E&A No. CC-850

Cubic Yards 1957 Stripping	Cubic Yards to Date	Cost Estimated	Actual-1957	to Date
34,173	216,691	$0.492	$0.634	$0.496

There is an unexpended balance of $15,400 on this E&A.

b. Open Pit Mining

175,339 tons of material, including taconite, cave, and surface removed from the pit, produced 76,629 tons of concentrates at a recovery ratio of 2.3::1 as compared to 3.1::1 in 1956. No shipments were made from the M. A. Hanna Company trespass, but crude ore was stocked in the Bray pit. The average daily production per shift was 2113 tons compared to 2160 tons in 1956, and the average production of crude ore was 1128 tons compared to 852 in 1956. Ore was removed from cave pillars in the north and east banks of the south channel and from the bottom of the channel. Some of this work was directly over the old main level drift; and at the close of mining, a hole was made into the drift towards the east end of the channel.

c. Drainage & Pumping

More pumping in the pit bottom was necessary than in 1956 due to heavy rain. A portable gas-driven pump was used and the water discharged into the old drift. The St. Paul mine pit water did not rise to interfere with the Sargent.

8. BENEFICIATION

a. Plant Operations

The screening plant operated satisfactorily during the year, the only delays being from the grizzly chain breakdown. Miscellaneous underground timbers, boards, etc. slowed operations. The crusher was not used as all oversize was screened out in order to improve grade of concentrate.

Rains and Great Northern Railroad service accounted for major delays at the wash plant. Net crude recovery was 81.86 per cent compared to 81.19 per cent in 1956; gross recovery was 75.31 per cent compared to 76.31 per cent in 1956. The plant operated 150 shifts, or 1200 hours, with a loss of 173 hours (14.4%) compared to 11.6 per cent in 1956. The plant operated mostly on a 2-shift, 5-day-per-week schedule averaging 511 tons of concentrates per shift.

9. MAINTENANCE & REPAIRS

Only necessary repairs were made to keep the job operating.

10. COST of OPERATIONS

a. Comparative Cost Statement

Product	1957 Budget	Cost Per Ton 1957	1956
Concentrates	75,000	76,629	71,961
Average Daily Production		923	692
Tons Per Man Per Day		38.4	25.9
Days Operated		83	104
Costs			
Pit Operating	$0.416	$0.439	$0.413
Beneficiation	0.222	0.184	0.220
Misc. Pit & Beneficiation	0.211	0.206	0.100
	$1.732	$1.435	$1.459
General Mine	0.286	0.368	0.268
Winter & Idle	0.778	0.100	1.170
Cost of Production	$2.796	$2.803	$2.897
Depreciation			
Plant & Equipment		0.045	0.033
Motorized Equipment & Other		0.063	0.130
Movable Equipment		0.006	0.006

Taxes

Ad Valorem	0.398	0.323
Occupational	0.128	0.076
Royalty	0.138	0.184
Total Depreciation & Taxes	$0.778	$0.752
Administrative Expense	0.050	0.050
Misc. Expense & Income	0.065	0.036
Royalty	0.794	0.800
Total Cost on Cars	$4.490	$4.556

11. EXPLORATION & FUTURE EXPLORATION

No drilling was done during the year, leaving a balance of $11,000 unexpended. No future exploration is contemplated with the cancellation of the lease.

12. TAXES

	1957		1956		Increase-Decrease	
Real Estate	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Mineral	$74,068	$30,731.00	$79,195	$25,325.50	-$5,127	$5,405.50
Land,Bldg,Mach	11,680	4,708.67	11,680	3,648.43		1,060.24
Equipment	13,406	5,611.89	6,587	2,121.88	6,819	3,490.01
	$99,154	$41,051.56	$97,462	$31,095.81	$1,692	$9,955.75
Average Mill Rate		414.02		319.06		

Note: Mineral valuation decreased by mining was offset by 29.76 per cent increase in mill rate, increasing taxes on mineral $5405.50.
Mill rate increased tax on lands, building, and machinery $1060.24.
Personal Property valuation was increased by Village and County Assessor plus mill rate increase of 29.95 per cent in Village of Keewatin.

Tax Commission Reserve as of May 1

Tons		
1957	1956	Decrease
3,593,217	3,695,610	-102,393

13. ACCIDENT & PERSONAL INJURY

1. John Damjanovich
Washing Plant Leadman, Age 37
On June 17, 1957, at 1:40 p.m., Damjanovich severely injured his right hand while helping to drop a loaded car, using a 30 hp tugger with a 5/8" cable and hook. The hook wedged on an angle iron and then suddenly let loose and caught another angle iron, squeezing injured man's hand between the hook and angle iron.
28 weeks lost. Compensation paid: $1260.

