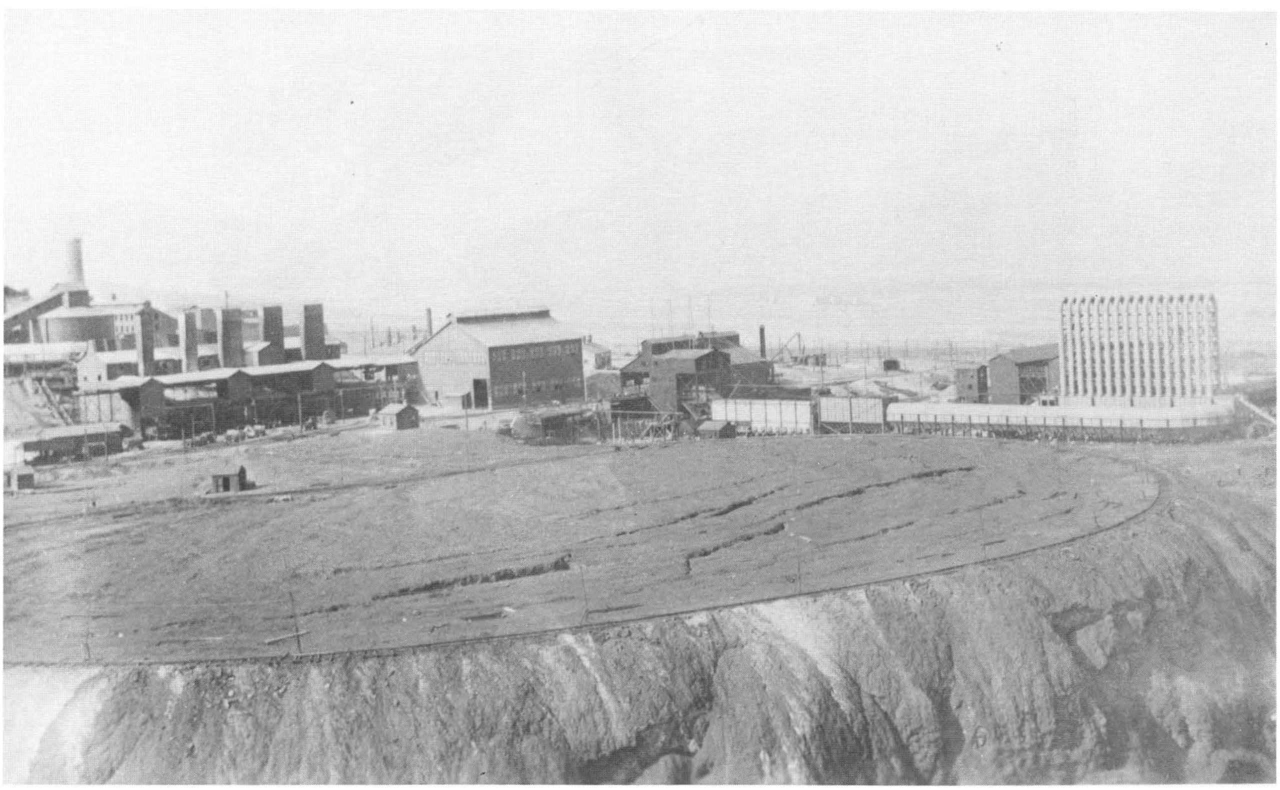


Dumping the second pot of slag at Tooele Smelter 1910.

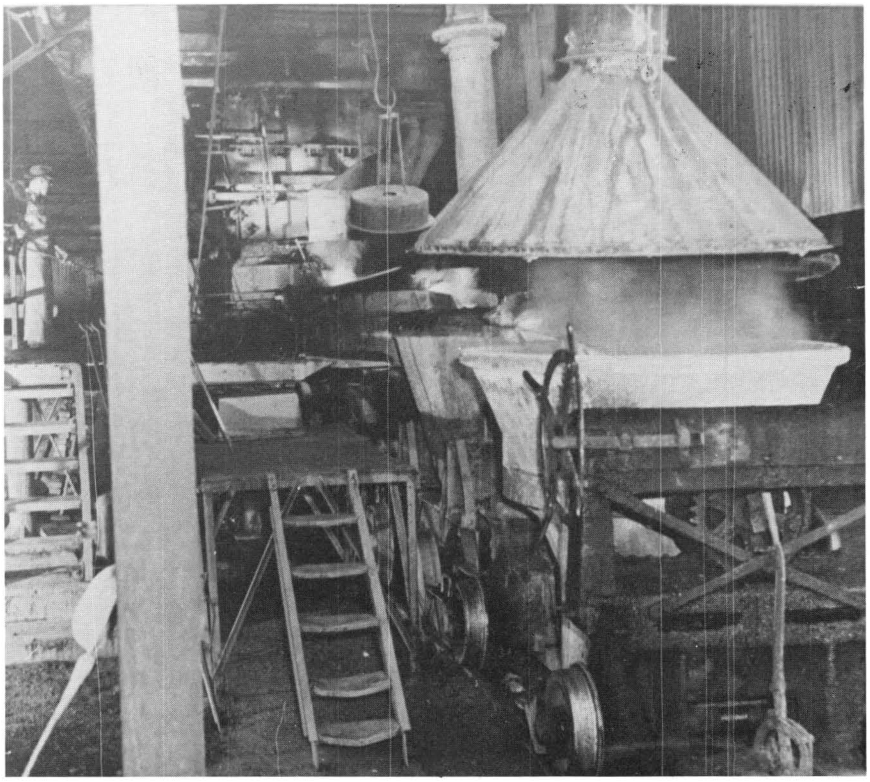


Tooele Smelter looking south at lead and zinc plants.

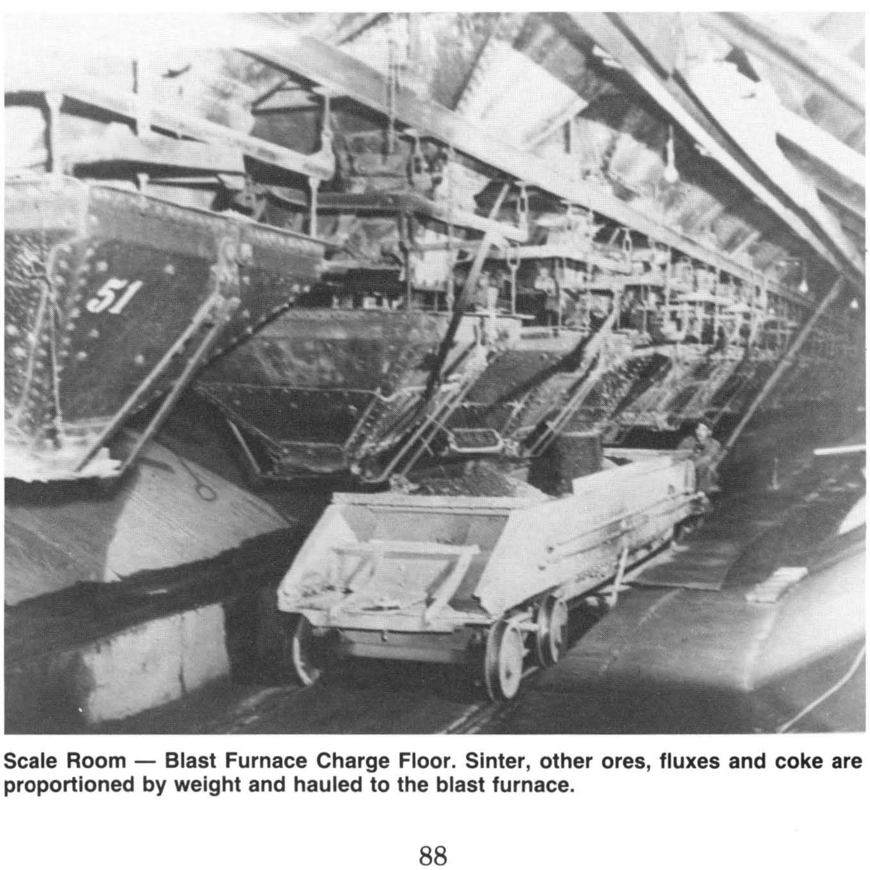
Showing blast furnace (left) Zinc plant (right).



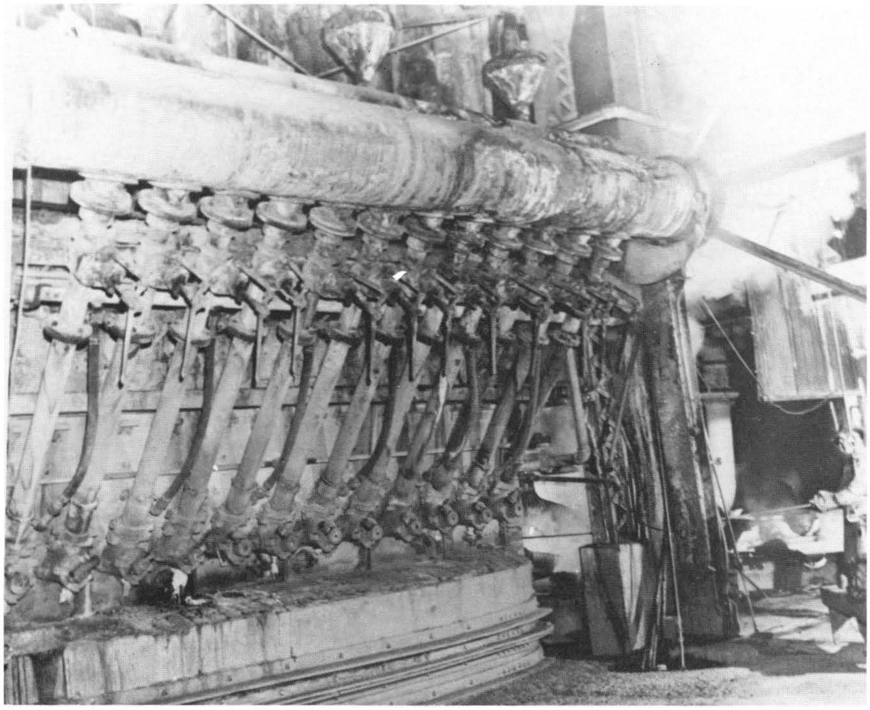
Aerial view of Tooele Smelter 1971.



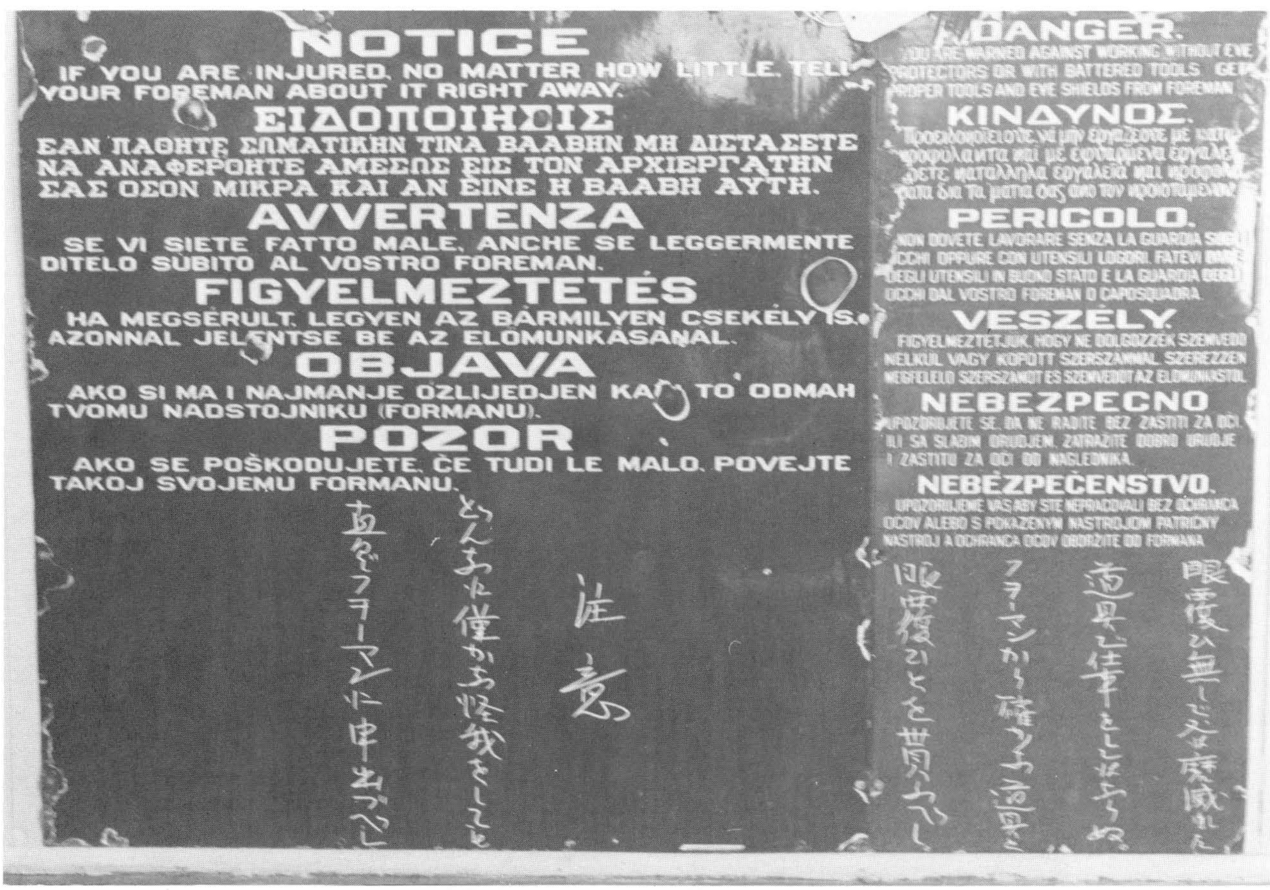
Tapping end of Blast Furnace. Molten slag and speiss are tapped together into settler. Molten lead is tapped from side of furnace.



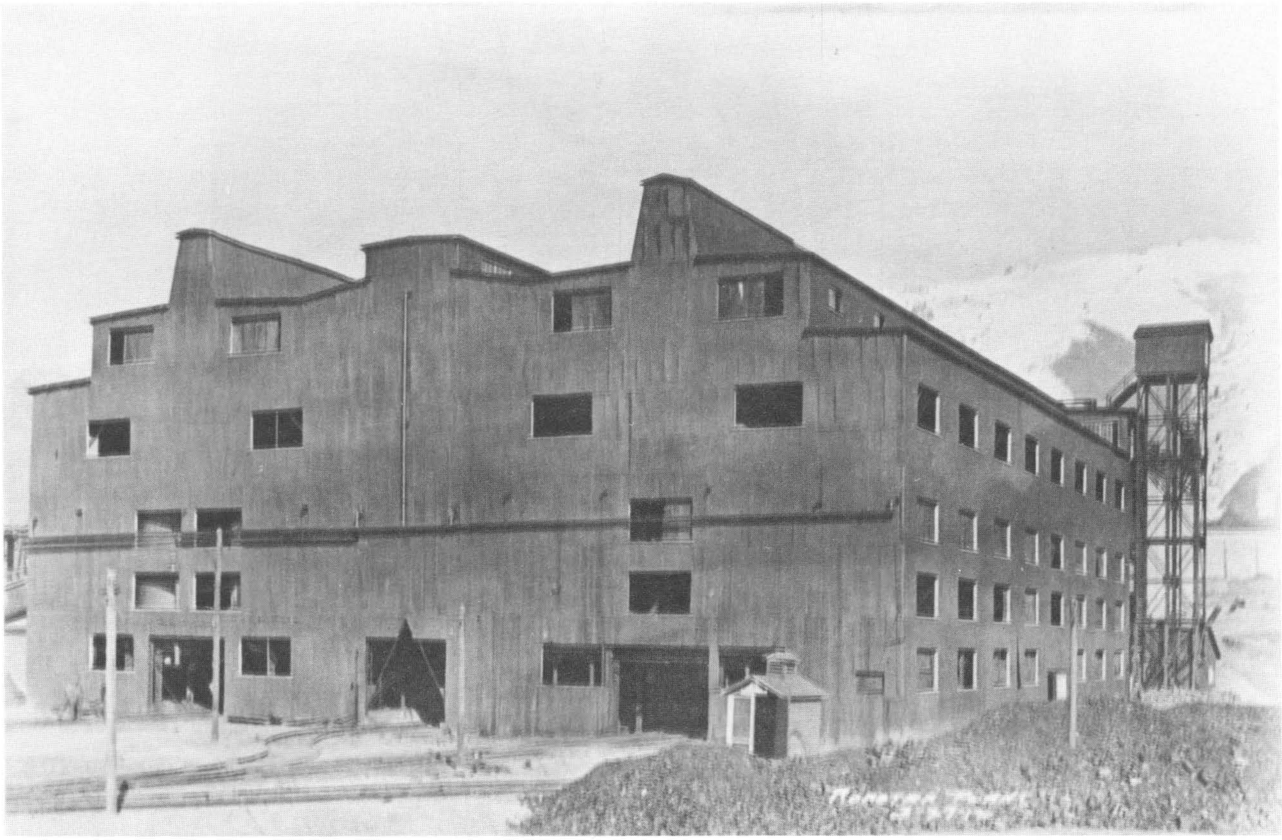
Scale Room — Blast Furnace Charge Floor. Sinter, other ores, fluxes and coke are proportioned by weight and hauled to the blast furnace.



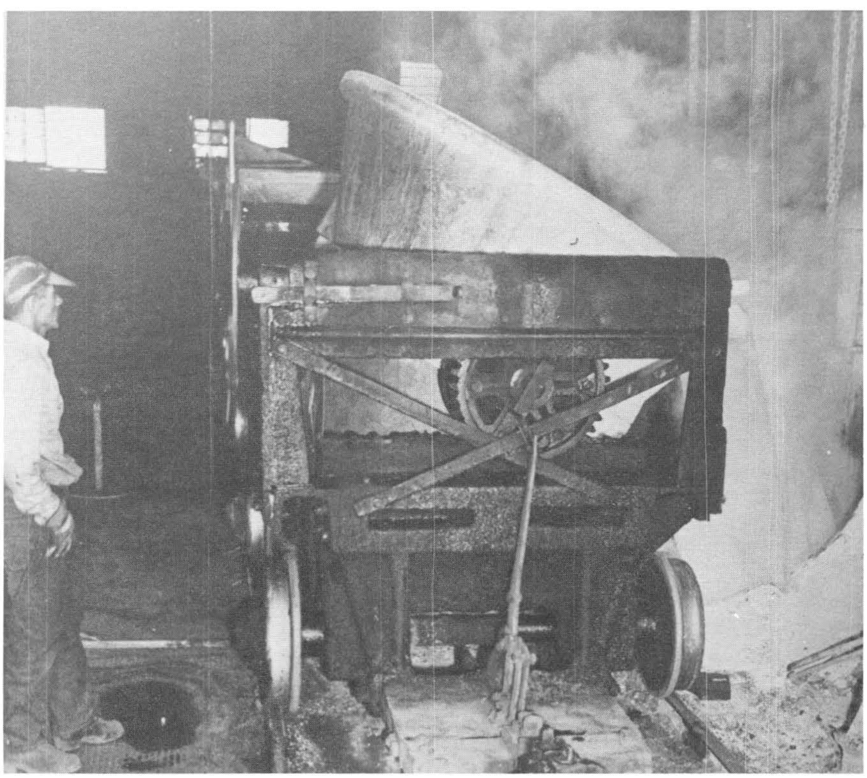
Blast Furnace Assembly. Showing brick crucible, water jacketed sides and air pipes to tuyeres.



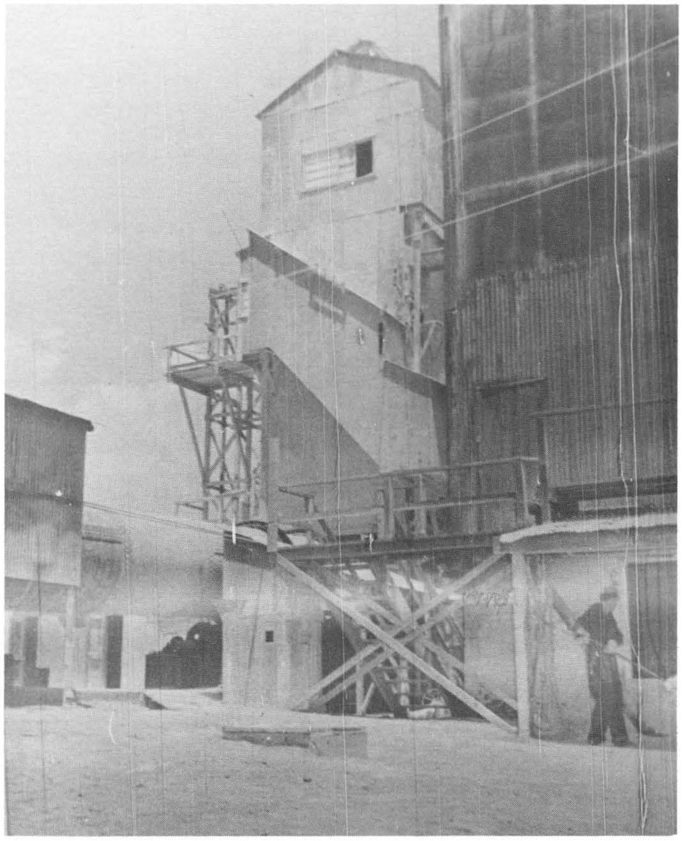
Instructions for workers of all ethnic groups that worked at the Tooele Smelter.



