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THESIS

for the Degree of
Bachelor of Science.

1910.

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REPORT OF HERALD MINE
JOPLIN, MISSOURI.
BY
CLAY GREGORY JR.

10923

Area and Location.

This property consists of 43 acres of land, situated 2 miles north-east of Galena Kansas, and 5 miles west of Joplin Missouri, about 100 yards north of the junction of the St. Louis and San Francisco and the Missouri Kansas and Texas railroads.

The mine is in the western part of the Joplin district on Lot 6, and 100 feet of Lot 7, NE 1/4, Sect. 2, T 27 N, R 34 W. The nearest camp to the mine is Bell Center, which is one mile north-east.

Lease.

This property is held by a ten year lease at 15% royalty upon the gross value of all ores of lead and zinc sold. Four years of this lease have elapsed.

General Considerations.

Three shafts have been sunk on the property: one a 45° incline which is the main shaft, and the other two vertical. The present plan is to connect these three shafts. The main shaft is 6 by 12, permitting double tracks for hoisting. The skips are loaded from a hopper at the 290 foot level. They are the ordinary type of

end dump skip, and hold two tons.

Ore was encountered at the 220 foot level in this shaft, and continued down to the 290 foot level, which is the bottom of the shaft. Hoisting is done by an electrically operated hoist, although an auxiliary boiler plant and steam engine is on hand for use in case of emergency. A 50 horse-power General Electric induction motor "Form M" is used for driving the 44 inch hoisting drum, and working at full speed has a capacity of 150 tons per hour, or one trip every 40 seconds. There is a small bin at the top of the shaft, into which the ore is dumped direct from the mine, and from there it is taken up to the mill hopper over a tram road 700 feet long on about a 3% grade; a separate haulage engine of 20 horse-power electrically driven, located in the mill, is used for this purpose.

The two vertical shafts, each 6 by 8 , are 150 feet deep. Lead sulphide is found at the bottom of these shafts. A 40 horse-power Fairbanks Morse gasoline hoist is used for hoisting the dirt from the shafts, and also for conveying it to the mill hopper.

Pumping is done by a 2 stage centrifugal pump, driven by a 30 horse-power motor. There is not enough water in the underground workings to supply the mill, consequently water is pumped from Short Creek, some 200 feet distant, for this purpose.

Development and Stoping.

Very little development work has been done from either of the vertical shafts, the work having been confined mostly to the 220 foot level of the main shaft.

About 800 feet of drifting has been done in the main shaft (see map). The drifts as well as the shaft are in good hard ground and no timbering is needed except in the first 50 feet of the shaft and one small drift (S 52 E, see map). The main drift runs straight south from the shaft. This drift is split into a southeast and a southwest drift by the large pillar in the middle. This pillar is 80 feet in diameter and will eventually be caved and mined. It is in these two drifts that the present mining is being done; an 80 foot stope being carried in each drift. Here the ore body follows up to the 150 foot level. The ore body pitches to the northwest at an angle of about 10°, as

indicated by the ore in the south drift which is at the 150 foot level, and in the west drift which is at the 200 foot level. No work is being done in the west drift at present, but this will later be mined by stoping from the 290 foot level.

Handling Ore Underground.

The ore is trammed from the stopes in 2 ten cars, to a winze connecting the 220 foot and the 290 foot levels. The ore is partially sized underground. A winze cut from the 220 foot to the 290 foot levels, serves as a hepper. At the top of this winze are grizzly bars set at 6 inches. Any material too large to pass this grizzly is broken by hand. The bottom of this winze has an ordinary gate discharge, which feeds direct to the skip.

Extent of the Ore Deposits.

The developments by shafts, drifts, and drill holes, already prove the ore to extend 400 feet north and south, and 300 feet east and west. It extends in depth, from 150 foot to 290 foot levels, a distance of 140 feet, and seems to be about the same grade of ore throughout. The properties north, south and east have not been drilled enough or drilled deep enough, to determine the

continuity of the ore body into their boundaries, but on the west, in the Ihlseng property, 300 feet distant, it has been found.

A 2 to 3 foot run of ore is found near the bottom of the 220 foot level.

Geology.