2. William Lehto
Washing Plant Sampler-Car Loader, Age 49
On July 3, 1957, at 2:00 p.m., Lehto fractured fourth finger of left hand while using a car mover to start nars. Car mover slipped causing Lehto to hit finger on rail.
No time lost. No compensation paid. 10% permanent disability paid amounting to $180.

Twelve days later, at 7:10 a.m., Lehto fractured and cut his right hand. The classifier had started and then stopped. Plant operator told Lehto to rock 18" pulley back to give classifier some play. Operator put power on and Lehto's fingers of the right hand were pulled in between pulley and belt.
24 weeks lost. Compensation paid: $1080.

14. PROPOSED NEW CONSTRUCTION None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

All equipment was transferred to other properties upon cancellation of the lease.

WANLESS MINE

ANNUAL REPORT

YEAR 1957

1. GENERAL

On February 25, 1957, pumping to dewater the pit was resumed at the Wanless mine which had been idle during the winter months. Five 34-ton trucks were returned to the Wanless on March 14 before road restrictions were put into effect for the spring breakup.

General repairs were resumed on the shovel and screening plant and a new conveyor belt was installed during April. Pumping was resumed from the Woodbridge shaft on April 22.

Mine operations were on a 1-shift, 5-day schedule during the year. Stripping was done on shifts when railroad cars were not available and when the Grading Department could not take Wanless ore. Splitting of coarse-fines at the other properties in 1957 made it difficult to grade Wanless ore.

Stockpiling of Wanless ore began on September 24 in order to insure a production of 200,000 tons for the season. This schedule was later reduced to 185,000 tons. All of the ore stockpiled during the season was screened and crushed prior to stockpiling.

The moisture content of the ore dropped from an average 18.42 per cent last year to an average 16.13 per cent for the 1957 season. Factors influencing the drop in moisture are the change in method of sampling, the reduction in blasting so that moisture would not be absorbed, and the increased efforts to keep water away from the immediate digging areas by ditching. The 3-line method of sampling railroad cars was put into effect on June 3, 1957. Samples were sent to the research laboratory to determine the effect of washing and scrubbing on moisture.

The ore season was completed on October 16. Stripping continued until November 21, 1957. Equipment was then moved out of the pit and trucks were transferred to other mines on November 22, 1957. Pumping at both the Woodbridge shaft and the Wanless pit was discontinued on November 22. The five 34-ton trucks were returned to the other mines and replaced by eight 22-ton trucks on October 31. Six of the 22-ton trucks were then brought back to other mines on November 22.

The mine office was closed on December 19, 1957, when it was finally decided that the Wanless would not operate in 1958.

2. PRODUCTION-SHIPMENTS-INVENTORIES

a. Production

Material	Wanless	Woodbridge	Total
Concentrates	926		926
Direct	120,781	55,367	176,148
	121,707	55,367	177,074

b. Shipments

Non-Bessemer			
Concentrates	926		926
Direct	113,480	46,219	159,699
	114,406	46,219	160,625

c. Stockpile Inventories

Direct	Tons
Wanless	7,301
Woodbridge	9,148
	16,449

d. Production by Months

Month	Wanless Direct	Wanless Concts	Woodbridge Direct	Total
May	22,017		8,610	30,627
June	11,991		21,552	33,543
July	30,391		18	30,409
August	26,281	926	237	27,444
Sept	10,992		16,922	27,914
Oct	19,109		8,028	27,137
	120,781	926	55,367	177,074

3. ANALYSIS

a. Crude Ore

Tons	Iron	Phos	Silica	Mang	Alum	Moisture
1,319	50.75	.099	8.75	.72	6.41	20.28

b. Tonnage & Analysis of Concentrates Produced

Ore	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Wanless Direct	120,781	51.26	.177	9.89	1.78	5.20	16.61
Wanless Concts	926	52.22	.101	7.99	1.12	5.41	18.68
Woodbridge Direct	55,367	53.94	.119	8.32	.86	4.80	15.05
	177,074	52.11	.158	9.39	1.49	5.07	16.13