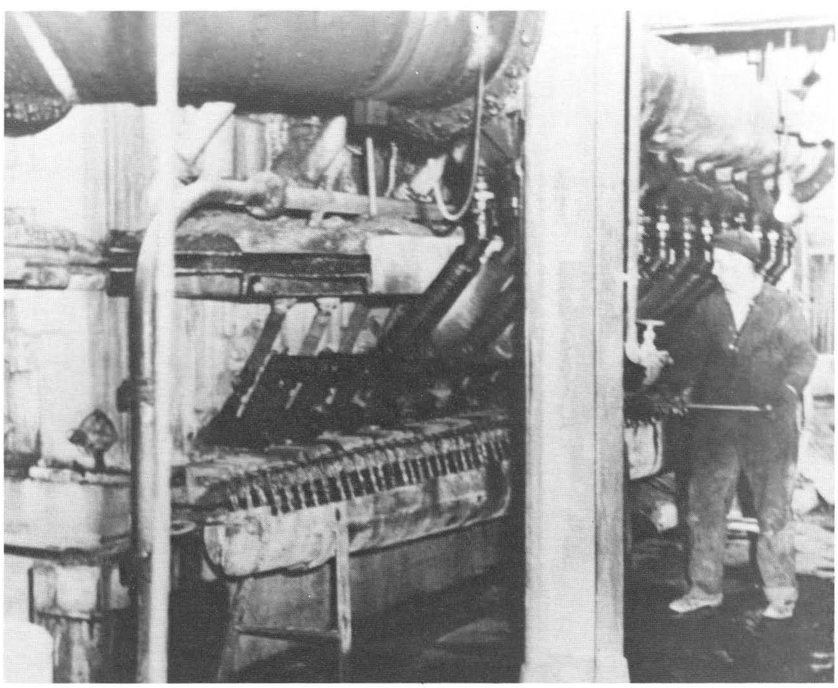
McDougall Roaster, copper plant.



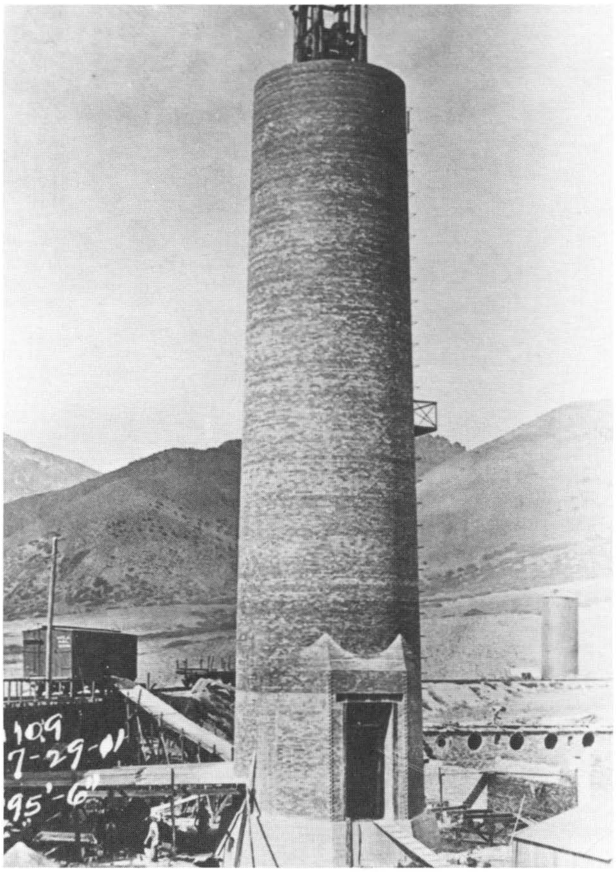
Pouring molten slag to slag furnace. Slag from the blast furnace is treated to recover lead and zinc.



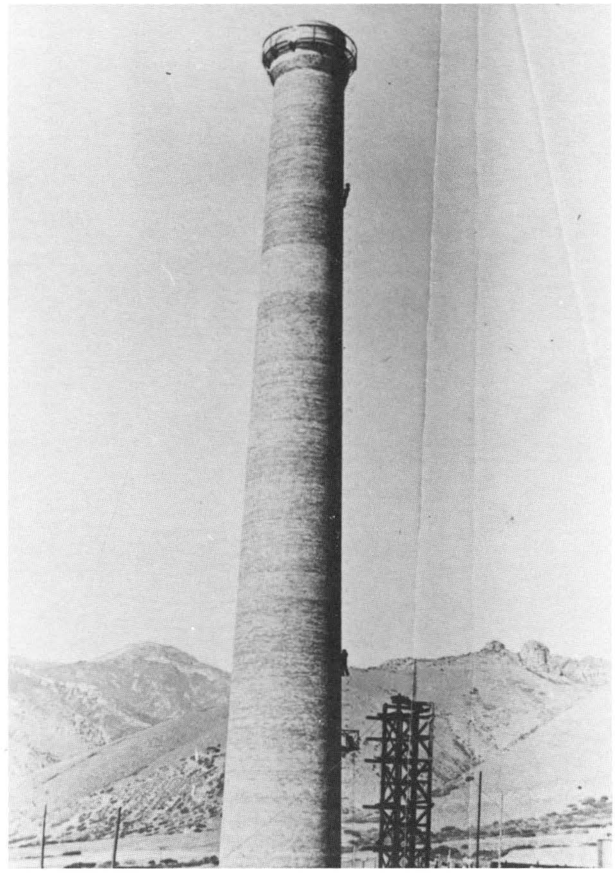
Slag Plant Baghouse — Deleading Kiln. Fume from slag furnace is collected in a baghouse then is roasted in a kiln to remove lead. Roasted zinc product is shipped to a zinc smelter.



Slag Furnace Assembly showing water jacket side walls and pipes carrying air and pulverized coal to the furnace.



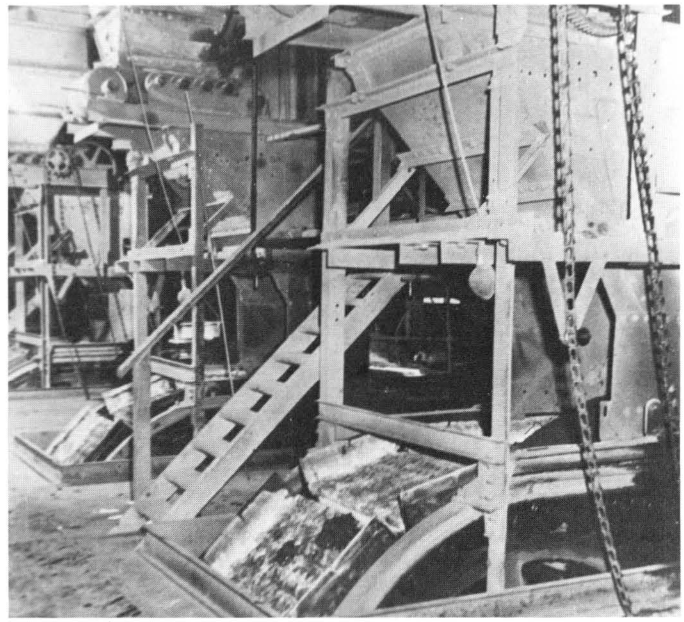
Smokestack under construction 1909.



Completed smokestack. This smokestack served the three copper smelting operations.

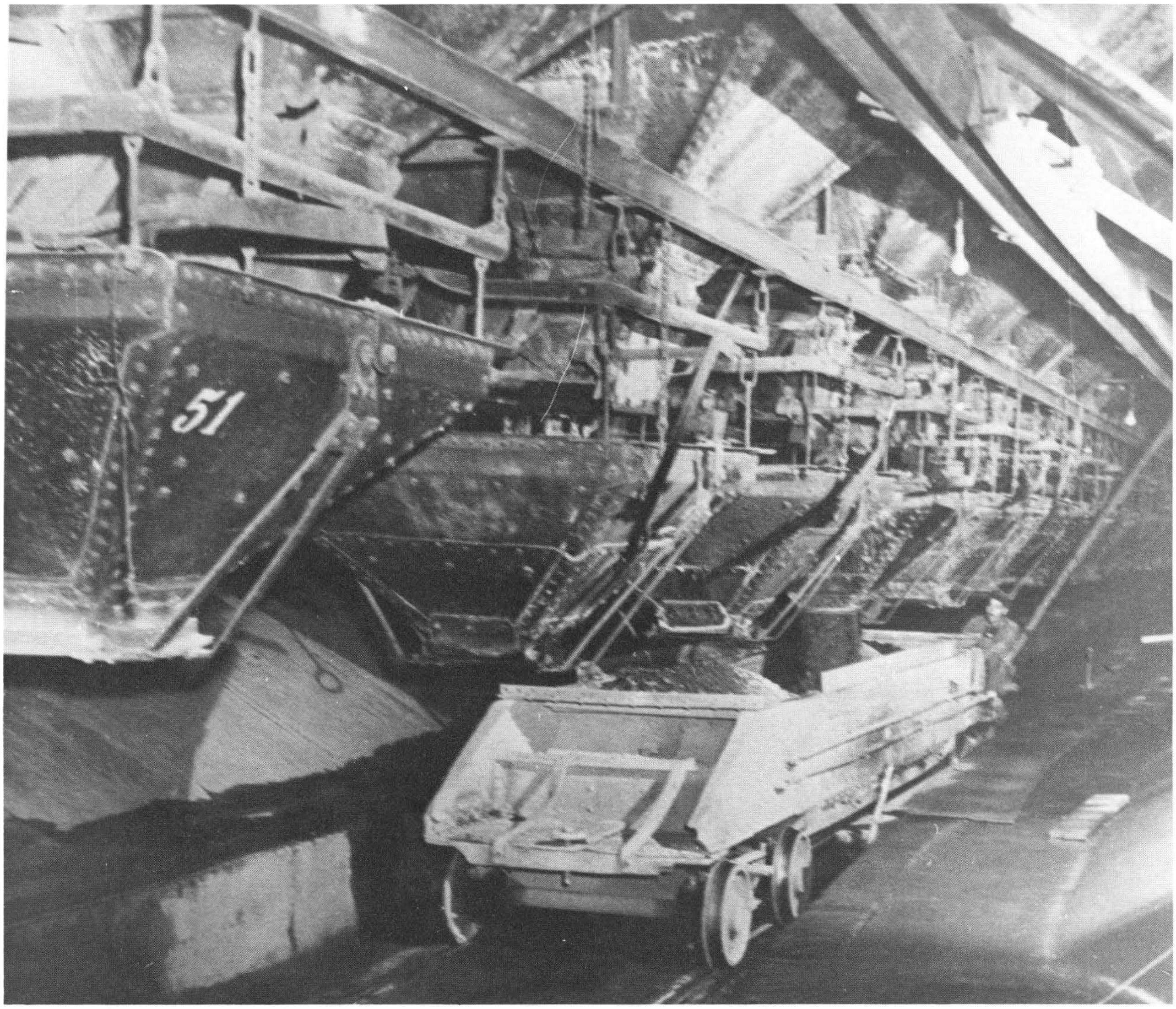
Sinter Plant

Discharge end of D&L Sintering Machine. Most of the sulphur has been burned out and the ore is agglomerated. The sinter is sent to the lead blast furnace.



Feed end of Sintering Machine. The ore mixture is fed to pallets having grates of cast iron.

Reverbatory Furnace. The second stage of copper smelting.



Scale Room — Blast Furnace Charge Floor, sinter, other ores, fluxes and coke are proportioned by weight and hauled to the blast furnace.

CHAPTER 20

MEMORIES OF INTERNATIONAL SMELTING AND REFINING COMPANY

by Claude F. Atkin

I was first hired by Sterling R. Harris, who was personnel director of the Tooele Smelter; or should I say, I rustled at the Smelter in 1939 after I quit working at Bauer, Utah, in the mines.

New hirings at the smelter meant you would be put on or get on for one shift and for any of the hundreds of jobs in as many departments. Usually the job would last for as long as it took the absentee man to sober up or to recover from an injury; and usually these rustling jobs would occur when box cars of brick for the furnaces were to be unloaded, or box cars of lumber, cement, chemicals, machinery, etc. was backed up; or we would have to shovel slag into 10-foot high cast iron slag pots, dig trenches, or excavate for new construction. You could usually find some vacancy in operation jobs on swing shift (4pm–12am) or on the cursed graveyard shift (12–8am). It would not be unusual for a new man or Rustler looking for work to pay 5¢ each way on the Tooele Valley Railroad three shifts a day for weeks, even months, before even getting one or two shifts a week. Rustlers would stand in line outside, or in the long hall of the office building, and wait, desperately hoping that some Foreman or Boss of yesterday would poke him in the ribs, or give him a nod of the head, to get his card and report. Many of us would be told at the end of the shift to come back the next day and perhaps the next day and maybe the next. And if we were lucky, we'd get 2 or 3 days, and maybe a full week's work. Many young men were going to school, and would rustle the graveyard shift every night. Smelter officials would make it a policy to hire men who were trying to get an education, even preferring to hire this type of individual over a man needing a job to support his family. When I worked in the mines in the 30s, whenever we emerged from the tunnels after working all night, we had to pass by long rows of unemployed men who hadn't worked for months and were desperate for a chance to have even a day's work. The same situation existed at the Smelter. There would be long lines of men who wanted work. They'd take your job in a minute, and that meant you'd keep your head down and your backside up, and keep that pick and shovel going.

I finally got a steady job in the converters, or copper plant, working for Marion Staples, handling molten coper bars which weighed 500 pounds; then working for Joe Sodja. It was dangerous work, and added to that, there were choking sulfur fumes. Then I went to the Rope gang working for Bill Shepherd, and the following other places: working in the sample mill; in the Bucking room for Cloyd Dalton; at the Roasters; on the Highline; dumping ore cars on the tramway; working at the Reverb furnace, in the Bag houses; then at the pipe shop under Marshall Frailey helping pipefitters. In fact, I worked in every department of the Smelter at one time or another. In 1940, I worked on the construction of the new zinc plant which came on line just in time to provide soft lead for small arms ammunition for the war effort. Harry Rockwell was Superintendent, with E. W. Steinbach over the lead plant.

I was made Foreman shortly after the initial start up of the Zinc Baghouse and the Deleading Kiln, with Ernest Simmonds and Jack Erickson as co-Foremen on the other shifts. As I recall at this time, the General Superintendent was B. L. Sackett. Next in line was Carlos "Bardy" Bardwell. The Department Superintendents and Assistants were

Mr. Nickols, H. M. "Rocky" Rockwell, E. W. "Steinie" Steinbach, Pat McKenna, T. W. Saylor, George Kostello, and Melvin Belich. These men, together with the General Foremen coming off the graveyard shift, would meet in a room called the Round Table. We, as the Foremen of the operation departments, would stop in this room each day to deliver the reports of the night's progress, or in some cases the loss time or breakdowns, or other crises. It was very seldom that these confrontations were optimistic or affirmative enough to satisfy any of the 'wheels' as we called them.

Early in the mornings in Tooele Valley, there existed a pall or smog overhead, usually above the valley floor, hanging above Pine Canyon down to Lake Point and around the point of the mountain. This was caused by smoke from the Kennecott Smelter drifting southward, and Smelter smoke from the International Smelting and Refining Company plant at Tooele going north. You could work in it all shift long, and sometimes it would drift down around town. The townspeople complained to the Mayor and he to Superintendent Sackett. I'll always remember the many mornings the big wheels would jump on the Foremen who would be coming off shift asking, "What in hell's wrong?" We knew, and so did they, but it allowed all concerned to blow off a little steam. Our plant here in Tooele was always smelting at capacity; and of course, when their furnaces were hot enough to melt calcine ore not molten slag, there just has to be smoke *and stink*. That's why it was called "Old Smoky."

It wasn't only trees, vegetation, or crops, or even horses who died of the effects of smelter smoke. Whoever worked there got a good dose of it. I remember being called to Superintendent Carlos Bardwell's office one day. The sulfur dioxide smoke was so strong in his office we couldn't talk without our handkerchiefs over our noses. The office men we always envied sometimes had to walk outside to breathe fresher air.

While working at the Smelter in the capacity of Foreman, I have talked and listened to many people who were highly educated in many scientific fields especially relating to mining — metallurgy, chemistry, smelting, engineering and geology. I've been impressed by their knowledge in their special fields.

Invariably, all worked hard to get an education, most starting in the underground mines in Wisconsin, or Butte or Arizona. Some of the General Superintendents were: B. L. Sackett, graduate Colorado School of Mines; Carlos "Bardy" Bardwell; E. W. Steinbach, graduate of the University of the Wisconsin School of Mines — he also worked in the mines of Butte, and then came to Tooele and eventually became the General Superintendent of the plant. Some of the other General Superintendents were Pat McKenna George Kostello, and Earl House. Their work was accomplished by conquering the basics of metallurgy and calculus. A slide rule was always in their pocket while blueprints and flow sheets were their bibles. They started out at the bottom and worked to the top.

Most of my General Managers and Plant Superintendents graduated in engineering, and got jobs at the smelter washing beakers in the chemistry lab for years before going out on the Hill as Assistant Superintendents. They ended up as Plant General Superintendents for a few frantic years and had the tremendous responsibility for many hundreds of employees and conditions that existed at the plant — labor relations, strikes, recessions, breakdowns, competition, wars, etc. But that was success long ago, as it still is today.

Being a Foreman or Supervisor at the smelter meant we were not required to belong to the Union. We were not paid by the day but were on a monthly salary. Union men would progressively be granted more money, benefits, better working conditions, etc., until over a period of time, some of our Union men would receive in five days as much and sometimes more than we did in six days. Foremen would always have to ask to be paid more. We had no union, but we were in contact with our immediate Superintendent and would be brought up to standard. Eventually, toward the closing of the smelter, Union demands far exceeded the will of the company to continue which resulted in the decision to close down the plant. Also, at the time, the EPA was getting strong support to clean up the air. So all the negative factors combined the ultimate result is what we see today in the 1980s — the closing down of all phases of mining, milling, smelting, steel mills — all over the civilized world, except in the third world countries.

Thousands of times I've been asked by top management, "Where in hell is all the lead going?" I'd ask, "Why ask me?" The Superintendent said, "Well, we've smelted so many hundred tons of hot slag mixed with 100 tons of cold slag, and we've only shipped seven carloads of lead this week, and 11 carloads of zinc concentrate. Where's all that ore we dumped in the furnace?" And he furthered, "We have a 10% unaccounted loss!" I said, "Well, some if it blew away because it was in the form of dust or fume, some washed away below the Dracco blower, or with rains etc., or drained away below the slag dump." One morning, Mr. Sackett jumped on all the Plant Superintendents, claiming that the unaccounted loss amounted to 6%–8% and even 9% in some months; and so the Superintendents were to find out from the foremen just where all their hundreds of pounds of gold, silver, lead, and zinc could have gone. Could it have been stolen? No way!

This kept up to greater or lesser degree all the opeating years of the plant, even until its closing in 1972. In other words, all the raw ore processed was originally weighed, assayed etc.; and when smelted, it was assayed and weighed again; there was an unaccounted loss each month. All smelted metal recovered from the smelting process was shipped out in the form of ingots weighing from 400 pounds to many tons — and could not have been stolen. As far as I know, no one ever found out where all that mineral wealth went.

After the plant was to be shut down in 1971 and sold for scrap, the company gathered up all the larger piles of dusts, calcine, raw ore, and cleaned out bins, etc. No systematic cleaning up or gathering in or around buildings or clean up piles was undertaken. I guess it was too costly to perform a thorough clean up. In 1971 the plant closed for good; all but a few men were laid off or retired, or received terminal pay. I was one of the last to go. I remained on the payroll as a watchman for approximately two years.