In discussing this deposit, a general geologic history of this part of the Joplin district may be outlined as follows:

<u>System.</u>	<u>Series.</u>	<u>Name of Formation.</u>	<u>Character of Rocks.</u>	<u>Feet.</u>
Carbon- iferous.	Penn.	Cherokee.	-----	eroded.
		Unconformity.	-----	eroded.
		Cartersville.	-----	missing.
		Unconformity.	-----	missing.
	Miss.	<u>Boone.</u>		*
		Short Creek	Could not	---
		Oelite.	determine.	
		Grand Falls	Heavy bedded	150-220
		Chert.	solid chert.	
		<u>Kinderhook.</u>		
	Choteau.	Limestone with inter-bedded chert.	220-300	
	Hannibal.	Sandstone and shale.	300-350	
	Louisiana.	Limestone.	350-	

* Have from 15-150 feet in lime and chert.

Description of Ore Body.

This ore body, in the Mississippian Series of the Carboniferous System, is in the Grand Falls chert and the Choteau limestone. The ore is found in the upper part of the mine in fissures in chert, even to the appearance of stock-work, while in the lower part the ore is disseminated, showing two distinct types of deposition. The dissemination is both coarse and fine, the coarse being often in the form of the vug or in small openings, whereas the fine dissemination is metasomatic in limestone.

The ore body consists of limestone, chert and dolomite: limestone in a larger proportion than chert, and dolomite constitutes a very small part. An examination of the shaft failed to reveal any Short Creek oolite, which theoretically should overlie the Grand Falls chert.

The limestone here is fossiliferous, coarse to finely crystalline, heavy bedded and bluish. The limestone is comparatively soluble in meteoric waters. Dolomitization has taken place in many instances, entirely obliterating any signs of fossils.

The chert occurs interlaced with limestone and also occurs in massive beds. In several cases chert is

secondary, having replaced the limestone by filling cavities formed by the water action.

The zinc sulphide is rosin zinc and when free to crystallize in vugs or small openings, is "ruby jack". These occur in isometric tetrahedral forms.

Selvage (220 foot level) is clay-like and is associated with lead and zinc sulphide. This selvage grades into mud and is easily scratched with the finger nail. It is a blue-gray color. The ore body grades into dolomite near the outer wall in the west drift.

The lead sulphide is found overlying the zinc sulphide.

Theoretical Considerations.

The process which operated to bring about the deposition of the ore, was circulation of underground water. Regions made up of limestone, generally have more or less complete systems of underground drainage. It is claimed by some, that the water circulation comes from below, i.e., the water was ascending. The deep well water of the district, shows no trace of lead or zinc, whilst all the mine waters of the district show lead and zinc.

This indicates clearly that it was a downward and not an upward circulation which brought the ore. The magnesium in the dolomite could have come downward the same as the lead and zinc. Certainly the Cherokee shale contained enough magnesium to have supplied the dolomite. If there were any faults as was formerly thought, there would then perhaps be some reason for ascending solutions, but there is an absolute lack of faults in the district.

Where selvage is found, it is reasonable to suppose that oxidation is taking place. Selvage may come from an argillaceous siliceous limestone. A water passage is opened permitting oxidation.

In several instances it was noticed that the zinc sulphide and dolomite were in close association. They were evidently precipitated at the same time and by the same agents.

The precipitation of the ore bearing solutions was affected by the reducing action of organic matter, very likely Cherokee shale or possibly from organic material in the country rock, hydrogen sulphide being furnished, which reduced the lead and zinc from the

salt or acid solution to lead and zinc sulphide.

The lead is generally found overlying the zinc, sometimes in contact with the zinc, and then again a few inches above. Lead has less solution tension than zinc, therefore when this lead-zinc bearing acid solution is acted upon by hydrogen sulphide, lead is the first to precipitate, the limestone present neutralizes the solution and the zinc is precipitated as zinc sulphide.

Metasomatic replacement also accounts for some of the ore deposition, since we may note that particles of the ore occur in the unaltered country rock; the silica from the chert and the calcium carbonate from the limestone being taken out and replaced by zinc and lead sulphide. In some cases zinc sulphide is found in the original limestone, due either to metasomatic replacement or having been deposited with the limestone.