c. Tonnage & Complete Analysis of Concentrates Shipped

Non-Bessemer Product	Tons	Iron	Phos	Sil.	Mang	Alum	Lime	Mag	Sulf	Ign Loss	Moisture
Wanless Concts	926	52.22	.101	7.99	1.12	5.41	.05	.07	.010	9.97	18.68
Wanless Direct	113,480	51.18	.174	9.99	1.80	5.20	.05	.07	.010	8.52	16.59
Woodbridge Direct	46,219	53.56	.123	8.54	.88	5.06	.08	.11	.012	8.07	15.02
	160,625	51.87	.159	9.56	1.53	5.16	.08	.08	.011	8.43	16.16

d. Mine Analysis of Ore in Stockpile

Direct	Tons	Iron	Phos	Silica	Mang	Alum	Moisture
Wanless	7,301	52.62	.226	8.48	1.60	5.13	16.72
Woodbridge	9,148	55.83	.099	7.20	.75	3.51	15.20
	16,449	54.41	.155	7.77	1.13	4.23	15.88

4. ESTIMATE of ORE RESERVES

a. Developed Ore - Factors Used

Ore No.	Cubic Feet Per Ton	Rock Deduction	Per Cent Recovery
1	14	0	100
2	14	0	100

b. Ore Reserves Estimated as of December 31, 1957

Wanless & Woodbridge	Reserve 12-31-56	Mined 1957	Balance After Mining	Changed by Re-estimate	Reserve 12-31-57
Woodbridge	240,166	55,366	184,800		184,800
Wanless					
Open Pit	1,021,229	121,708	899,521		899,521
Underground	141,028		141,028		141,028
	1,402,423	177,074	1,225,349		1,225,349

c. Estimated Analyses of Reserves

Lease	Tons	Iron	Phos	Silica	Mang	Alum
Woodbridge						
SE-NE 16-58-19						
Open Pit No. 1	109,741	54.37	.086	7.30	1.11	1.11
Open Pit No. 2	75,059	50.67	.106	11.80	1.63	3.99
	184,800	52.87	.094	9.13	1.32	2.28
Wanless						
NE-SE 16-58-19						
Open Pit No. 1	722,588	54.03	.115	9.22	1.43	2.93
Open Pit No. 2	176,933	48.59	.114	14.24	1.44	5.88
Underground No. 1	41,600	53.50	.151	9.52	.90	2.65
Underground No. 2	99,428	49.05	.092	14.33	1.78	3.81
	1,040,549	52.61	.114	10.57	1.44	3.50
Total Mine						
No. 1	873,929	54.05	.113	8.99	1.36	2.69
No. 2	351,420	49.16	.106	13.74	1.58	4.89
	1,225,349	52.65	.111	10.35	1.41	3.32

5. LABOR & WAGES

a. Comments

Four men were recalled on April 2 to resume repairs on the shovel and screening plant. The rest of the men were called back to work for the beginning of ore season on May 1. All hourly employees were laid off in November.

Although labor relations improved over the previous year, the 1957 season witnessed many gripes. Much labor tension was brought on by the small crew and the diversified duties given to each man--a necessary procedure if the mine was to be economically operated.

b. Comparative Statement of Production & Wages

Direct Ore-Tons	177,074
Number of Days Operated	80.5
Average Number of Men Working	15
Average Wage Per Man	$24.44
Production Per Man Per Day	78.18
Labor Cost Per Man Per Day	$0.312
Total Number of Man Days	2265
Amount Paid for Labor	$55,358.51

6. GENERAL SURFACE

a. Building & Repairs

No major building or repair programs during 1957.

b. Roads

No changes in haul roads in 1957.

7. OPEN PIT

a. Stripping

Stripping was carried on from May 1 to November 22, and some stripping was done during the regular ore season when railroad cars were not available. Stripping continued from the end of the ore season (October 16) to November 22 on a 1-shift, 5-day schedule. 5 trucks, 2 tractors, 1 grader, 1 85-B electric shovel, and 1 churn drill were available for stripping and mining operations during the year.

Material moved averaged 1369 cubic yards per shift. Moving the shovel from ore to stripping each day, narrow benches, and shallow cuts contributed to stripping delays. Following is a summary of Wanless stripping in 1957:

E&A No.	Cubic Yards	Cost Per Yard
800	75,150	$0.771
934	16,268	1.146
	91,418	$0.838

b. Open Pit Mining

114,407 tons of Wanless and 46,218 tons of Woodbridge were shipped during the year for a total of 160,625 tons. 121,708 tons of Wanless and 55,366 tons of Woodbridge were produced for a total of 177,074 tons. The difference of 16,449 tons was stockpiled. The scheduled production of 200,000 tons was not mined due mainly to the grading problem. Considerable splitting of coarse-fines at the other Cleveland-Cliffs mines made it difficult to grade off the Wanless ore.