After the final shutdown of the Tooele Plant, and the sudden departure of the labor force with the exception of the Superintendent, a few salaried department heads, and a timekeeper engaged in shutting off water lines, gas lines, and power, there was a feeling that surely someone would grab the chance to buy the Tooele Smelter for a song and start it up again — bigger and more efficient than ever. But, no. The furnaces were cold, water lies were leaking, and doors were swinging in the wind. Work schedules on the change room bulletin board rustled next to Supervisors' instructions. Safety first precautions, lunch tables, benches, lockers, old work clothes (monkeysuits), boots, hard hats, respirators, gloves, even tools, hoses — everything — just dropped, everything just stopped! Only the people were gone.

As I walked around the plant punching the watchman's clock for security and insurance reasons, it was like walking through the old abandoned Indian ruins of civilization long past. I knew that people had worked and lived and hoped here; but the people were gone.

I recall that the only crew working at the plant was on the day shift, under the supervision of Jesse Smart, boss of the construction crew. I had heard rumors of what this apparently secret crew was doing, so one night while making my regular rounds I noticed some barricades around the old Reverbatory Furnace. Lots of picks, shovels, chisels, hacksaws and wheelbarrows were covered by a large tarp. There were no lights anywhere, so I didn't say anything. I noticed the crews coming to work each morning. All appeared to be Mexicans. As far as I know, no one spoke English. I contacted the grapevine and did a little investigating myself. I tried to put the pieces together as well as I could. Usually, the Reverb furnace was never allowed to cool during plant operations. Its floor, walls and arched roof were made of special fire brick. When the whole thing needed to be rebuilt the smelter would be shut down for several weeks. Floor bricks would just burn up or melt away with wear and intense heat.

This furnace was seven feet high, 100 feet long and 15 feet wide and fired by high pressure gas or oil. All ores were roasted or calcined, then dumped into the Reverb furnace which was "trapped" into slag pots and sent to the slag dump. All remaining metals such as copper, gold, silver, cadmium, etc., would melt and sink into the brick as the terrific heat would force it lower and lower.

I suppose this same situation has occurred many times in the past, and was common knowledge concerning the abandonment of all old smelters, especially Reverb furnaces. Apparently, the company was digging up the earth directly under the furnace. It was hot work for the men. But there was gold down there. I had heard stories of how hard it was to dig out the solid gold, silver and platinum. The gold would not break; you could bend it all day. Hacksaws were used to cut the wires of gold, and also large chisels. Chains would be tied around large chunks which refused to budge until the gold could be cut like roots of a tree.

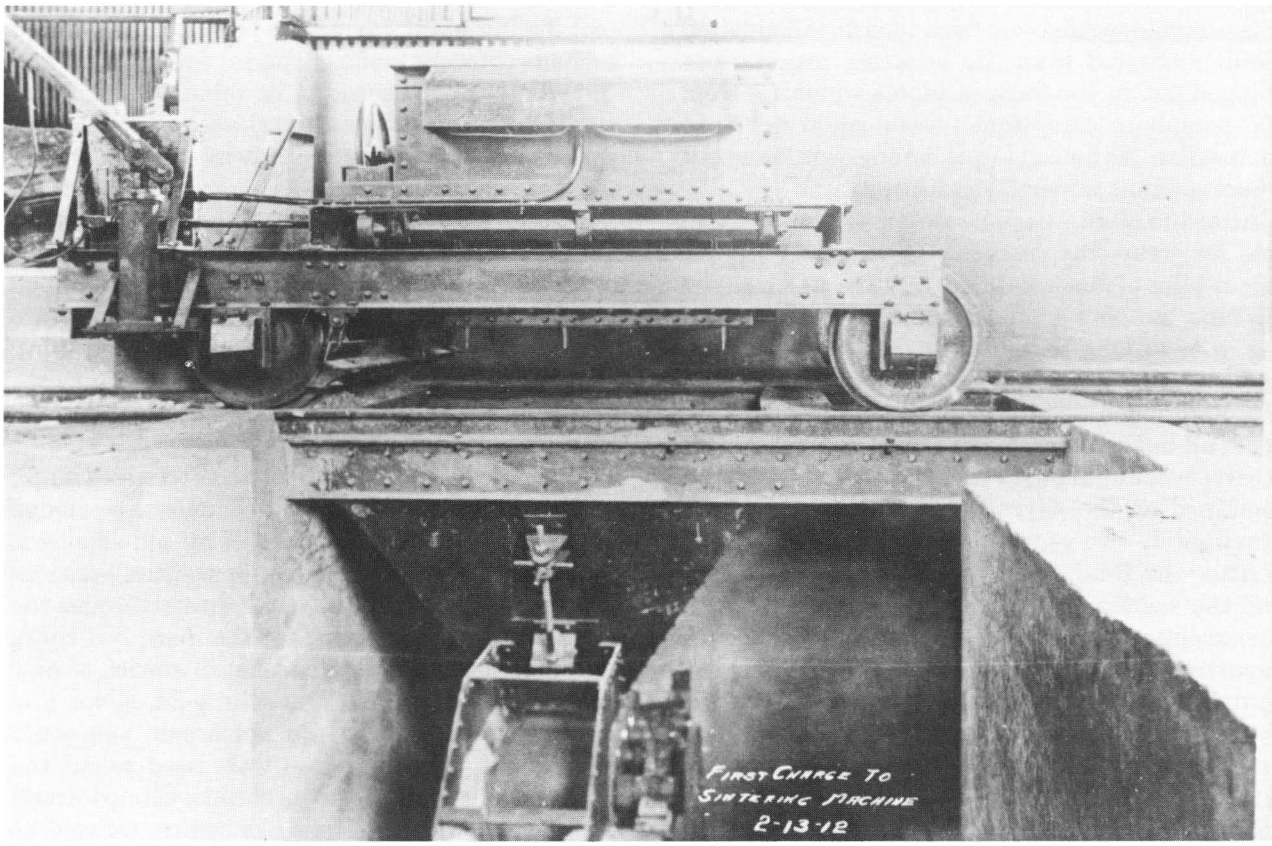
A hole wider than the furnace was entirely mined to about 50 feet in depth, and everything was shipped to the refinery. The hole was later filled in. I don't think the laborers actually knew what they were doing, and the security was tight. They were sent back to Old or New Mexico.

Years later, I talked with people who should know and although no confidences were broken, we figured that a large part of that 10% unaccounted loss the company was crying about for decades has been recovered and accounted for. I even heard the figures were up into several millions of dollars. Where else could it have gone? Of course, the gold belonged to them anyway. There might be some more under those old furnaces even to this day. This is just my opinion, of course.

This I must add. I've been retired since 1972. I talked to many people — the construction of the

Tooele Smelter started in 1908–1909. At its zenith, over 2,000 men held steady jobs. Its payroll was the largest and the industry was the most important in Tooele County. It was forced to close in 1971. For 63 years it served our town, state and nation. And people today who left the Smelter for various reasons, even many who left to go to the Tooele Army Depot, say they will always remember and cherish those good old days while working at that stinkin' smoky Tooele Smelter.

It was a job, of course, but it was fun. We worked hard, but we didn't mind. We were mostly mingling with a good bunch of guys, and they would end up saying, "I liked it there, even if it was dirty." Lasting friendships were made, and many of us miss that old Smoky!



Blast Furnace Tapping Pot.

CHAPTER 21

Letter to Claude F. Atkin, Tooele, Utah from E. W. Steinbach, former Plant Superintendent

Dec. 19, 1984

Dear Hap:

I enjoyed reading of your accounts and remembrances of things in the past. I spent some time remembering things that happened over the many years, particularly at this time of the year. Sixty years ago on Christmas, my first away from home, I missed the train to work, and walked to the Smelter with a foot of snow on the tracks. I had been in Tooele two weeks, and did not know anybody, so it wasn't a very Happy Day. I had no money, so couldn't go back to Butte.

During the early forties, before the Copper Plant shut down, we were receiving some lead matte from the St. Joe (St. Joseph, Mo.) people that contained considerable nickel. This nickel reported into the lead dross and created a high nickel speiss in the Dross Reverb. This material was taken to the Converters, but was poured into the Copper Reverb, I think the No. 3. In order to keep it in solution, it was necessary to use more heat, causing the matte to go into the bottom. When the Copper Plant was shut down, we dug up the bottom to a depth where we could still find stringers of metal, possibly 15 or 20 feet. We later used this hole to place the arsenic from the last arsenic run. Some of this material was later sold to the lawn fertilizer people.

Our metal losses were calculated each month by the Accounting Dept., and an average loss was calculated using 5 years; and this figure was used in the purchase of ores. They dropped the oldest figure and added the latest to get this average. After joining in with the U.S. people, this was very important as was the first of the month estimates of the on-hands. A certified account was given them each month as they received credit for all the metals in their tonnage.

It was a real struggle during the late years to show any profit; one year in the red, and the next we would make a few bucks; but mostly losses. They made a few bucks during the war years , but lost over a million dollars the last year of the Copper Plant on one shift operation, but felt it was a duty they had to keep going.

During the latter years, I had the opportunity to go to New York and found that men like Weed, McGlone, Newlin, Capels, and others, were just as big as their job. They all came up through the ranks.

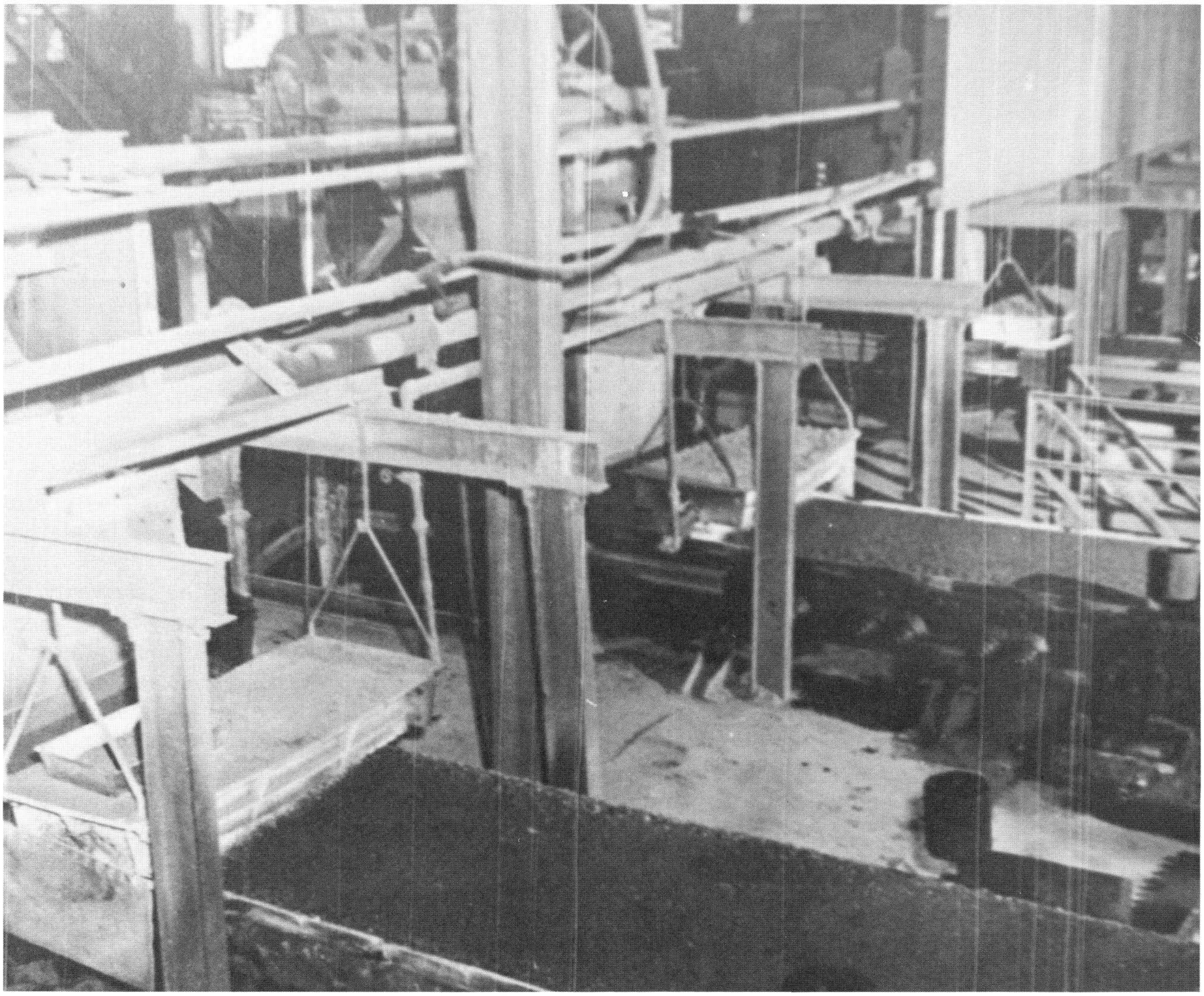
I sat down one evening and listed the names of those I could remember and had worked with, all college graduates, and most got good jobs during their career. I listed the names of 90 that I could remember, and from almost every engineering school in the country — all worked at Tooele.

Hap, I believe I gave you a copy of the history of the Tooele Plant a couple of years ago and told Irene she could type it and correct for grammar and etc. It also contained a list of old timers I could remember.

Hope you can read this. I am rather shaky these days and don't remember as well, but am very lucky. Have a good Holiday.

Regards,
E. W. "Steinie" Steinbach

I had several offers for much better jobs during my 46 years, but like those I worked with and the challenges, even with the dust and smoke.



Charge Ignition and Bedded Pallets. The sulphur in the ore is ignited and burns as pallets move over wind boxes.

CHAPTER 22

HISTORY AND COMMENTS OF LOCAL UNION #55 OF THE INTERNATIONAL UNION OF MINE MILL AND SMELTER WORKERS

On July 1, 1933 a group of men who worked at the International Smelter & Refining Company (Tooele Plant), met at the Eagles Hall, which was located above the Tooele Drug Store at the corner of Main and Vine Street.

Attending this meeting was J. B. Rankin of Salt Lake City. He was the Secretary-Treasurer of the branch of the American Federation of Labor. He addressed the meeting or group on the benefits to come through organization and affiliation with the national group.

More than two hundred and fifty men, employees of the International Smelting & Refining Company and the Bauer Mine, were present at this meeting. Mr. Frank Taylor, an employee at the Smelter acted as the temporary chairman.

When the call for membership came, one hundred and eighty-four men signified their intentions of joining the Union and another meeting was called shortly to form a permanent organization. Thus, Local Union #55 of the International Union of Mine, Mill and Smelter workers was formed. The date that this took place was on August 11, 1933. Mr. Frank Taylor was voted in as the first President of Local Union #55; Glen Gillespie was voted in as Vice-President; and John Adams was voted in as the Financial Secretary. A board of trustees was also formed consisting of Joe Johnson, David Bankhead, and Yanie Tullis. Twenty-Two people were initiated and three-hundred-fifty pledged to the Union, which was composed of employees of the Tooele Smelter and the Bauer Mines.

On May 16, 1934, the Union held their first social meeting in the Eagles Hall, with Frank Taylor, President, presiding.

On May 18, 1934, the Union held a report meeting.

July 6, 1934, David Bankhead was elected as the President of Local Union #55 of the International Union of Mine, Mill & Smelter workers. Jack Schneller was elected Vice-President, John Adams Secretary-Treasurer, and Lee West as a Trustee for a two-year term. In addition, Frank Taylor and Glen Gillespie were named as delegates to attend the National Convention in Salt Lake City.

On September 14, 1934, Glen Gillespie was honored by the Unions of this area, for his outstanding organizing work in the Unions.

The first permanent home of the Local #55 Union was the old Methodist Church, which the Union bought. It was located where part of the Senior Citizens building is now located at 57 East Vine Street in Tooele. They met in this hall, as it was known, until the late 1940's, when Hyrum Jordan was President, and the Union built the present hall, which is now part of the Tooele Senior Citizens, and this building was known as the Tooele Smelterman's Lodge.

On October 13, 1936, the first strike was "pulled-off" at the Tooele Smelter. It lasted only a short period of time. Full operation of the Smelter started in November 17, 1936, after the long semi shut-down during the depression years.

In June 1935, the annual election was held. Glen Gillespie was elected President, Afton Davis as Vice-president, Leo Bird as the Financial

Secretary, and Edward Bonnelli as the recording Secretary. After this term in office, Glen Gillespie went to work for the International Union as an organizer and Afton Davis was elected as the new President.

Afton Davis, Jack Daly, and Louis Vorwaller were in the leadership of the Union. (This was the years during the 2nd World War). In 1947 Hyrum Jordan became President of Local #55.

About this time, the Union or men in the Unions, started to have disagreement about the politics or their political views. Some locals in this area of the country voted to *leave* the International Union of Mine, Mill & Smelter Workers. Before the Unions, when a plant was on strike, the other plants would continue to work. The men who continued to work while a strike was at another plant, would pay into a fund, which was called a strike fund. They would pay one dollar a shift that they worked. This was a very successful weapon to use against the Companies.

When The International Union of Mine Mill & Smelter Workers chose to leave the United Steel Workers of America or AFL-CIO, the "strike" fund was divided up between the local unions who had paid into it. Local #55 of The International Union of Mine Mill & Smelter Workers, received about $14,000.00 for its share of the strike fund.

Local 55's hall, which was originally the Methodist Church, was in real bad shape. So the members, through the leadership of Hyrum Jordan, chose to build a new hall. However, as mentioned prior in this article, the politics between some of the members was still "up-in-the-sky." So it was decided, through the advice of an Attorney, Earl Marshall, that we build a hall and then rent it back to the Local Union #55. The hall would be known as the Tooele Smelterman's Lodge. This was done this way so that the International Union could never take over the hall if the Local Union #55 was abolished.

Hyrum Jordan was President of the Local Union #55 from 1947 to 1957, when Chris M. Weyland was elected to the leadership of Local #55. He served as the President until 1966 when Keith Dymock was elected to the office of President and he held this office until the complete shut-down of the Smelter in January 1972.

The Local Union #55 and the International Unions did a great job for the men at the Tooele Smelter. At one time a coal yard was started by the Local #55 and the men were sold coal at a much cheaper price. Through the leadership of the Local #55, a lot of good was accomplished by this program that was obtained for the members of the Union.

Although there was never a complete Closed-Shop, there were periods when all hourly paid men had to belong to the Union or had to have Union permission to work at the Smelter. There were a couple of times when STRIKES were called because someone refused to join the Union.

There were several strikes and shut-downs during the operation at the Smelter. Two such strikes were quite long in duration. One was six months and the other was nine months long.

The Union did quite well in bargaining the contracts between the Company and the Union, as long as the copper side of the Smelter was running. But after the shut-down of the copper production, The Union was always in a precarious position when negotiating with lead and zinc as the main metal being produced. This being caused, because of the foreign ore that was being shipped into this country.

There were three different International Unions that Local #55 belonged to in its history. The first being The American Federation of Miners; the second The AFL-CIO; and the third The United Steelworkers of America.

The mens names used in this article are mainly the names of the presidency of the Union. At the time, there was always a full slate of officers, but finding all the names and listing them to the rightful position is about impossible.

This article was written from newspaper reports and the memory of different people who were interviewed to write this article. Also, from the memory of the author who wrote the history of the Union and placing all the names in the different positions would be impossible. The reason some names were used as they are, was that a lot of them went on to quite important jobs in the community of Tooele. Such as Postmaster, County Clerk, and a lot became foremen at the Smelter.