The secondary chert is due to a replacement of fossils which were deposited in the original limestone and now are found in chert, showing that replacement has been practically complete.

Referring to the cost sheet it will be seen that the cost per ton of dirt mined, is nearly one dollar. This may be taken as an average over the entire Joplin district, the management and the kind of ground causing the slight variations. This ore is easily mined and milled.

Zinc ore is sold on a basis of 60 percent zinc content, one dollar being deducted or added for each percent decrease or increase. The concentrates obtained in this mine are unusually clean, due largely to the small amount of iron in the ore, and contained from 62 to 63 percent zinc which adds \$2 to \$3 per ton to their value.

An interesting feature of this mine is that the ore body lies in what has heretofore been considered barren ground in this part of the district. The flint has always been considered bed rock and very little drilling has been done in or below it. All of this ore body underlies the so-called bed rock. The discovery of ore in and below this formation will, undoubtedly, lead to deeper mining in this part of the district.

It is hardly advisable to figure "ore in sight" in the Joplin district and all the less advisable to try to figure it in this mine since the drill hole records were not available, and without these "ore in sight" could not possibly be calculated. However, a statement as to the weekly profits and losses can be figured for any given week-- taking the week of October 2, 1909 as an average. The ore ran 4.47 percent. \$18.50 cost per ton concentrates.

<u>71.41</u> tons produced.	\$50.00 paid for 60% ore.
\$1422.50 total cost.	This ore has an increase of 2% \$52.00 or \$2.00 per ton.
	<u>71.41</u> tons produced.
\$3712.80	\$3712.80 total received.
<u>\$1422.50</u>	
\$2290.30 net gain.	

At the conclusion I wish to state that the Herald Mine has one of the best properties I have seen in the Joplin district.

COST SHEET.

Week Ending September 25th.

Items.		Cost per Ton of Dirt.	Cost per Ton of Ore.
Labor,			
Mill	\$210.00	\$0.1254	\$2.95
Top	133.65	.0799	1.87
Ground	576.97	.3447	8.09
Liab. Ins.	32.22	.0192	.45
Fire Ins.	9.00	.0054	.12
Gas Power	63.75	.0380	.89
Elec. "	72.05	.0430	1.01
Powder & Fuse	119.15	.0712	1.67
Supplies	202.17	.1208	2.84
Totals	\$1418.93	\$0.8476	\$19.89
Pounds of Dirt Milled.	3,342,000	Pounds of Ore Produced	Percent Ore in Dirt
		142,560	4.26

Week Ending October 2nd.

Items.		Cost per Ton of Dirt.	Cost per Ton of Ore.
Labor,			
Mill	\$212.00	\$0.1241	\$2.77
Top	152.15	.0908	1.99
Ground	515.26	.3017	6.74
Liab. Ins.	30.78	.0180	.40
Fire Ins.	9.00	.0053	.12
Gas Power	60.00	.0351	.79
Elec. "	32.39	.0190	.43
Powder & Fuse	93.80	.0549	1.23
Supplies	309.46	.1812	4.05
Totals	\$1414.84	\$0.8301	\$18.52
Pounds of Dirt Milled.	3,416,000	Pounds of Ore Produced.	Percent Ore in Dirt.
		152,320	4.47

Week Ending October 9th.

Items.		Cost per Ton of Dirt.	Cost per Ton of Ore.
Labor,			
Mill	\$186.56	\$0.1350	\$2.51
Top	147.10	.1064	1.98
Ground	514.10	.3720	6.92
Liab. Ins.	29.67	.0215	.40
Fire Ins.	9.00	.0065	.12
Gas Power	60.62	.0439	.82
Elec. "	74.52	.0539	1.01
Powder & Fuse	100.25	.0725	1.55
Supplies	207.02	.1498	2.79
Totals	\$1323.34	\$0.9615	\$17.90
Pounds of Dirt Milled.	2,764,000	Pounds of Ore Produced.	Percent Ore in Dirt.
		148,500	5.37

September Ore averaged \$244.76
 October Ore averaged \$246.04

FLOW SHEET of HERALD MILL Joplin Mo.