Ore operations began on May 1 on a 1-shift, 5-day schedule and continued until October 16. It became apparent during the latter part of the season that ore would have to be stockpiled if the 200,000 tons were produced. This schedule was later reduced to 185,000 tons; but even with the cut in production, the Grading Department could not take all the Wanless ore, so that 16,449 tons were left in stockpile at the end of the ore season.

c. Pumping & Drainage

Pumping to dewater the pit before the start of ore season was resumed February 25; pumping from the Woodbridge shaft began April 22; and pumping from the Wanless pit and Woodbridge shaft was discontinued November 22.

The 250 hp Layne-Bowler pump in the Wanless pit was lowered 30 feet in June. A 125 hp Layne-Bowler pump belonging to the Wanless was taken out of storage at the Central Warehouse and installed in October.

Snyder Mining Company was contacted in December to consider taking over the pumping at the Wanless mine and at year's end was doing so, using the Wanless pump but supplying power from the Whiteside mine.

8. BENEFICIATION

Fluctuation in moisture content of Wanless ore was investigated jointly with Lerch Brothers, and it was decided by both parties to use the 3-line method of sampling railroad cars beginning June 3. An experimental stockpile was started to determine what effect stockpiling would have in reducing moisture. Moisture samples from this stockpile indicated stockpiling was of little help in moisture reduction on this particular type of ore.

A sample of Wanless ore was sent to the test laboratory to investigate the possibility of reducing moisture by washing and/or scrubbing. Washing proved ineffective in making a substantial moisture reduction; scrubbing, followed by screening and classification, showed favorable results. Because of the encouraging scrubbing results, 30 cars of Wanless crude were sent to Rhude & Fryberger's Boeing plant for further scrubbing test work which, however, proved disappointing. About 500 pounds were cut from the Wanless crude being processed at the Boeing plant and sent to the ore test laboratory where further scrubbing tended to verify the Boeing plant results. Reports have been submitted on the test laboratory results. No recommendation can be made on the basis of test work to date because of the different results that were obtained.

9. MAINTENANCE & REPAIRS

Preparations to resume operations for the 1957 ore season began in April. Minor repairs were made on the shovel, trucks, tractors, graders, screening plant, etc. No repairs were made to buildings or equipment after November 22. All hourly employees were laid off at that time.

10. ~~COST of OPERATIONS~~

A. Comparative Mining ~~Costs~~ DATA

Product	1957 Budget	1957 Year	1956 Actual
Direct Ore-Tons	200,000	176,148	257,349
Concentrates		926	
	200,000	177,074	257,349
Average Daily Product		22.05	24.74
Tons Per Man Per Day		78.18	86.53
Days Operated		80.5	104
Costs			
Total			
Pit Operating	$0.484	$0.496	$0.400
Pit & Beneficiation	0.680	0.595	0.477
General Mine Expense	0.176	0.130	0.164
Winter & Idle	0.150		
Cost of Production	$1.006	$0.725	$0.641
Equipment Rental	0.187		
Taxes			
Ad Valorem		0.128	0.060
Occupational		0.180	0.249
Underlying Royalty		0.002	0.001
Total Cost on Cars	$1.193	$1.035*	$0.951*

*Final Cleveland Figures

DO NOT TYPE (TL)

b. Cost Comments

The difference between actual costs and budget figures for the major items is as follows:

	1957		
	Budget	Actual	Difference
Pit Operating	$0.484	$0.496	+$0.012
Pit & Beneficiation	0.680	0.595	- 0.085
General Mine Expense	0.176	0.130	- 0.046
Winter & Idle	0.150		
	$1.006	$0.725	-$0.281

Total Pit Operating
is $0.012 per ton higher than the budget because more hard ore was encountered than was anticipated, thus increasing costs on items such as drilling, blasting, operating shovels, and operating the screening plant. Maintenance of the screening plant was higher than the budget because the mine was without railroad cars more than was anticipated, making it necessary to assign men to minor plant repairs rather than to send them home. Maintenance of trucks was considerably lower than the budget because an allowance was made in the budget to cover a 12 per cent grade increase in the ore haul road out of the pit, but this grade increase was not made. The lower-than-budget production increased pumping and other costs having an element of fixed expense in their makeup.

Total Pit & Beneficiation
is $0.085 per ton lower than the budget because of loading and stocking, loading stockpile ore, and employee vacation pay. No manganiferous ore was stockpiled and reloaded as was originally planned when preparing the budget.