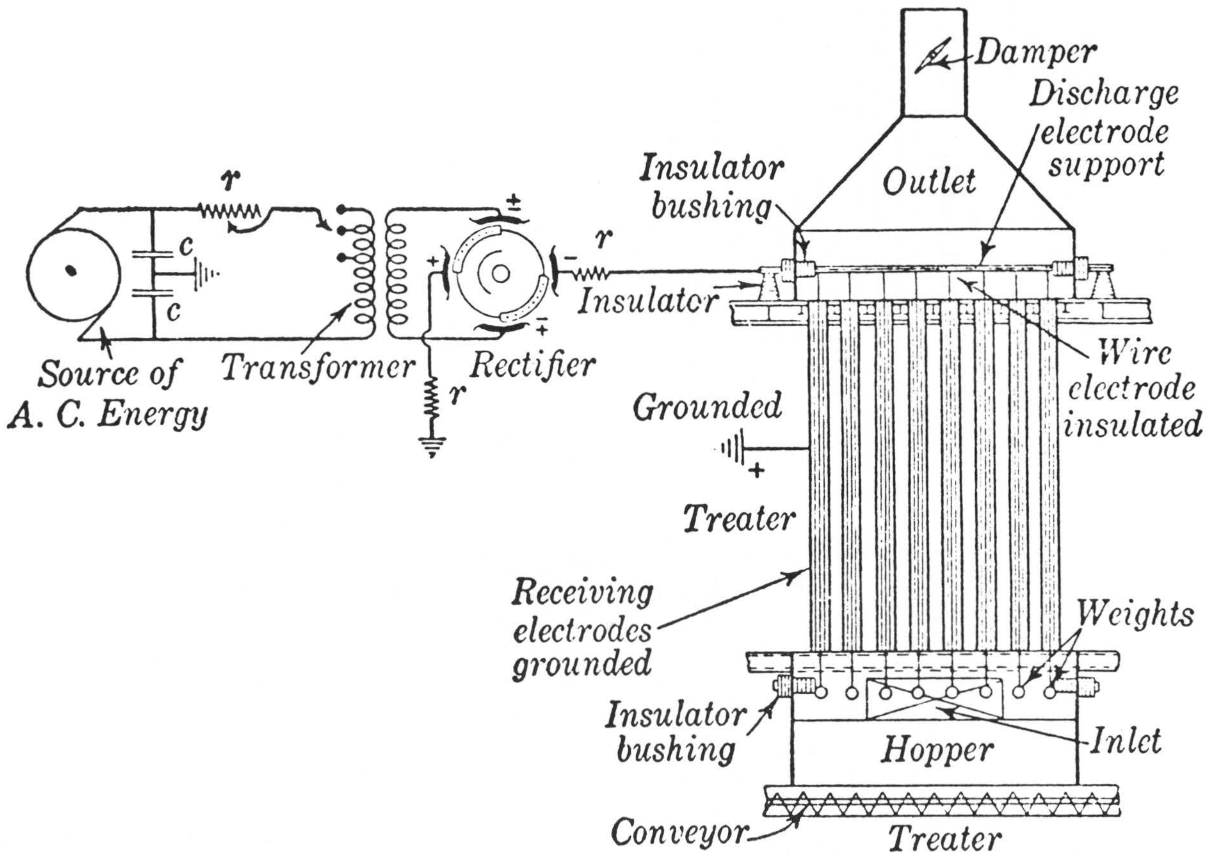
As a whole, I think the men who were President of Local #55 enjoyed the job they did and were very sincere. I know I did and I got to travel a lot and to meet a lot of people from all walks of life.

Some of the accomplishments attained by the Local Union at the Tooele plant were the following: Lunch rooms, toilets instead of troughs, respirators for dust and gases, clothing for working in places where ones clothes were ruined by the work he was doing, and by getting the State Industrial Commission to visit the plant to see the bad conditions that the men were working under. There were many more and as a whole the men who belonged to the Union were quite satisfied. The Union also won a pension plan from the company and although it was not very large, a lot of the men are now enjoying a lot more leisures through their efforts and the Unions, than they would be on just Social Security alone.

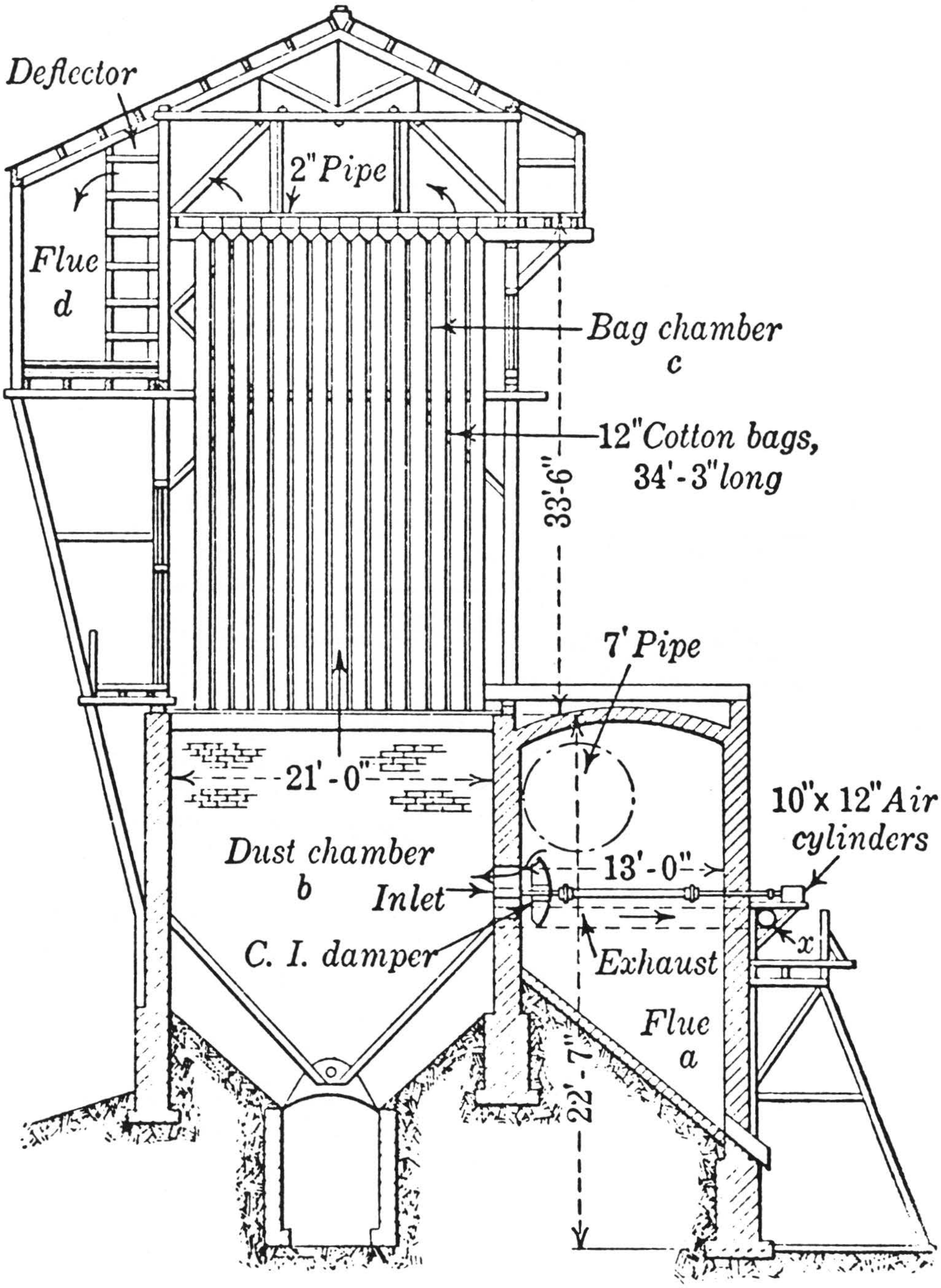
I think from my own knowledge and talking with the men who worked at the Tooele Smelter, that it was a good place to work. The friendliness of the employees, whether they belonged to the Union or not, meant a lot to all of us workers at the Tooele Smelter. As a whole, there were a lot more good employees than there were bad employees.

There wree a lot more social programs the Unions won and others were backed by the Unions. I don't think that there was a more dedicated group of men than there were in the Local #55 Union, when there was help needed by another group or a social program to be won by the public, they were always there when they were needed.

Sincerely,
Chris M. Weyland



Cottrell treater where particulater in furnace gases receive electrical charges which causes these to precipatate.


Deflector
2" Pipe
Flue
d
Bag chamber
c
12" Cotton bags,
34'-3" long
33'-6"
7' Pipe
21'-0"
10"x 12" Air
cylinders
Dust chamber
b
13'-0"
Inlet
C. I. damper
Exhaust
x
Flue
a
22'-7"

CHAPTER 23

THE TOOELE COPPER AND LEAD SMELTER

by T. Allan Comp

Utah, settled during the last half of the nineteenth century, presents the industrial archeologist with an impressive array of sites, each of them conditioned by the Utah environment and the post-industrial technology of the state's pioneers. An area of vast spaces and rapid climatic and topographical changes, Utah demanded of those who would build there an alert response to the total environment. The famous Salt Lake City Tabernacle, a masterful essay in timber construction; the Ogden–Lucin Cutoff Trestle, longest trestle and fill project in the United States; the Garland Beet-sugar Refinery, oldest working beet-sugar refinery in the Mountain West; and the Telluride Power Company's Olmstead Station, built by the Nunn brothers, pioneers in long-distance and high-voltage alternating current transmission were recorded by the Historic American Engineering Record during the summers of 1971 and 1972. Each of these sites provides an example of technological innovation in response to necessity as well as a challenge to the methodology of industrial archeology.

The state was settled by a group that placed community needs above corporate needs or personal gains, and the impressive list of sites named above indicates, to some extent, the nature of that community's needs and interests. Both agriculture and industry played important roles in Utah's early economic development. The original settlers created a self-sufficient and balanced economy but, after 1869, the dimensions of that economy began to change and the reasons for this change are of great interest. It was the completion of the transcontinental railroad in 1869 that brought significant change to the Utah economy. With the railroad providing cheap transportation, large numbers of newcomers began to exploit the state's mineral wealth. Gold, silver and later copper created boom towns in the mountains as well as a string of imposing mansions in Salt Lake City. As the new mining and smelting industry expanded, it often encroached on the earlier agricultural community; and the continued and increasing success of the newer industry posed a serious threat to older agrarian interests.

Smelting practice before 1900 seldom suffered any form of restraint. What went up the stacks or leaked out of furnaces (this included several acids, toxic dust, unburned hydrocarbons, and large quantities of fly ash and other particulate matter) could be, and usually was, forgotten by the mining interests. A group of farmers in the Salt Lake city area brought suit against all of the smelters in their region, claiming that crops were turning brown and livestock were dying because of smelter pollution. The final decision in the long court fight went in favor of the farmers, and by 1908, all but one of the smelters in the region had closed. The only plant that survived, the Murray plant of the American Smelting and Refining Company (ASRCo), did so by withdrawing from the suit and paying farmers a cash consideration to insure the immunity of the smelter.[1]

The Utah Court decision made cleaner smelter practice and prudent self-protection essential to the survival of any smelter constructed or reopened after 1908. Both the methods and the style of smelting practice in the Mountain West

[1]The Engineering and Mining Journal, 11 January 1908, p. 122 (hereafter cited as EMJ).

changed considerably after the 1908 court decision. Any new smelter constructed in the area was forced to consider the needs of the total community.

One example of this new and required combination of social and technological sensitivity was the Tooele Smelter which still functioned in 1971 and still existed in the summer of 1972, when it was recorded by the HAER. Tooele was the second copper smelter and the first lead smelter constructed after the historic Utah court decision, and, eventually, the last custom smelter in the Mountain West.[2] Tooele was actually two smelters in one: both copper and lead plants existed on the same site, and both were completed between 1910 and 1915. Operations continued without major modification until January 1972, when rising maintenance costs forced the old plant to shut down. Shortly after the HAER team completed its survey, most of the buildings were demolished for salvage. As both the "first" and "last," the Tooele Smelter provides an excellent opportunity to document and study an industry responding to a new social environment.

It would be impossible to discuss fully an installation as large and complex as two smelters sharing the same site. Over three million dollars went into construction and almost 100 different departments were included in the initial budget. The plant became famous for its low manpower requirements, yet it still employed 500 or 600 men throughout the year. While the footnote references will guide those interested to more thorough analyses, this paper will concentrate on the ways in which the Tooele Smelter reacted to the court decision, protected itself, and, in the process, created a long-lasting landmark in smelter practice and a challenging topic for industrial archeology.

The closure of all but one of the smelters in the Salt Lake City vicinity brought a sudden reduction in local smelting capacity, a reduction that left many small shippers unable to send their ore or concentrate to more distant smelters because of higher transportation costs. The ASRCo responded to this demand by erecting a new copper plant at Garfield, Utah. One contemporary engineer said the smelter was a major undertaking, constructed "at immense expense, at a locality and under conditions guaranteeing it against claims for damages" by what smelter men called the "smoke farmers."[3] However, this ASRCo smelting monopoly soon tempted others into the field, among them the International Smelting and Refining Company (International), a division of the Anaconda Copper Company and the builders of the Tooele Smelter.

The existence of surplus ore supplies and the high demand for more smelting capacity was only one of several inducements that brought the International to Utah. Two other factors, again related to the 1908 court decision, made the construction of the Tooele Smelter desirable. First, the salvage possibilities at the shutdown smelters presented a source of cheap structural steel, building materials, and smelter equipment; the Tooele Smelter grew out of the graves of these older plants.[4] It is difficult to estimate the total savings in this regard, but Tooele may have saved as much as 85 percent of original cost by purchasing salvaged machinery and materials. The Utah Consolidated Mining Company reported selling $72,000 worth of structural steel and $92,000 worth of machinery to the new Tooele plant, although the net salvage amounted to only 14 percent of original costs.[5]

A second consideration that made construction feasible was acquisition of a near-perfect smelter site discovered during a thorough topographic survey of the region. Located at the mouth of Pine Canyon in the Oquirrh Mountains 4½ miles east of the town of Tooele, Utah, the sloping topography of the site facilitated the gravity flow movement of materials. Equally important, prevailing winds carried smoke and gas up the canyon and away from inhabited areas.[6] One visiting engineer commented on the utility of the site and its prevailing winds, predicting that air currents would send "the smoke from the big stack too high to ever again trouble the horizons of men."[7]

As if to insure this optimistic prediction, the company took three precautions. First, International purchased all the ranches near the smelter and secured long-term options on most of the land within a two-mile radius. Outright purchases totaled over 2,000 acres and the cost of purchases and options exceeded $35,000.[8] As a second precaution, the company sent a team of veterinarians and botanists through the surrounding countryside to make a careful examination of agricultural

[2]A custom smelter accepted ores and concentrates from a variety of shippers, rather than from just a single mine or ore body. Variation in the chemical compositions of different ores required maximum flexibility and attention from the plant and its managers.

[3]EMJ. 11 January 1908, p. 122, Salt Lake Mining Review, 15 November 1912, p. 11 (hereafter cited as SLMR).

[4]EMJ. 9 September 1909, p. 740.

[5]EMJ. 20 April 1910, p. 900.

[6]The Mining World, 19 November 1910, p. 943 (hereafter cited as TMW).

[7]SLMR. 15 November 1910, p. 20.

[8]TMW. 19 November 1910, p. 946; Tooele Smelter Business Office Files.

and livestock conditions before the smelter opened.[9] Finally, as a further precaution against possible damage suits, a weather bureau with self-recording instruments for measuring precipitation, wind velocity and direction, barometric pressure, etc., began operation six months before smelting operations started.[10]

The original estimate by International predicted the copper plant would cost $2.7 million to construct.[11] Knowing that any oversight in design or construction could bring damage suits and complete loss, the company assembled a team of its best engineers to design the plant and supervise construction.[12] C. H. Repath, senior engineer for International, designed the Tooele plant and was present during its construction. A. G. McGregor, the mechanical and electrical engineer for Tooele, worked as an assistant superintendent in power plants and as testing engineer for the Anaconda Copper Company before coming to the Tooele project. After completion of the Tooele Smelter, he formed a partnership with Repath to design smelters in Arizona and elsewhere. E. E. Thum worked as field engineer for Anaconda and was assigned chief civil engineer for the Tooele Smelter in 1908. By 1915, he was Professor of Metallurgy at the University of Cincinnati, and by 1918 the Metallurgical editor of the Chemical and Metallurgical Engineer. J. B. McIntosh worked as a mining engineer until 1900, when he became construction engineer for Anaconda. Tooele was his first assignment as superintendent of construction, but he later went on to perform the same task at three other major smelters in Utah and Arizona.

The first team of engineers involved in the construction of the new plant arrived in December 1908, and immediately began to survey a railroad route from the San Pedro, Los Angeles, and Salt Lake Railroad main line to the smelter site seven miles away.[13] With the completion of this line, named the Tooele Valley Railroad, work on the 200-acre smelter site began.[14] The copper plant was the only installation originally anticipated with plans calling for extensive storage bins, a sampling mill, calcining plant, reverberatory furnaces, converters, a power plant, and numerous smaller departments. These structures required a total of 9,900 tons of structural steel, 6,900 furnished by the American Bridge Company of New York, and 3,000 obtained from the site of the old Highland Boy smelter. The Oscar Daniels Company of Chicago directed construction of the Tooele Smelter, which required 200,000 cubic yards of excavation by steam shovel and mule team and over 26,000 cubic yards of plain and reinforced concrete. It is some measure of the work involved in smelter construction to note that the 350-foot main smokestack alone required over 1,750,000 bricks for its construction.[15] Severe winter weather and steel shortages delayed construction somewhat, but construction crews consisting of 375 to 600 men helped to speed the process.[16]

As a custom smelter, Tooele could accomplish little without efficient ore-transportation facilities, and the plant incorporated a variety of systems to meet the needs of the shippers it wished to attract. The Tooele Valley Railroad, controlled by the International and completed even before other construction began, had a seven-mile main line of standard gauge connecting with the San Pedro, Los Angeles, and Salt Lake railway.[17] This connection made it possible for mines anywhere in the West to ship their ore to Tooele, and by the early 1920s, as many as 85 or 90 ore cars from all over the West could be found unloading in the Tooele Smelter rail yards.[18] Most of the ore for Tooele, however, came from the vast copper deposits in Bingham Canyon on the other side of the Oquirrh Mountains and arrived via two other transport systems. The first was a private aerial tramway built by the Utah Consolidated Mining Company. The Utah Con was a Bingham Canyon mine that previously shipped its 800 tons of ore per day to the Garfield smelter before the 4½ mile aerial tramway brought the mine 20 miles closer to Tooele than it was to the ASARCo smelter in Garfield.[19] To provide a similar shortcut to other Bingham Canyon shippers, the Utah Metals Company drove an 11,000-foot tunnel from the heart of the Bingham district to a point within 2 miles of the Tooele Smelter. This tunnel could be used by any Bingham shipper and gave Tooele a 17-mile advantage over all other smelters.[20] Once ore arrived at the smelter site, 10 miles of electric industrial track

[9]EMJ. 28 May 1910, p. 1129; TMW, 19 November 1910, p. 946; TMW, 19 February 1910, p. 421.
[10]EMJ. 19 February 1910, p. 421.
[11]Tooele Smelter Business Office Files.
[12]John W. Leonard, Who's Who in Engineering (New York: 1925).
[13]EMJ. 5 February 1910, p. 334.
[14]The Tooele Valley Railroad was a wholly owned subsidiary of the International Smelting and Refining Company.
[15]SLMR. 15 August 1910, p. 17.
[16]EMR. 19 February 1910, p. 434; 28 May 1910, p. 1129.
[17]Horace J. Stevens (compiler). The Copper Handbook, Vol. X (Houghton, Michigan; 1911), p. 989.
[18]Oral interview with Eli Steinbeck, 26 June 1971.
[19]EMJ. 19 February 1910, p. 434; TMW, 19 November 1910, p. 946; SLMR, 15 October 1910, pp. 17–18.
[20]TMW. 19 February 1910, p. 421; 18 June 1910, p. 1269; 19 November 1910, p. 946; SLMR, 30 December 1910, pp. 15–17.

equipped with three 7½-ton and two 18-ton locomotives and 50 cars made quick work of moving an ore flow of up to 4,000 tons per day.[21]

Copper smelting at Tooele remained virtually unchanged from its beginning in 1910 to its final shutdown after World War II. The efficiency of the Tooele Smelter depended heavily on its ability to keep tons of ore and intermediate products moving smoothly through the four stages of a continuous smelting process. Because thorough technical analyses of the copper smelter are available elsewhere, the description presented here will be brief and will concentrate on a simplified account of the process and the materials handling problems solved by the Tooele Smelter.[22]

The four major departments at Tooele — sampling, roasting, reverberatory smelting, and converting — can be followed in the copper flow sheet prepared by the HAER survey team. Sampling actually involved both crushing or milling the ore into pieces, ¼ inch or smaller, and removing a representative sample of the ore for assay by the smelter laboratories. The content or value of this ore sample determined the price paid to the shipper. Ore arrived in railroad cars which unloaded directly into the storage bins in the sample mill. Ore coming in over the aerial tramway was dumped automatically into rail cars that were then hauled to the sampler bins. Discharge gates beneath each bin opened onto a conveyor belt that carried ore to the crushers in the sample mill. After crushing and sampling, ore was discharged onto another conveyor belt running to the storage bins in the roasting building. The sampler building occupied ground space of 58 by 84 feet; its five stories framed with steel, covered with corrugated steel sheets and floored with concrete.

Roaster bins were much like the storage bins at the sampler. Filled by one conveyor, the bins discharged onto a series of other conveyors that made it possible to supply any of the MacDougall roasters automatically. Roasting forced out most of the sulphur and water vapor in copper ore by heating the ore until the sulphur ignited and burned away, leaving a new ore-product termed calcine. The MacDougall Roaster consisted of six horizontal levels or hearths. Ore, coal and flux were charged into the top level, spread by circling rabble arms and gradually worked around the hearth to drop down to the next level where the same process repeated. By the time the ore worked down to the bottom level, its temperature was about 600° C. and most of the sulphur and water vapor had been driven off. Tooele installed 32 MacDougalls, each water-cooled, in two steel-frame, iron-sheathed buildings 64 by 162 feet each. Fumes from the roasters ran first through two dust chambers 300 feet long and finally into a 210-foot flue leading to the main smoke stack.

Each MacDougall roaster discharged into bins or hoppers that loaded into calcine dump cars that discharged directly into the reverberatory furnaces (reverbs). The calcine and other ingredients were heated until the once-solid materials became a molten liquid and began to separate into layers (because of differences in specific gravity) of copper and waste or slag. The five reverbs at Tooele, each 19 feet wide and 102 feet long, had a total capacity of over 1,250 tons per day. Because of the high temperatures in the furnaces, each was heavily braced with steel "I" beams. Coal, calcine, and the fluxes were charged into the furnace and an iron silicate slag formed above the "matte" or layer of copper and iron sulfides. Slag, skimmed off the top of the mass, went into slag cars and then to the dump. Matte discharged from the bottom of the furnace into steel launders and troughs leading to the converters. Fumes from the reverbs passed through a 1,200-foot flue to permit dust to settle, and then up the main stack.

Reverb Matte contained only about 20 percent copper. For further purification, matte ran into cylindrical converters 96 by 126 inches where it was heated and blown with air through vents or tuyeres in the bottom of the converter. The resulting slag went back to the reverbs for reprocessing, and blister copper, now better than 98 percent pure copper, was cast ready for shipment to the refinery. The converter building, 117 by 402 feet, housed five converters and fumes again passed through a long dust chamber or flue and then up the main stack.

Total cost of constructing the copper smelter as of October 1, 1910 was $2,413,679. The bill included 39 different budget categories.[23] Utah Governor William Spry ignited the first fire in the reverbs on July 25, 1910 and this "blowing-in" marked the beginning of smelting operations at Tooele.[24] The Utah Society of Engineers paid a formal visit to the smelter in October 1910 and

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[21]SLMR. 30 July 1910, p. 25; Copper Handbook, p. 989.

[22]Unless otherwise noted, material on the copper smelter is drawn from the following; Max Sorensen, "A Description of the Lead and Copper Processes at the Tooele Smelter: A Report by the HAER Utah Survey Student Metallurgist"; TMW. 19 February 1910, pp. 419–421; 19 November 1910, pp. 943–946; SLMR. 15 August 1910, pp. 17–19; EMJ. 26 November 1910, pp. 1059–1060.

[23]Tooele Smelter Business Office Files.

[24]SLMR. 30 July 1910, p. 25.

pronounced the site "a new, modern and perfect plant." "The splendid system of transporting ore from the receiving bins to the sampler and from there to the various distributing bins and roasters resulted in one of the cleanest and best arranged plants" the visiting engineers could imagine.[25] Although the general plan at Tooele followed that of the larger International smelter at Washoe, Idaho, the visitors found the standard equipment most admirably arranged and adapted for the elimination of manual labor, and for low operating costs.[26]

As was often the case in the mining and smelting business, things did not work out as well as anticipated, despite the technical success of the plant. It was anticipated that half of the Tooele copper ore supply would come over the aerial tramway from the Utah Con mine in Bingham Canyon. The year 1910 proved to be the year the Utah Con ran out of good copper ore. The Copper Handbook, main journal-encyclopedia of the smelting industry, reported in 1911 that daily tonnages at Tooele were running as low as 150 tons and seldom as high as 550 tons, well below the full smelter capacity of 4,000 tons per day.[27] The handbook pointed out that Tooele was "most excellently designed and equipped," but also that while "technically a masterpiece, it scarcely can be considered a commercial success as yet."[28]

With 2½ million dollars invested in a safe site, extensive transportation facilities, and a relatively clean smelter, the International Smelting and Refining Company was not about to give up. Smelters were generally expected to last at least five years, and sometimes ten, before ore ran out — one year of less-than-full-capacity operation was too great a loss even for a company as big as International. The answer to the problem was lead — lead from the silver-lead ores uncovered in Bingham Canyon, in Park City, and in Tintic; lead concentrates from mines in Idaho and Nevada. By using the same site and much of the same machinery for a new lead smelter, International could break into a new and profitable custom lead smelting business at the same time that it retained the copper smelter. This decision turned out to be a wise one — copper smelting finally collapsed in 1946, but lead smelting continued profitably until 1971, longer than any other custom smelter in the Mountain West.

Managers in the International company, and at Tooele, could not have known that their decision was historic, their main concern was to make the smelter pay. Construction started on 1 March 1911 and the first lead blast furnace was blown in exactly one year later.[29] Construction of a lead smelter by a company primarily engaged in copper-smelting produced a number of important innovations. Retaining the same goals of efficient materials handling and low manual labor requirements, the company introduced many of their copper-smelting methods to lead smelting. The result: "a newcomer in the lead field (was) the first to adapt modern charging methods to lead metallurgy."[30] Lead smelting also created a number of dangerous and visible pollutants and, with damage suits still a possibility — especially since the hills around the smelter were already turning brown and a few horses had been killed as a result of the sulphuric acid, arsenic and other pollutants released into the atmosphere by copper processing — the company adopted new methods of filtration to cut down on pollutants.[31]

Much like copper ores, lead ores were first milled and sampled, then roasted, melted and separated, and then tapped into ingots for shipment to a refinery. Milling and sampling machinery paralleled that used on copper ore, but the last three steps were quite different. Instead of the multiple-hearth MacDougall furnace used to roast copper ore, the Tooele lead operation took advantage of a very new development in lead ore roasting, the Dwight–Lloyd sintering machine. A development of the decade previous to the construction of the Tooele lead smelter, the sintering process consisted of roasting fine ore, thus burning off most of the sulphur and producing a sinter hard enough to be used easily in a blast furnace where very fine or soft material could choke up the necessary air blast. Sintering was first carried out on a batch method in Huntington and Heberlein sintering pots, which required several hours to complete the process. The Dwight–Lloyd machine changed sintering into a continuous process in which ore, automatically supplied to each machine, was spread on a moving belt, ignited by a gas flame, burned as it passed over a forced draft and then automatically discharged into railroad hopper cars.[32] The ten sintering machines were installed

[25]SLMR. 15 November 1910, pp. 17–21.
[26]Copper Handbook. p. 987; SLMR. 15 November 1910.
[27]Copper Handbook, p. 989.
[28]Copper Handbook, p. 990.

[29]Unless otherwise noted, material on the lead smelter is drawn from the Sorensen report (see fn. 22); SLMR. 15 November 1912, pp. 11–14; 30 November 1912, pp. 9–12; 15 December 1912, pp. 13–15.
[30]SLMR. 30 November 1912, p. 9.
[31]Oral interview with Eli Steinbeck, 26 June 1971.
[32]TMW. 28 May 1910, pp. 1079–1080: EMJ. 2 December 1911, p. 1093.

at Tooele by the Dwight–Lloyd Metallurgical Company of New York.[33] Savings in manual labor and the increased efficiency of the process were great. In fact, the original Tooele machines remained in use until the smelter shut down in 1971, and sintering continues to dominate lead smelting practices today.

The blast furnace was substituted for the copper reverberatory furnace and here the Tooele Smelter broke new ground by applying copper techniques to lead smelting. Charging a lead blast furnace usually required the frantic work of thirty to forty men, at Tooele it took four. Sinter and other materials for the furnace arrived on railroad cars that dumped directly into storage bins located above the charging floor of the furnace. To charge a furnace, one simply opened a gate and the charge dropped through two heavy trap doors and into the furnace.

The blast furnace produced three materials — slag, matte, and bullion. Slag ran continuously from the furnace to 12-ton slag cars and thence to the dump. Matte, a thin layer between the slag and bullion, was tapped off and put through converters. Lead bullion went into small railroad cars and then to the drossing plant, where it flowed into large drossing pots in which it was again heated, while air bubbled through it and the resulting slag skimmed off. Once slag no longer formed in the drossing pot, the lead was poured into pigs ready for shipment via railroad to the International refinery at East Chicago, Illinois.

As mentioned earlier, lead smelting created some rather toxic pollutants, which usually were allowed to escape into the atmosphere. Tooele, unwilling to risk damage suits, took every available precaution. The sintering plant produced large volumes of fine dust high in lead content. To capture this dust, sintering fumes first flowed through a 446-foot baffled horizontal flue 6 feet wide and 10 feet high. Inside this flue, the company hung 32,000 steel wires to accelerate the dust-settling process. After leaving the flue, the sinter went to a Cottrell treater, one of the first innovations responding to the antipollution court decisions and one of the first electrostatic precipitators.[34] The Cottrell consisted of a number of long metal tubes about seven inches in diameter with a number 10 insulated copper wire suspended in the center of each tube. Gases from the flue flowed through the tubes and when the wire received a unidirectional electrical charge of between 25,000 and 60,000 volts, the current passed from the wire to the tube, negatively charging the dust particles in the gas and causing them to cling to the sides of the tube. To clean the Cottrell precipitator, one simply turned the electricity off, hit the tube, and the collected dust fell to the hoppers below. This dust returned to the blast furnace for reprocessing.

The lead blast furnace employed a different filtration method. After flowing through a 600-foot horizontal flue eight feet by twelve feet and again filled with thousands of wires to slow air movement and accelerate dust settlement, the blast furnace gasses went to what was appropriately named a baghouse. This house, 100 feet long and 54 feet wide, contained 1,440 tubular cotton bags. A fan forced the blast furnace fumes through these bags and then up a 200-foot stack to the atmosphere. To clean the bags, Tooele developed a remote method of simply reversing the air flow several times in succession, thus expanding and collapsing the bags and causing the trapped dust to fall into hoppers below. This dust also went back to the blast furnace for reprocessing.[35]

Power requirements for such a diverse operation as the Tooele Smelter called for a major power plant installation.[36] Housed in a handsome brick structure 240 feet long and 52 feet wide, the plant provided AC and DC electrical power and air compressed at 2½, 15, and 90 pounds per square inch. Two vertical, triple-expansion, Union Iron Works marine engines dominated the center of the building and powered alternating current generators for lighting and electric motors throughout the smelter. Two Nordberg–Corliss steam engines and a Curtis turbine supplied power for the direct current generators used to power the electric railway haulage system and the motors in the numerous overhead cranes. Air compressed to 2½ psi for the lead blast furnace came from two Roots blowers, powered by Corliss engines from the Allis–Chalmers Reliance works. Two large steam engines, one a 350 hp Nordberg, the other a 600 hp Rarig, supplied 15 pound air to the copper and lead converters. To supply air at 90 psi to the sampling mill, blacksmith shop, and for pneumatic tools, the smelter installed a large Westinghouse electric motor and a Laidlaw–Dunn–Gordon steam engine. The power house, which additionally contained a wide variety of smaller pumps, exciters, motors, and its own shop, remained largely un-

[33]Taken from the patent plates on the Tooele Smelter sintering machines.

[34]Oral interview with Eli Steinbeck, 26 June 1971.

[35]Copper Handbook, p. 989; John L. Bray, The Principles of Metallurgy (Boston; 1929), pp. 70–71, 176–177, 227.

[36]A detailed description of the power house was prepared for the HAER report and may be obtained from the HAER.

modified throughout its 60-year history. The old marine engines were torn out in 1924 and one of the Reliance compressor units blew up in 1970, but the power house, like the rest of the Tooele Smelter, achieved longevity that proved its sound engineering.

A decade after its completion, the Tooele Smelter contributed about $20 million annually to the Utah economy and furnished direct employment to approximately 2,000 men. The company paid one-sixth of the taxes in Tooele county, supported five-eights of the county population, and purchased $15 million worth of ore annually, mostly from local mines. The plant annually treated 750,000 tons of ore and produced 72,000 tons of lead, 10,000 tons of copper and numerous byproducts, including 9,000,000 ounces of silver.[37]

From 1915 to 1972, the Tooele Smelter had little reason to alter its basic operations. The copper smelter closed in 1946. The lead plant added a few new operations during its history: a pioneering flotation mill to treat lead-zinc sulphide ores in 1924, and a slag treatment plant to recover zinc and lead in 1941. But the basic metallurgical processes and the machinery required to carry them out remained essentially unchanged for sixty years. Eli Steinbeck, retired superintendent with 45 years of service at the Tooele Smelter, called the flexibility demanded by a custom smelter like Tooele "an education for a young metallurgist." He also noted that in its last years, Tooele had become a shoestring operation in which rising maintenance costs at the old plant demanded the best in entrepreneurship and low-cost ingenuity from its operators. Finally, after more than sixty years of continuous operation, maintenance costs exceeded $20,000 per month and the company decided to close the plant.[38]

As an early reaction to anti-pollution court decisions, the Tooele plant demonstrates certain technological and management responses in this area and several significant improvements in smelter practice resulted from the threat posed by damage suits from nearby residents. None of the filtration devices was specifically required by law. Their development and installation sprang from a company decision to protect itself from suspicious or even hostile neighbors, neighbors that included the state supreme court. The Cottrell treater, improved baghouse filtration, better dust settlement in the flues, and cleaner, safer, mechanized materials handling all received favorable comment in the contemporary engineering press. At the same time, the smelter went to great lengths to make sure local farmers either would not, or could not, sue for damages. Weather stations, agricultural surveys, land options and outright purchase helped to protect the plant from the smoke farmers.

By and large, the effort worked. It is true that the foliage covering the canyon hills soon disappeared, but no one lived there anyway. A few horses died of lead when mistakenly pastured too near the smelter, but cattle did quite well on the same pasture. The smelter itself compiled an impressive safety record; and local support, even after the plant shut down, remained quite strong. The company policy of better engineering and thorough self-protection proved to be the successful answer to the anti-pollution sentiments of the Utah farmers and their friends on the bench.

Tooele was an important representative of a now-vanishing type of industrial plant, and as such, it deserves the thorough attention of industrial archeologists and others.* The HAER team included four architectural students, a student metallurgist, two student engineers, and one historian. They were fortunate in having access to the drawing files and business records of the smelter, and the drawings prepared by the team represent a compilation of those drawings, just as this paper is a compilation from scores of historical sources. The two process flow drawings depict a method long-abandoned, and it required the close cooperation of the historian and metallurgist to prepare accurately even these simple diagrams.

It is impossible to point to a single "landmark" innovation at Tooele. It was, instead, the innovative combination of engineering and entrepreneurship that made Tooele the longest lasting of its kind. With Tooele gone, over thirty mines and other lead recovery operations had to find another market, but few could afford the extra cost of shipping to El Paso, Texas, East Helena, Montana, or Kellogg, Idaho, so they had to cease operation.[39] It is ironic to note that the Tooele Smelter, which grew from the salvaged steel and machinery of earlier smelters, was itself demolished for salvage after it shut down. Tooele had its origins in a new set of rules and a more considerate operating style that remained acceptable standards until the re-

[37]SLMR. 15 May 1928, pp. 9–10.

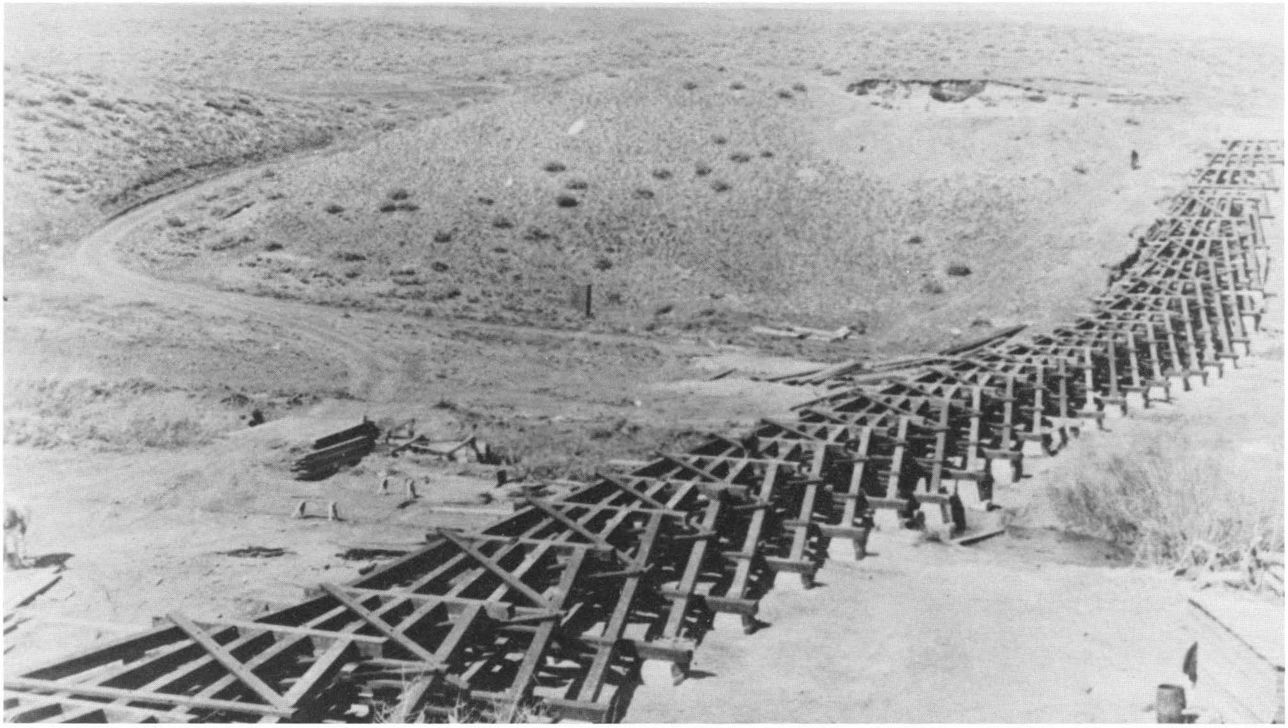
[38]Oral interview with Eli Steinbeck, 26 June 1971; SLMR, 15 May 1928, p. 9.

*T. Allan Comp served as the historian on the Utah Survey. He is now the Historian for the Historic American Engineering Record, National Park Service, Washington, D.C. He wishes to thank the staff at the Tooele Smelter and Selma Thomas for their assistance.

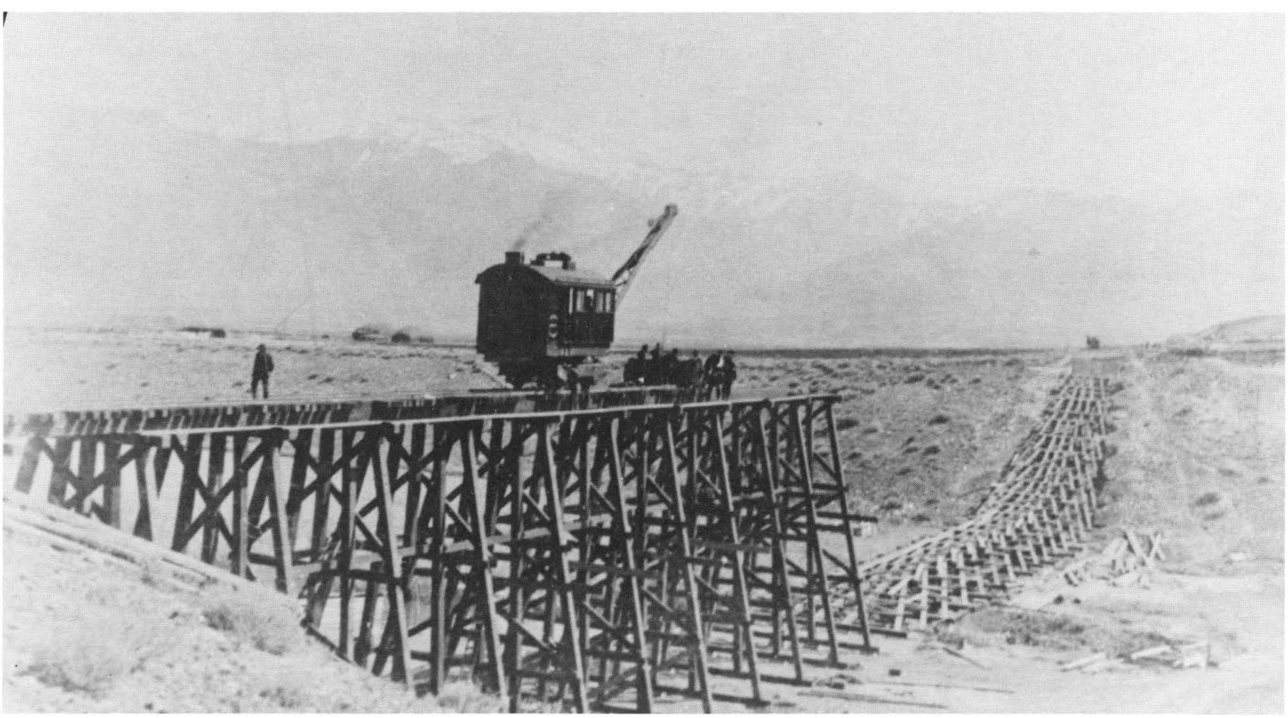
[39]Deseret News, 6 November 1971; 13 November 1971.

newed environmental concerns of the 1970s. Lasting far longer than originally anticipated, the construction and demolition dates of the Tooele Smelter mark the beginning and the end of an era in the history of custom smelting in the Mountain West.

PART III RAILROADING IN TOOELE COUNTY



Trestle supports laid out for erection at Middle Canyon.



Locomotive crane raising supports for Middle Canyon trestle 1909.

CHAPTER 24

HISTORY OF THE TOOELE VALLEY RAILWAY

by Larry Arthur Deppe

The Tooele Valley Railway Company was incorporated November 18, 1908, as a separate corporate entity. However, this statement is somewhat deceiving since one hundred percent of the common stock issued was held by the parent company, Anaconda Copper Company. The company was organized to build and operate a railway which would connect the Union Pacific and Western Pacific lines at Warner, Utah (west of Tooele City) to the International Smelting and Refining Company (another subsidiary of Anaconda) smelter located at International, Utah, a distance of approximately seven miles.

The railway took a fairly direct easterly route to International from the connection at Warner. Indeed the directness of the route was characterized by the fact that the line passed right through what was in 1908 the center of Tooele City. The route brought the line up the center of Vine Street to First Street where the line curved slightly to the north so that it paralleled Vine Street from First Street to the mouth of Middle Canyon.

Aside from the fact that Vine Street as a city street essentially ended at the mouth of Middle Canyon (although the road continued on to the top of the canyon) there was another distinctive feature of the line at the mouth of the canyon: the wooden trestle spanning a large gulley at the canyon mouth.

The Middle Canyon trestle was constructed in a most interesting manner. The supporting uprights of the span were assembled and transported to the site of the bridge. Here they were laid on their sides in the correct order in which they would serve in supporting the track. Once this was accomplished, the construction of the trestle was begun by bringing a steam-powered locomotive crane to the edge of the gulley. The crane raised the first uprights from the floor of the gulley. The top structure of the bridge was assembled, the track laid, and then the crane crept out onto the newly-constructed span far enough to reach the next upright lying on the gulley floor. This process continued until the entire bridge was finished.

The trestle beams remained the sole support of the railroad track until around 1939 or 1940. The Elton Tunnel opened in 1937 and overburden from the tunnel was used to fill in the trestle as the years had taken their toll on the wooden structure. As early as 1926, time tables issued to railroad employees stipulated that train speed was not to exceed eight miles per hour when crossing the Middle Canyon Trestle. One might conclude from these instructions that the structure was starting to fail in the mid-1920s. Once the structure was filled in, the speed limit was increased to fifteen miles per hour. Some speed restriction was still necessary due to the height of the track over the floor of the gulley.

Beyond the trestle the line curved somewhat in a southeasterly direction and then curved back northward where it climbed along the foot of the Oquirrh Mountains to the smelter. This curvature was known as the "Big Curve" and the sharp radius of the turn not only caused the steel wheels of cars and locomotives to squeal loudly but also limited the size of locomotive that could traverse the line beyond the trestle.

The line's eastern terminus was the smelter plant itself. Trackage here consisted (beginning at the south, which was the highest level as the plant site was located on a bench and proceeded up the side of the mountain) of a seven-track holding and classification yard (including a scalehouse track for weighing both in-bound and out-bound tonnage), a six-track holding yard at the west end of the so-called "high-line" over the ore bins, a single-track leading into the smelter yard at the level of the sintering plant, and the approach to the enginehouse at the lowest level near the highway to the plant. The enginehouse was a three-stall structure with two stalls used for storage of and light repair work on locomotives and one stall used for light car repair. Major repairs were effected in the boiler shop, part of which was the first enginehouse used for a brief period just after the smelter was constructed. This first enginehouse became part of the boiler shop and was used primarily for major repairs of the locomotives rather than storage after the construction of the three-stall structure mentioned above.

The trackage around the enginehouse consisted of two tracks used to store and repair hopper cars used in intra-plant movements of ore and sinter, a wye for turning locomotives and cars, and two tracks which went beyond the enginehouse to a point near the end of the machine shop building. The track nearest the building first passed the coal dock near the enginehouse and it was here that coal was stored, and subsequently loaded into large buckets, which would then be hoisted by an electrically-powered crane to the coal bunker of the locomotive tenders. This track was also used to spot cars near the unloading doors at the side of the machine shop for the delivery of parts and machinery used in the operation and maintenance of the smelter.

Due to the limited length of the railway, there were only two stations and a small ticket office. The station at 35 North Broadway is described in an appendix to this paper. This station was the management headquarters and business office of the line. A small building located on Vine Street just west of Main (and which is now the Green Top Cab office) served as a ticket office and waiting room for passengers boarding the train from the central and southern parts of the city. Warner Station (originally called Tooele Station with the name being changed to Warner upon construction of the depot on Broadway) was the San Pedro, Los Angeles and Salt Lake (later Union Pacific) depot serving Tooele City.

These stations were extremely busy places from the railroad's beginning in 1909, to the end of the passenger service in 1946. A timetable (Timetable No. 12) effective November 14, 1926, graphically illustrates this point.

Train No. 2, consisting solely of passenger coaches would leave the small station at Main Street in Tooele at 7:30 a.m. to take a day shift to the smelter. The train stopped at the depot on Broadway at 7:33 a.m. to pick up smeltermen from the east side of town and then proceeded to International where it arrived at 7:45 a.m. The train would then wait until the graveyard shift was over and would leave International at 8:10 a.m. to return to the Tooele depot at Broadway. Workers from the smelter would disembark here and passengers wishing to proceed to Warner to catch the morning S.P.L.A. & S.L. train to Salt Lake City would come aboard. The train then proceeded to Main Street where the same routine would be repeated. The train left the station at Main Street and travelled the line to Warner where it would arrive at 8:35 a.m. Passengers for Salt Lake City (or other points) would then take refuge in Warner depot until the arrival of the S.P.L.A. & S.L. train.

Having deposited its passengers, the crew would then go to work assembling the loaded cars of ore, concentrate, and merchandise. The freight cars would be coupled behind the passenger coaches and this mixed train would depart Warner at 8:50 a.m. and head east to the smelter where it arrived at 9:35. The train stopped at Main Street and at the depot on Broadway to unload any merchandise or to spot cars on the team track at the Broadway station.

The train would arrive at the smelter where the passenger coaches would be spotted near the machine shop and the engine and freight cars would then head to the seven-track yard where the train would be broken up by one of the two locomotives involved solely in switching the smelter tracks. The road engine would then pick up one of the cabooses and head back down to Warner for another group of loaded hopper cars. Any finished products from the smelter would also be taken westward at this time.

The road engine would be involved with the trips back and forth from International to Warner until the departure time of the afternoon mixed train. This train left International at 2:45 with loads of finished product from the smelter, empty hopper cars, and the passenger coaches (probably three in number). This train made the usual stops in Tooele and arrived at Warner at 2:50 p.m. in time to meet the afternoon S.P. L.A. & S.L. train from Salt Lake City. The train headed east at 3:00 p.m. (passenger coaches only, not mixed) and arrived at Main Street stop where it unloaded the passengers who boarded at Warner as well as any merchandise. The train would then wait at Main Street until its scheduled departure at 3:30 p.m. which served the afternoon shift to the smelter.

After stopping at the Broadway station, the train then would head up the grade to the smelter where it arrived at 3:45 p.m.

The train waited at the smelter until 4:15 when it left to carry the dayshift workers from the smelter to Tooele. This train would go only to the Main Street stop, return to the smelter arriving there at 4:47 p.m. and would leave the smelter at 4:50 with the shop and maintenance employees who worked the 8:00 a.m. to 4:30 p.m. shift.

The road engine then concentrated on freight service until 11:30 p.m. when the passenger train left Main Street to take the graveyard shift to work and then returned to Tooele (leaving International at 12:15 a.m.) with the afternoon shift workers.

This basic pattern prevailed right up to the end of passenger service in 1946 with one notable exception. The train service to Warner ceased in the early forties due to the advent of the automobile and the passenger trains assumed the sole purpose of transporting the smeltermen to and from work. In time, the automobile also brought an end to the so-called shift trains resulting in abandonment of all passenger service in 1946.

With the end of passenger service, the road's efforts were devoted totally to the movement of freight to and from the smelter with a smattering of general merchandise business consisting of bulk oil, newsprint, and occasionally automobiles. The train ran throughout the day and night and served as the lifeline of the smelter.

The road owned during the 1920s six locomotives but available evidence indicates that only four of these were operational for more than half the decade of the twenties. Number 2, a 2-6-0, was built in 1896, by Brooks and retired on February 6, 1923. It remained on the property until its sale in May of 1929. Number 3, an 0-6-0, was built in 1892, by Brooks and was retired November 15, 1925, and was also sold in May of 1929, along with Number 2. From the description given previously of the hectic pace of operations, it is obvious that these smaller and older engines could not deliver the horsepower nor withstand the demands of such a grueling schedule.

The T.V. depended primarily on four 2-8-0 locomotives from its beginnings to the end of steam operations in 1955. Each of these engines (as well as the line's two diesels) is described in detail in a separate appendix to this paper. The acquisition in 1955 of the first diesel electric locomotive brought an end to steam on the line as well as an end to night operations since the new diesel's power and speed (no longer was it necessary to stop for water or to wait for the slow moving power reverse to change the valve gear every time a change in direction was required) allowed it to effectively replace two steam locomotives. In all fairness to the steam engines, however, it must be noted that the copper plant ceased operations in 1945 thus freeing the diesel from the added burdens of servicing this operation. Indeed, the cessation of the passenger operations and the closing of the copper plant contributed to the early demise of locomotive Number 9 in December 1950.

Instead of running twenty-four hours a day, the railway began a pattern that was to last until the closing of the smelter in 1972. The diesel and its crew met a call at 8:00 or 8:30 a.m. and began assembling the train of empty hoppers and loaded box cars from the high line and the lower yard. Cars of sinters from the sintering plant would be pulled from the yard and pushed up to the high line bins to be emptied. Having assembled its train, the engine would then head west to Warner at approximately 10:00 or 10:30. Here it would exchange its consist for loaded hoppers of concentrate and would head east. These loads would be spotted in the holding yard of the high line where samples of the concentrate would be taken prior to the unloading of the cars. The engine and crew would have lunch, complete some additional switching and then head west to Warner generally with just the engine and caboose. Additional loaded cars (up to the engine's 1200-ton limit) would be assembled from deliveries by the Union Pacific and Western Pacific and the train would head east again.

Upon arriving at the smelter, the same routine again prevailed. The loads were spotted at the high line holding yard. Loads of coal for the smelter furnaces would be pushed up the coke trestle for emptying. Any box cars or gondolas used to ship finished product from the smelter would then be pulled back down to the lower yard near the enginehouse at the end of the day where the motors (small electric locomotives used within the confines of the smelter plant due to tight curves and limited clearances) would pick up these cars and pull them to the crossing plant area for loading. The caboose would be spotted on the track by the coal dock and the engine would be retired to the enginehouse and shut down until the following morning.

Throughout its life, the T.V. rarely pulled cars up the grade. The grade of 2.4% was relatively steep but the fact that the right-of-way went right through the middle of downtown Tooele was the major issue. The route through town made railroad officials nervous that loaded hopper cars might break loose and careen wildly through town not stopping until reaching the Union Pacific tracks (and perhaps blocking said tracks) at Warner. Hence, the engine was always placed at the end of the train, pushing the cars up the grade with the caboose (suitably equipped with air horn and headlight) leading the procession. The system worked extraordinarily well. The road had very few accidents or wrecks. Indeed, the only major wreck on the line occurred on January 24, 1933. (See description in appendix.)

There were two accidents that resulted in loss of life to citizens of Tooele not connected with the railroad. One of these occurred during the 1940s when a young man fell under the wheels of the train and was killed. The other occurred at the Seventh Street crossing in the mid-sixties when a woman drove her car carrying her and her children onto the track into the path of the train. The coupler of the caboose apparently struck one of the children in the car killing the child.

Aside from these incidents and except for the regular minor derailments which occurred around the smelter, the road had an admirable safety record. This was due in large part to the diligence of the train crew in maintaining a constant vigil for any cars or pedestrians on the track running through town and to the maintenance of the locomotive by the company to keep it and its braking equipment in excellent operating condition.

The primary reason for the Tooele Valley's existence was the smelter. The T.V. was the lifeline of the smelter. Without the railroad, the smelter would cease to operate. Unfortunately, the reverse of the preceding statement also proved to ultimately be true.

The expropriation of Anaconda's Chilean properties by the dictator of Chile, Salvador Allende, in 1971, dealt a massive blow to the company (a blow from which Anaconda never recovered and which, in fact, resulted in its being acquired in 1975 by Atlantic Richfield). Marginally profitable and unprofitable operations were closed in order to save the company. The Tooele smelter fell into the latter category of the unprofitable.

During the period 1972 through 1975, the Tooele Valley hauled carload after carload of scrap iron that once was the smelter as the plant was dismantled. Townspeople speculated on the fate of the railroad, with those deeming themselves more progressive (and the railroad as being an anachronism) desiring the quick demise of the train once the smelter site was cleared.

In the meantime Anaconda was desperately struggling to replace its lost copper productive capacity in Chile by developing promising new properties in the United States. The Carr Fork project east of the old smelter site was one of these properties and the railroad was also kept occupied during and after the dismantling of the smelter transporting machinery and construction materials to the new project. There was some speculation that the Tooele Valley would eventually be used to transport concentrates produced by the Carr Fork mine and concentrator to the Union Pacific for shipment to Montana for smelting. This, however, was not to be.

Studies of the economies of the situation did not favor the use of the railroad and the decision was made to seek abandonment of the line in 1981. Application was made to the Interstate Commerce Commission and, since there was no viable reason for the line's continued existence, approval was granted.

The railroad that had been a part of the city was to be no more. The tracks that provided boundaries for everything from the school a child would attend to which church he or she would go to on Sunday were to be removed.

Several citizens of Tooele requested that Atlantic Richfield leave something of the railroad as a reminder of its existence. Through the efforts of Don H. Lee, Superintendent of the Railroad during its final years, and Robert Murray, Vice-President, ARCO Transportation, the railroad depot at 35 Broadway, the last steam locomotive (No. 11), the last two cabooses, and the road's snowplow, were deeded to the city during a ceremony held July 1983. Citizens of Tooele, Mr. Murray, Mr. Lee, and employees of the Tooele Army Depot donated their time and efforts to the moving of locomotive No. 11 from the City Park to the depot grounds.

The end of the railroad itself came rather unceremoniously on August 26, 1982. No. 104, the last locomotive held by the line, left the enginehouse that day and trailing the lone remaining caboose (No. 04) headed west for the last time. Upon arriving at the depot on Broadway, the engine set the caboose on a siding, a portion of which would remain as part of the museum, and then finished the trip to Warner where the locomotive was picked up by the Union Pacific and transported to Salt Lake City pending its sale. The engine was sold in March of 1983 and shipped to its new owner in Minnesota.

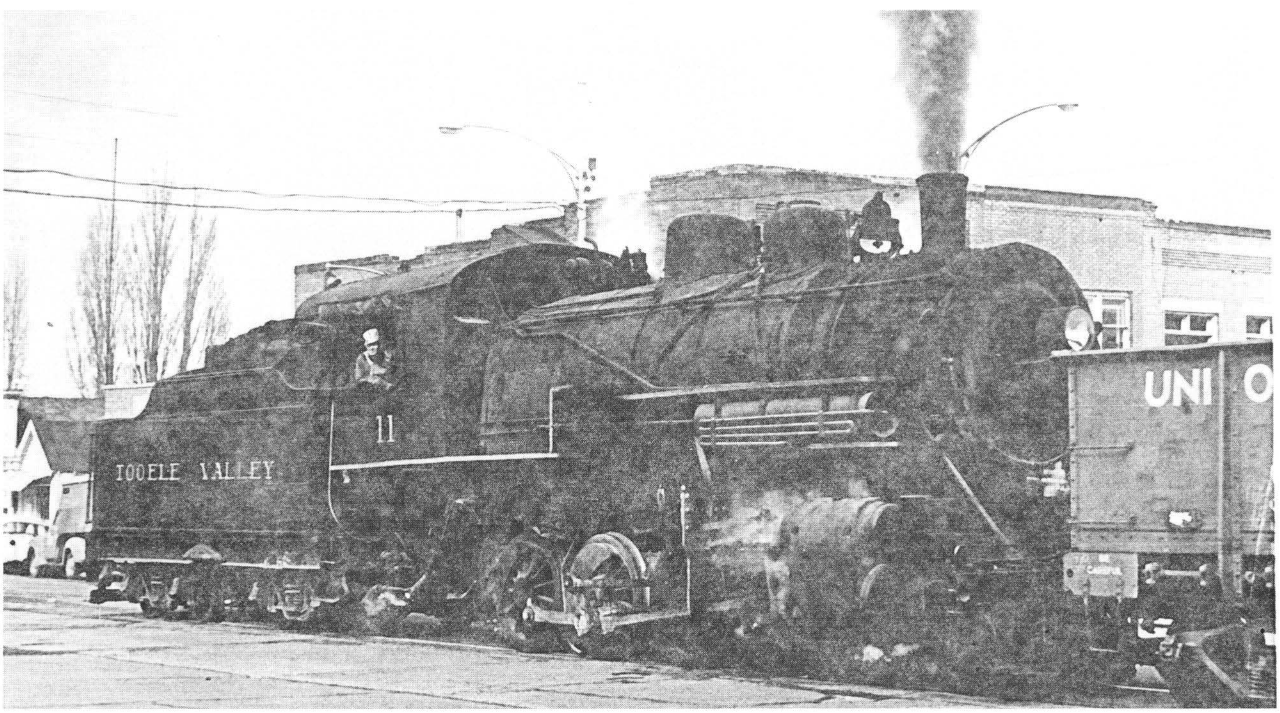
Over the next three months, the track was systematically removed. Vine Street was repaved. The engine house was dismantled.

The railroad was very much like the people it served. Few, if any, will ever see their names in print as great historical figures. Few amassed great fortunes. All will be remembered in the hearts of those who loved them and who recognized their contribution to the building of a town. So it is with the Tooele Valley Railway.

These men served as superintendent of the Tooele Valley Railroad.

1. C. E. Burke
2. W. H. Raymond
3. E. G. Smith
4. J. E. Tate
5. J. E. Park
6. Kenneth O. Rhea
7. Don H. Lee

Tooele Valley Railroad Depot and operations office. As of 1983 a museum and registered as a historical site.



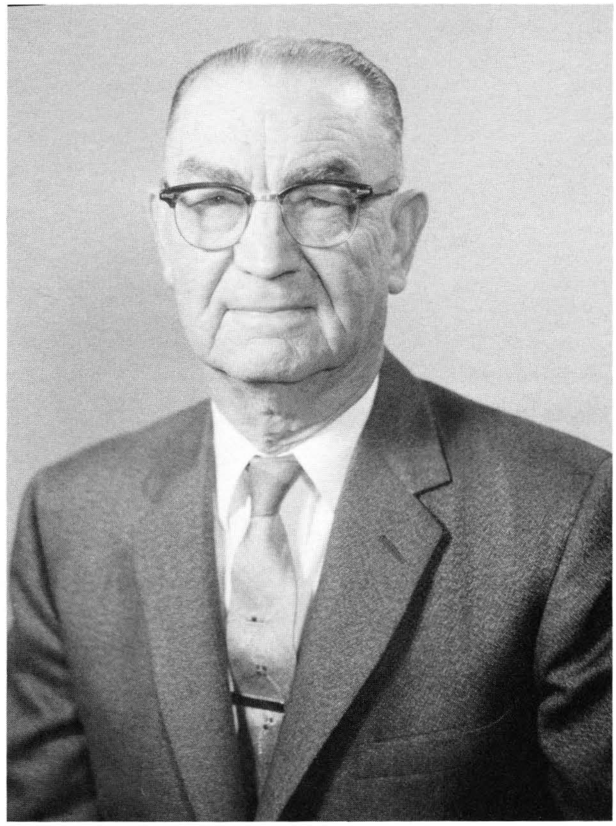
Tooele Valley Railroad Train at Main and Vine, Roy Snyder Engineer.

Addendum to Chapter 24

Joseph Earl Tate retired from the Tooele Valley Railroad in 1947 and as of 1986 he is still alive at 96. He was born 7 January 1890 in Tooele City, Utah of Matilda Nelson and Joseph Seetree Tate. His grandparents on both sides came to the United States on a sailing vessel and walked across the plains and settled in Tooele. After graduating from the 8th grade in Tooele he attended the L.D.S. Business College in Salt Lake City. He studied telegraphy. His teacher told him the only job opening was one in Tooele which of course delighted Earl — this was going back home. He became the first telegrapher in the Tooele Valley Depot. He was paid $60 for seven days a week and at least a ten hour day — that is, $60 per month. He paid $30 for room and board. The depot was built in 1909 and Earl started in 1910, not only as telegrapher, but American Express and Tooele Valley Agent. All telegrams, express and freight went through the depot. Earl used to say that all of the business in those days days was done with dots and dashes. He also had nine clerks who took care of way bills and supplies and wages and endless other duties including selling tickets on the TVRR. In those days it cost 5% a ride.

In winter a round coal stove located in the middle of the wooden coaches kept the passengers warm. They had plenty of problems in those days with heavy snow, and these problems became of real concern then Earl became Superintendent in the early thirties. One time the train was stalled in deep snow for five days and men had to shovel it out.

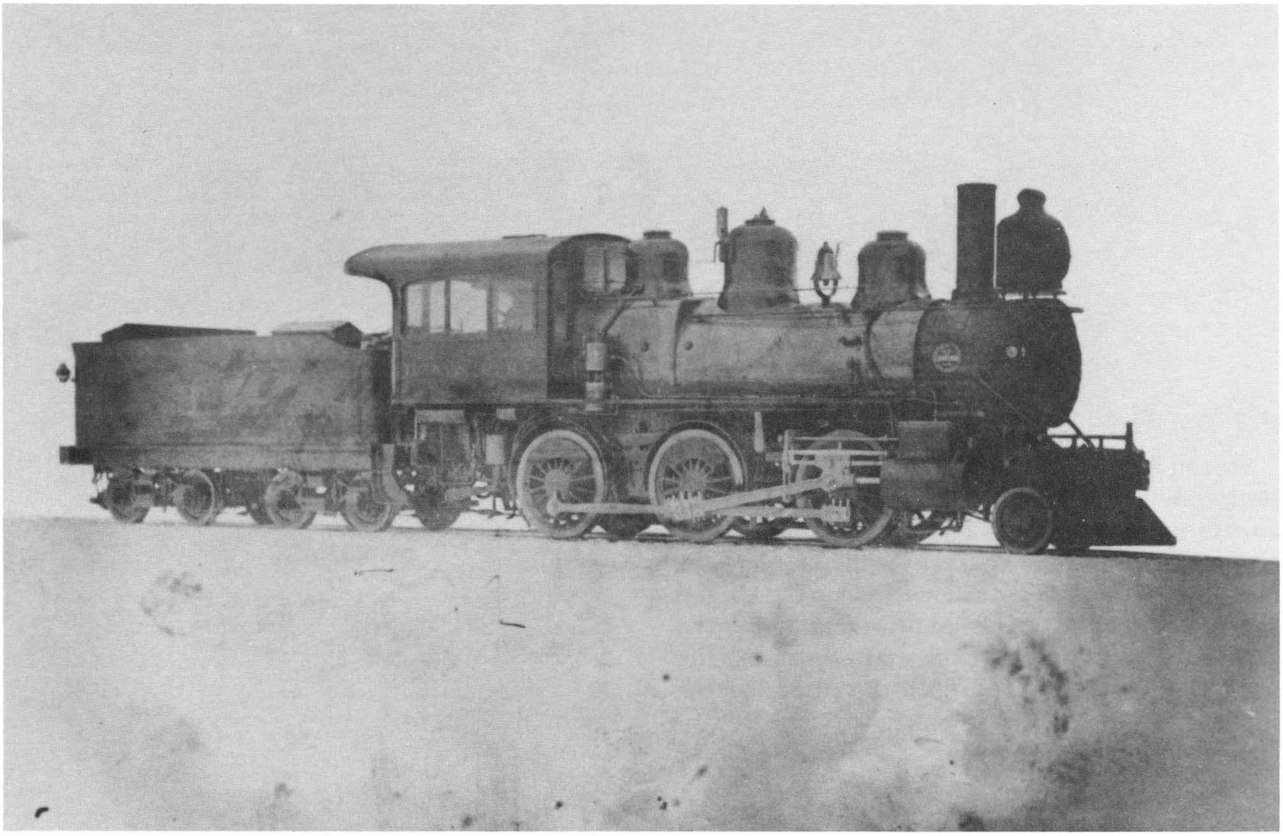
At 96 Earl can tell you how many shifts they had and the number of men and the tonnage and the problems of the steep grade to the smelter. He also told us if we had a telegraph key he could still send messages. Earl drove his own car until 1984 — his life span went from horse and buggy through a Model T Ford and a Model A and ended with a Pontiac. He and Mr. Hicks started the first furniture store in Tooele in 1912. Earl was also a volunteer fire man most of his life.



Joseph Earl Tate

Earl is still living in the same house he bought for $1800 in 1913 when he was married to Bertha Shields. They had three children — Maxine Grimm, LaVar and Norma Allen. Earl is especially pleased over the Tooele County Museum which is located in the old Tooele Valley Railroad Depot. He visits there often and reminisces with other retired men who used to work for him.

by Maxine Grimm
August, 1986



Tooele Valley Railroad steam engine #2.

APPENDIX
LOCOMOTIVES AND CABOOSES OF THE TOOELE VALLEY RAILWAY COMPANY

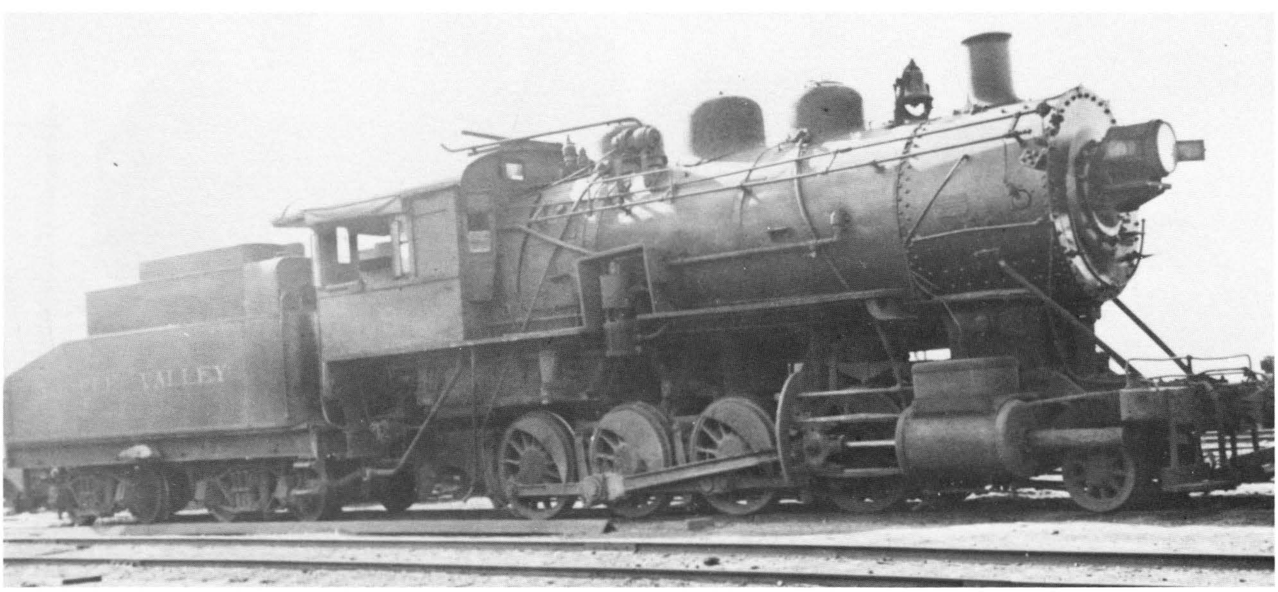
NUMBERS 9 AND 10

The similarity of the histories as well as the appearances of Numbers 9 and 10 suggest that these two locomotives be considered together.

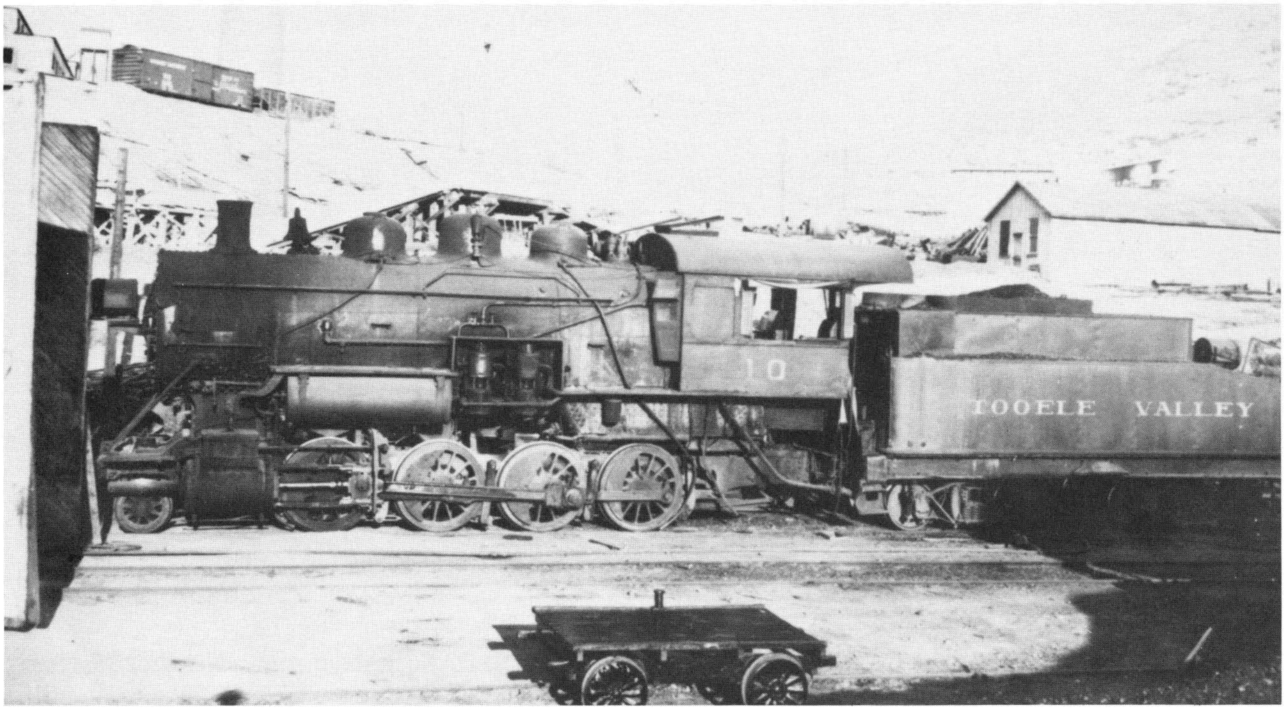
Number 9 was built in 1910, builder number 48884, by the American Locomotive Co. It originally worked on the Butte, Anaconda, and Pacific Railroad as that road's Number 29. It was acquired from the BA&P by the Tooele Valley on November 18, 1925, and re-numbered as the 9. Number 9 was a 2-8-0 type with 21″ × 28″ simple cylinders, 52″ drivers, and Stephenson valve gear. It served on the Tooele Valley until 1950, when it was retired and scrapped.

Number 10 was acquired in April of 1916, again on a second-hand basis from the BA&P. It operated on the BA&P as that road's Number 28. Number 10 was a 2-8-0 type with 21″ × 28″ simple cylinders, 52″ drivers, and Stephenson valve gear. It was built in 1907 and carried builder number 44336. The 10 operated on the Tooele Valley until April of 1955, when it was sold for scrap iron.

Numbers 9 and 10 were unique due to their slope-back tenders. Such a tender was frequently used on switching locomotives where increased vision in backing was a necessity, but was seldom seen on something as large as a 2-8-0. The application of such a tender was due primarily to the intended use of these locomotives in mining operations where switching as well as road duty was required.



Tooele Valley Railroad steam engine #9.



Tooele Valley Railroad steam engine #10.

Tooele Valley Railroad steam engine #11.

NUMBER 11

Locomotive Number 11 holds the distinction of being not only the last operating steam locomotive on the Tooele Valley Railway but also the last operating steam locomotive in common carrier service in the State of Utah.

Number 11, a 2-8-0 with 21″ by 28″ cylinders and 51″ drivers, was built in April of 1910 by the American Locomotive Company at the Brooks Works. Like its sister, Number 12, its early years are somewhat a mystery although it appears that both engines were originally intended for the Buffalo and Susquehannah Railroad (which later became part of the Baltimore and Ohio Railroad). Both engines were acquired by the Tooele Valley in 1912 and began hauling freight and passengers on the Tooele Valley in October of that year. Both engines also proved superior over Numbers 9 and 10 in road service. This was due at least in part to the fact that both 11 and 12 utilized Walscharets valve gear that resulted in the more efficient use of steam and a lower rate of consumption of coal.

When the decision was made to dieselize the railroad in 1955, Number 11 was retained in stand-by service and was used whenever Number 100, the Tooele Valley's first diesel, was ailing. Number 11 served in this stand-by capacity from June of 1955 to May 30, 1963. Rumor has it that a city ordinance was passed preventing the railroad from operating the engine within the Tooele City limits after June 1, 1963. This rumor has never been confirmed, however.

A more likely reason for the retirement of Number 11 is that it was in need of major repairs. According to the records of the Tooele Valley, all three of the steam locomotives were in need of major overhauls in 1955 when the decision was made to acquire a diesel-electric. Indeed, the condition of the steam locomotives in 1955 was used as justification for requesting the expenditure of some $113,000 on a new diesel. Number 11 was apparently in the best condition of the three steam locomotives in 1955 and was retained and run until it would essentially run no more without some major maintenance work. Evidence of the engine's condition on its last run was clear to the author as he and his father watched the engine struggle to crest the grade just below the low-line switch with only four (as compared to six or seven in better days) loaded cars of concentrate.

Number 11 was held at the smelter in the enginehouse from June of 1963 to September of 1964. It traversed the line down as far as the Kirk Hotel in the summer of 1964 and was placed on display for a few days as part of an exposition on mining held in Tooele City. It did not move under its own power, however, since its boiler had been condemned by Federal inspectors.

In September of 1964, crews from both the Tooele Valley and the railroad division of Tooele Army Depot participated in moving the locomotive from the mainline down Vine Street to a cement pedestal in Tooele City Park. This was accomplished by constructing a temporary track from the street to the cement pedestal. Attempts were made to operate the engine under its own power by using air rather than steam to move the cylinders. This proved unsuccessful and the locomotive was finally pushed onto the pedestal by Number 100 with three or four long hopper cars and caboose Number 04 between Number 11 and Number 100 in order to protect the railroad's only remaining operating motive power. Here the old engine rested until July of 1982.

In July of 1982, the decision having been made by Anaconda Company's parent Atlantic Richfield to abandon the Tooele Valley, it was determined that the railroad's two remaining cabooses, the snowplow, and Number 11 would be perserved near the depot as part of a museum. Consequently, Number 11 was again to be moved.

Don H. Lee, superintendent of the Tooele Valley, went to the old coal spur above Seventh Street a few days before the scheduled move and cut the rails of the spur from the switch leading to the main line. On the day the move occurred, a large crane from Tooele Army Depot picked up this entire piece of track and set it on two flatcars borrowed from the Tooele Army Depot. Since the curvature of the track ended up facing the wrong direction, the two flatcars were pulled to Warner by Number 104 where they were turned around on the wye which was part of the Western Pacific interchange yard. The cars and the track (which looked very much like the several sections of toy train track coupled together) were then pushed back up to the park, the track unloaded, and Number 11 was readied for movement.

A large tractor attempted to move the old engine but to no avail. Two large tractors were then employed, one attached via a cable to the rear coupler of Number 11's tender and the other pushing at the front coupler. But still the engine refused to move.

Finally it was discovered that the engine's brakes had been welded in position back in 1964 so that the locomotive would not roll from the pedestal. A cutting torch was summoned and the main rod of the brake rigging was cut. Finally, the engine moved. But the worst was yet to come.

As the steam locomotive neared the end of the temporary track, its 120 tons of weight forced the unsecured rails to the end of the temporary track apart and the engine derailed, sinking into asphalt of Vine Street about one quarter of the way up the left rear driving wheel. The tender was already into the street and nearly aligned with the main line so that an attempt to rerail the tender seemed reasonable using rerailing frogs and having the 104 and the flat cars couple to the rear of the tender to pull it and hopefully the locomotive into position. There was one slight problem that made this idea a bit less than successful, however.

The Number 104 had an electric throttle and an automatic cutoff feature that would stop the traction motors from turning the locomotive's wheels when the wheels were spinning. Thus every time Mr. Lee opened the throttle to try to pull Number 11 from the asphalt the 104's traction motors would cut out. The final solution to the problem came when one of the large tractors used to pull Number 11 to the street was attached to the rear coupler of the 104 through the use of a cable. With the help of the tractor, the 104's wheels didn't spin and Number 11 was extricated from its embarrassing position and moved to the depot.

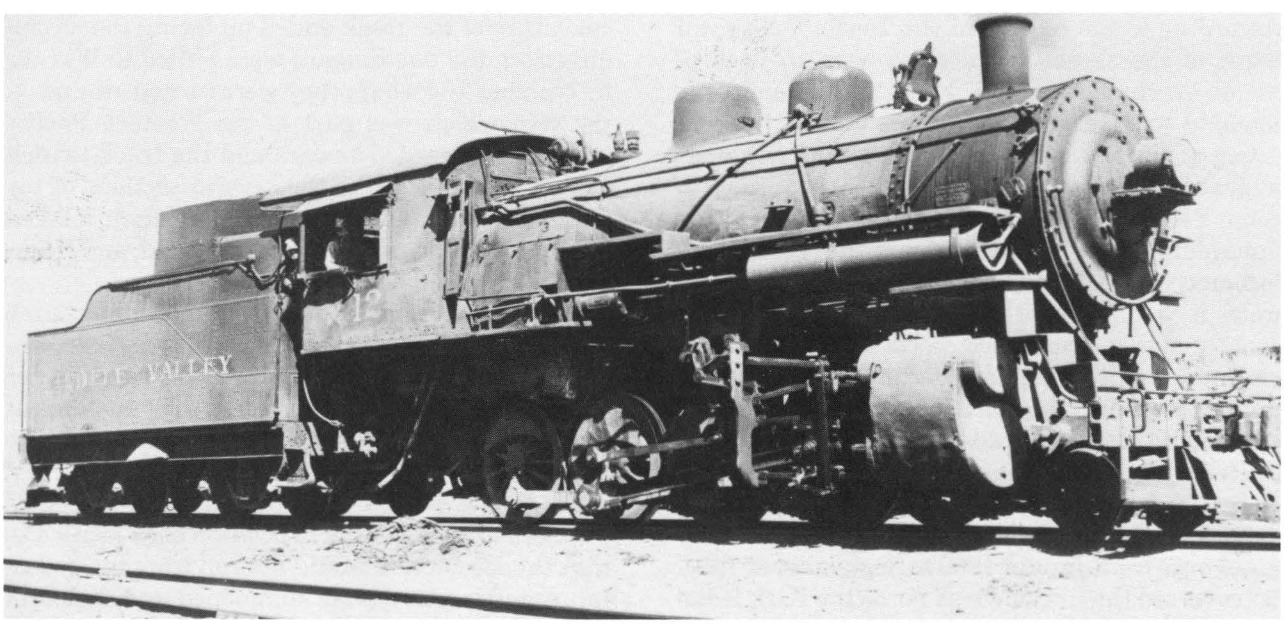
The author of this paper assisted in this move of Number 11 and spent a great deal of time that day in the cab of the 104 with the late Don Lee. At one point Mr. Lee asked me to drop down from the cab and hand something to the late Don Lombardi who was serving as switchman. As I did so, the train went past me and, as it did, I could still hear very distinctly the sound of compression in Number 11's old and weatherbeaten cylinders. At the moment (and many times since) I was impressed with the skill of the men who not only built the engine, but also those who operated and maintained the locomotive. And I could not help but wonder if they might be pleased if they were allowed to observe this scene to see the old engine moving again after nineteen years of Utah winters and destructive vandals.

Credit should also be given to Don H. Lee, Donald E. Lombardi, Richard Stoddard, Marion Bevan, and the men from Tooele Army Depot. Their efforts have allowed an important part of the history of Tooele City to be preserved for future generations.

NUMBER 12

Number 12 was the sister engine to Number 11. Number 11 carried builder number 47764 while Number 12 carried builder number 47765. Both 11 and 12 were built by the American Locomotive Company at the Brooks Works in April of 1910. The engines were apparently originally intended for the Buffalo and Susquehanna Railroad in New York State (although this fact has not been documented). The B & S, for reasons which are at present obscure, did not retain the engines. It is not known just exactly how many owners the engines had between April, 1910, and October, 1912, when they were acquired by the Tooele Valley.

Number 12 was said to be the smoother riding locomotive of the two. The 12 saw constant service



Tooele Valley Railroad steam engine #12.

along with the 11, as the road engine of the Tooele Valley. Number 12 was a 2-8-0 type and had 21″×28″ compound cylinders, 51″ drivers, and Walscharets valve gear.

Number 12 was retained on the roster for nearly a year after the acquisition of the first diesel. It was scrapped in May of 1956 (after the diesel had proved its worth) but its tender was converted for use as the snowplow for the railroad.

NUMBER 100

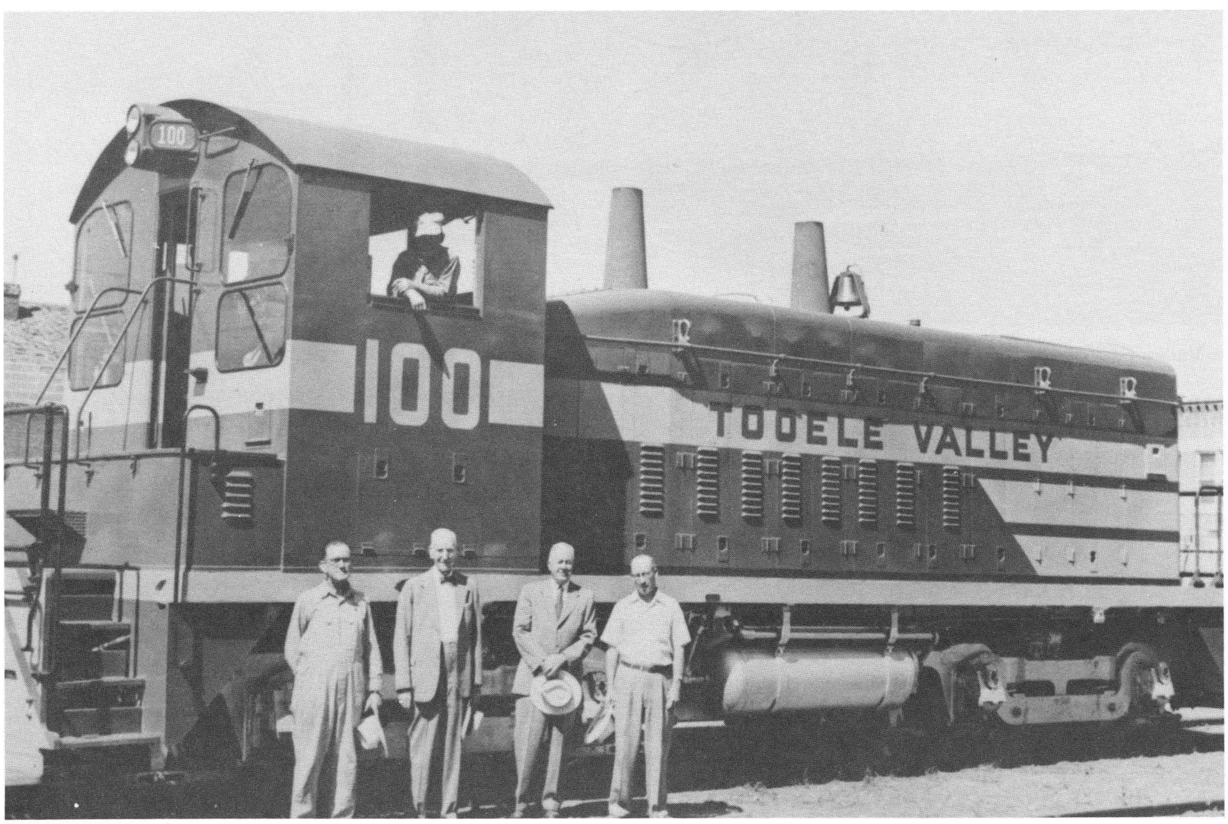
Tooele Valley Railway locomotive Number 100 was acquired new from the builder (the Electro-Motive Division of General Motors) in June of 1955 and carried builder number 20640. The locomotive was a model SW1200 switching locomotive rated at 1200 horsepower. It was powered by a twelve-cylinder model 567C diesel engine which was the prime mover for the generator providing the current for the traction motors mounted on the four axles. The entire unit rode upon AAR type A switcher trucks. These trucks had a wheelbase of 96″ and were double-equalized with drop equalizers.

Number 100 was the first diesel-electric owned by the TV and replaced the three steam locomotives (10, 11, and 12) then in service. The 100 was in daily service on the railway from 1955 until the smelter closed in early 1972. The engine was then transferred to the Butte, Anaconda, and Pacific where it served until the smelting operations in Anaconda were shut down. Number 100 was then transferred to the Anaconda Aluminum Reduction works at Columbia Falls, Montana, where it is currently operating. It has carried the same number, 100, throughout its life.

NUMBER 104

Number 104 was acquired in 1966 from the Pickering Lumber Corporation in California primarily as a replacement for the last steam locomotive (Number 11). Number 11 had been retained on stand-by status for use when the 100 was ailing. When the boiler of Number 11 was condemned in 1963, the Tooele Valley was left with only one locomotive and was forced to rent an engine from the Union Pacific Railroad if a replacement was needed. The delays in operations that resulted from waiting for a Union Pacific engine to be dispatched west from Salt Lake City necessitated the acquisition of a second locomotive that would be immediately available.

Upon abandonment of the Tooele Valley Railway in August of 1982, Number 104 was shipped



Tooele Valley Railroad diesel electric locomotive #100.

to Salt Lake City, where it was stored until March 19, 1983. On that date, the engine was shipped to its new owner, Minnesota Corn Products Co., Marshall, Minnesota.

The 104 is a model SW900 diesel electric switching locomotive built by the Electro-Motive Division of General Motors in April of 1959, carrying builder number 25343. The engine is rated at 900 horsepower and is powered by a model 567CR diesel engine. The locomotive rides on EMD Flexicoil trucks. The Flexicoil truck is a lightweight road truck lacking the outside spring hangers of the standard EMD road truck and has a wheelbase of 96 inches.

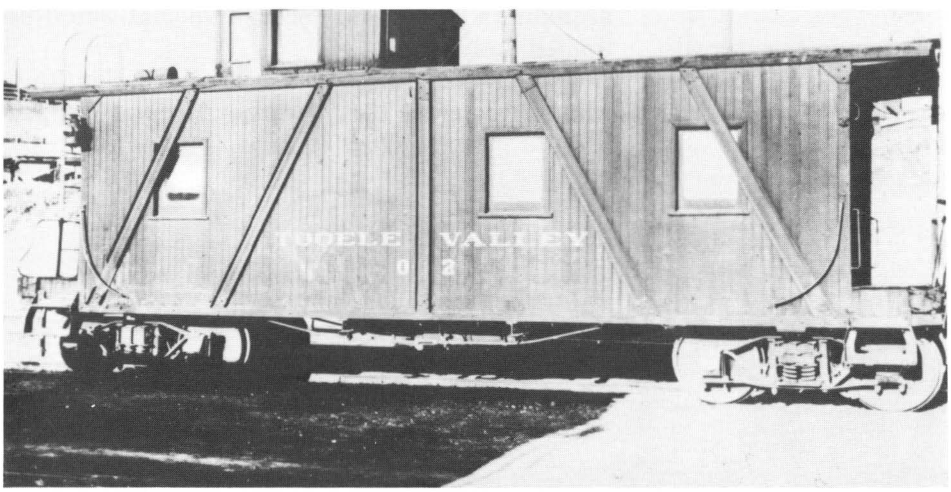
THE CABOOSES

The Tooele Valley Railway owned four cabooses during its lifetime. The first, Number 01, was actually a passenger car converted to a caboose by the railway in its own shops in July of 1916. This first caboose had a wooden body and underframe. Number 01 was used until September of 1925, when it was retired and converted into a flat car.

The 01 was replaced in 1925 by Caboose 02. The 02 was acquired second-hand from the Butte, Anaconda, and Pacific Railroad at a cost of $1,219. Number 02 also had a wooden body and underframe and was the regular caboose on the line until the acquisition of Number 03 in 1937. The 02 was held by the railroad until 1957, when it was retired and scrapped.

Number 03 was also acquired second-hand from the Butte, Anaconda, and Pacific on October 25, 1937. This caboose has a wooden body but, unlike its predecessors, a steel underframe. It is also distinguished by the large door on each side used for loading freight and baggage. The 03 was retired from active service May 19, 1972, but was held by the railway until abandonment of the line in August of 1982.

The Caboose Number 04 was acquired second-hand from the D&RGW in 1957 and was in service when the railway ceased operations in 1982.



Tooele Valley Railroad caboose #2.

Tooele Valley Railroad caboose #3.

THE WRECK

(Adapted from the *Tooele Bulletin,* June 20, 1967)

The Tooele Valley Railway had an admirable record of safety. During its seventy-plus years of service, it had only one major wreck (though derailments were not unknown). This wreck occurred on January 24, 1933.

It seems that Tooele had an unusually hard winter that year and motorists were driving their cars down the railway's right-of-way to avoid going through the deep snowdrifts on Vine Street. As the automobiles travelled on the tracks, they began to pack the snow on the rails into ice which clogged up the flangeway at the side of the rails. A westbound freight pulled by Number 12 hit the packed snow and ice just west of Coleman Street flipping the locomotive onto its side and pulling two cars of the train off the track.

Engineer James McCardell, fireman, O. H. McKee, brakeman, Edson Bevan, and sectionhands, Albert Petras and Will Pitt, were riding in the cab at the time of the accident. Mr. Petras suffered a dislocated vertebra in the accident while the others sustained only minor cuts and bruises.

Number 12 was not severely damaged and was repaired and returned to service.

THE TOOELE VALLEY RAILWAY DEPOT

The Tooele Valley Railway Depot was built in 1909. It served as the general offices of the railroad, the unloading and loading point for inbound and outbound freight, and provided shelter for passengers wishing to ride the Tooele Valley to either Warner or International, Utah. Passengers travelling to Warner were likely desirous of catching a Union Pacific passenger train while those headed to International were generally employees of International Smelting and Refining Company whose lead, zinc, and copper smelter was located at International.

The depot is a one-story, brick structure. The floor is raised to the level of the door of a boxcar since the platforms framing three sides of the building's outer perimeter were used for loading and unloading freight. The depot housed a scale for weighing freight, a baggage room, and office space for the telegrapher, station agent, timekeeper, paymaster, two accountants, and the superintendent of the line.

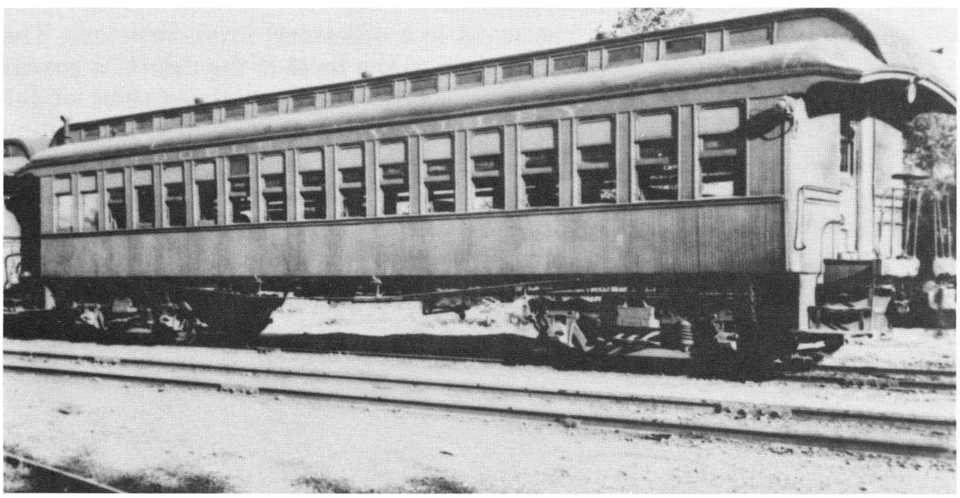
Last run of the steam locomotive pulling freight cars 30 May, 1963. Depot building behind trees at right.

The depot was the center of operations for the railroad. Waybills and other documents relating to inbound and outbound freight were processed at the depot. Operating instructions for the railway's conductors and section foreman were also prepared by the office personnel working at the depot. Tickets for the railway's passenger trains were also sold at the depot.

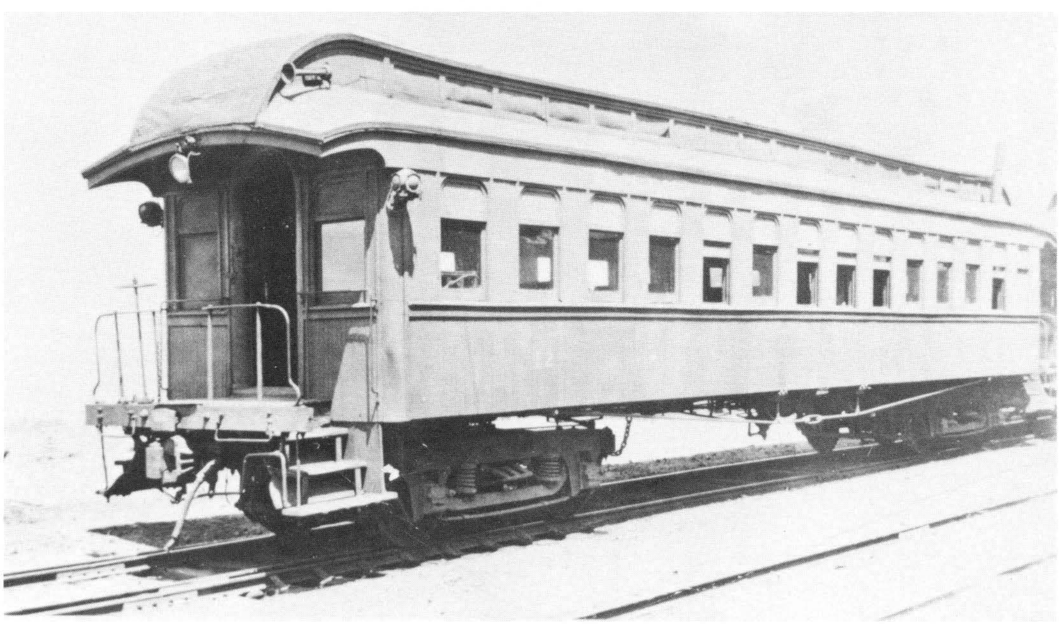
The need for the depot is evidenced by the variety of freight carried by the Tooele Valley over the years. In addition to the many cars of ore and concentrate and finished products hauled to and from the smelter, the line also served several lineside industries with carload lot service including coal yards, oil storage facilities, and local automobile dealers whose inventories of new cars arrived in town in boxcars. The railway also had a thriving less-than-carload-lot (LCL) business until around 1950 when trucks were able to capture this segment of the freight business. Indeed, according to Norman Adamson, a former station agent for the Tooele Valley, the railroad received, on average, three carloads of LCL merchandise a week in 1942. By 1950 (just before the trucks took over), volume had dwindled to less than one carload a week.

The depot still stands today and serves as a museum for the mining, smelting, and railroading artifacts and history of the Tooele area.

(The above was abstracted from a lengthier paper on the depot and the Tooele Valley Railway written by Orrin P. Miller in December of 1983.)



Tooele Valley Railroad coach #9.



Tooele Valley Railroad Passenger Coach #12.

CHAPTER 25

THE UTAH NEVADA WESTERN RAILROAD

The Salt Lake Sevier Valley, Pioche Railroad was originally organized in 1873. Two principal organizers were General Patrick Connor and H. S. Jacobs. Connor had large, rich deposits of ore in Stockton. Jacobs had the fabulous Hidden Treasure mine in Jacob City. They desperately needed transportation for supplies in, and ore out of the mining districts.

They organized a company with a 6,000,000 stock issuance authority. Stock shares were $100.00 each. Tooele citizens pledged $30,000.00 in labor and materials. John Rowberry purchased ten shares ($1,000). Rolling stock was ordered and contracts let for construction of a bridge across the Jordan River and grading of the road bed.

The panic of 1873, financial problems and a power struggle between H. S. Jacobs and Patrick Connor resulted in collapse of the company.

In 1875 the Utah Nevada Western Railroad was organized with Heber P. Kimball and John W. Young as prime movers. During 1875 the railroad was completed to the Lakepoint station in Tooele County (Ref: History of Rails, Utah Historical Society).

Dr. J. F. Clinton, an early entreprenuer, constructed a boat dock and built a hotel near the site where the station was later built. The railroad brought tourists and pleasure seekers from Salt Lake City to bathe in the lake, dine on cruise ships, as well as dance and dine at the hotel. He had a thriving business until the lake receded in 1889 to the 4,203 foot level (Ref: Tooele County History, page 147).

During the period of 1875–1883 the railroad received ore hauled by team and wagon from Stockton, Ophir and Dry Canyon. The ore was then hauled to the smelters in Salt Lake Valley.

By 1883 the railroad had been completed to the terminix at what is now called Bauer. From Bauer it continued in the hauling of ore and bringing supplies to Stockton and other communities.

There was one depot west of Tooele. It was located approximately three-quarters of a mile west of the intersection of Utah Highway 112 and the Union Pacific tracks. The depot serviced people from Grantsville and Tooele.

The old railroad grade is still visible along the north approach to Bauer.

The construction of the Union Pacific Railroad in 1905 put the old narrow gauge railroad out of business.

Original Tooele Station on the San Pedro, Los Angeles, and Salt Lake Railroad Station. Name changed to Warner upon completion of Tooele Valley Ry. Depot.

CHAPTER 26
UNION PACIFIC RAILROAD

Senator Clark of Montana made millions of dollars in Butte, Montana and Ophir, Utah. He promoted and financed the construction of the San Pedro-Salt Lake Railroad circa 1900. The railroad subsequently became a part of the Union Pacific system. It was a standard gauge railroad and very successful.

From north to south depots were established at Erda, Warner (Tooele) Stockton. St. John, Faust, Ajax, Dunbar and Lofgreen. Section foreman and laborers (gandy dancers) were stationed at each depot to service the tracks and replace rotten ties.

The advent of hard surfaced highways and trucks in the 1930s caused the railroads to lose their local freight and passenger business, so they were all closed and the buildings were removed or burned.

The use of creosote on ties eliminated the need for a section gang every ten miles.

The U.P. serviced Tooele Army Depot, the Tooele Smelter and Bauer with carload lot freight service.

The last station agent at Warner was Herbert Cook who died in 1984 at age 92.

One of the deepest railroad cuts in Utah is at Stockton Bar. This geological feature is a natural dam that separates Tooele Valley from Rush Valley. It was built by wave action of Old Lake Bonneville 24,000 years ago. The elevation at the top of the Bar is 5,200 feet above sea level. The elevation of the tracks through the cut is 5,079 feet.

The cut is approximately one-half mile long, 121 feet deep and 150 feet wide at the track level. Excavation was by steam shovel. Olaf A. Miller reported that in 1902 he was an oiler on one of the steam shovels. He worked ten hour shifts and was paid 25 cents per hour.

Tooele Valley Engine Tooele Valley Railroad. Lower terminals were Union Pacific and Western Pacific Railroads.

CHAPTER 27
WESTERN PACIFIC RAILROAD

Coming east, the Western Pacific Railroad enters Tooele County at Wendover (see page 939 Tooele County History). The town was built to service the railroad and accommodate its employees. There were section maintenance crews stationed every ten miles across Tooele County. They were Wendover, Salduro, Arinosa, Barro, Knolls, Clive, Low, Delle, Timpie and Burmester. There were stations at Burmester to serve the salt industry there, and at Delle to serve the livestock and mining business in Skull Valley.

Delle was the water stop between Salt Lake City and Wendover. Steam engines required copious quantities of water. The water came from the Delle Ranch area 14 miles southeast of the depot. To get the water right they had to buy the ranch from Quince Knowlton.

To get a straight line track between Timpie and Lake Point, extensive diking and rip rapping was required in order to get across the south shore of the Great Salt Lake. About 1910 the track bed was threatened by the rising waters of the lake. Millions of tons of rock were used to raise and rip rap the road bed. This rock came from the north tip of the Stansbury Mountains.

A huge area of the mountain was drilled, then all holes filled with dynamite and exploded at one time. It was reported to be the largest explosion ever made up to that time.

Creosoting the ties eliminated the need for section hands. By 1950 all section houses were gone. Oil fired diesel engines replaced coal fired steam locomotives, thus eliminating the station at Delle.

In the early 1980s the Union Pacific Railroad system acquired control of Western Pacific Railroad. During 1983 and 1984 the rail bed across the lake needed raising again. Millions of dollars were spent to raise the grade to elevation 4210.

It was decided in 1984 that the route across the lake was not feasible to maintain, so action was taken to acquire ground to build a new route east of Grantsville and through Erda to Lake Point.

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