General Mine Expense
is $0.046 per ton lower than the budget because of insurance-property, etc. It appears that an overcharge was made in 1956 and was adjusted in 1957.

DO NOT TYPE (RLT)

11. EXPLORATION & FUTURE EXPLORATION — None

12. TAXES

	1957		1956		Increase-Decrease	
	Assessed Value	Taxes	Assessed Value	Taxes	Assessed Value	Taxes
Real Estate						
Mineral	$194,143	$20,130.69	$234,477	$18,929.33	-$40,334	/$1,201.36
Lands,Bldgs,Machinery	2,032	214.37	2,032	166.43		/ 47.94
Personal Property						
Equipment	9,294	963.69	10,508	848.31	- 1,214	/ 115.38
Lean Ore Stockpile	2,493	258.51	2,349	189.63	/ 144	/ 68.88
	$207,962	$21,567.26	$249,366	$20,133.70	-$41,404	/$1,433.56
Average Mill Rate		103.71		80.74		

Note: Increased mill rate of 22.97 mills or 28.45% over 1956 more than offset decrease in taxable value of 19.91%.

Tax Commission Reserve

as of	Tons
May 1, 1957	1,402,423
May 1, 1956	1,659,772
	-257,349

13. ACCIDENTS & PERSONAL INJURY — No lost-time accidents.

14. PROPOSED NEW CONSTRUCTION — None

15. EQUIPMENT RECEIVED & PROPOSED NEW EQUIPMENT

a. Equipment Received

All haulage trucks rented from other Cleveland-Cliffs mines.

b. Proposed New Equipment — None

Safety Department

Annual Report

Year 1957

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents

Two fatal accidents occurred at our properties during the year. One of these accidents happened at the Bunker Hill Mine and the other at the Mather Mine "B" Shaft. With the average of 3200 employees the fatality rate for 1957 is 0.62. This compares with the average fatality rate since 1911 to 1957 inclusive of 1.75. These rates are based on per thousand employees.

Following are brief descriptions of the two fatal accidents:

Bunker Hill Mine - Ellsworth Richard Chapman

Chapman was fatally injured at about 5 P.M. on January 27, 1957. This occurred in the south skip compartment while the crew of three men were taking the twist out of the skip rope. A fall of dirt and debris is believed to have fallen from a broken wooden platform which formerly was the skip tender's landing just below the old 9th level elevation. Inspection of the shaft had been made on the night of the 25th and although this dirt had been seen on this and previous inspections, the shaftmen did not consider it involved any hazard. After the accident, inspection showed that the plank platform was rotted from age. The dirt and debris which fell into the shaft struck the safety bonnet of the skip with such force that it broke one of the supporting chains of the bonnet causing it to tilt and strike Chapman across the side of the head, face and neck. Death was instantaneous.

The accident was Classified as a II 7 - Failure To Provide Proper Tools, Appliances or Place To Work.

Mather Mine "B" Shaft - Thomas Sharp

Sharp was struck by a piece of rock which had been thrown by a blast. The rock caused a skull fracture. The accident occurred on April 29, 1957, and Mr. Sharp died from the injury on May 3, 1957. Cause of the accident was a violation of blasting safety rules. Only two crews were working on the 10th level, one a diamond drill crew working in a cross cut and the other a three man crew driving the main drift. When the contract #54 which was driving the main drift was ready to blast they failed to notify the diamond drill crew. Mr. Sharp carrying a drill sludge sample just happened to arrive at the switch of the X-cut when #54 contract fired the blast electrically and although Mr. Sharp was 243 feet from the blast a chunk or chunks struck him in the head. Number 54 contract miners admitted that the supervisors had reminded them they must warn the diamond drill crew of every blast and guard all entrances.

The accident was Classified as III B 3 - Violation of Rules, Other Workmen.

Safety Department

Annual Report

Year 1957

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE I

FATAL ACCIDENT RECORD
THE CLEVELAND CLIFFS IRON CO.
MINING & ELECTRIC POWER DEPARTMENTS
1898-1957, INCLUSIVE.

YEAR	NO. MEN EMPLOYED	NO. OF FATALITIES	FATALITY RATE
1898	1065	6	5.63
1899	1174	4	3.41
1900	1427	4	2.80
	3,666	14	3.79
1901	1317	9	6.83
1902	1485	8	5.38
1903	1551	8	5.15
1904	1338	4	2.97
1905	2038	12	6.54
	7,729	41	5.30
1906	2418	10	4.13
1907	2843	17	6.00
1908	2340	6	2.52
1909	2520	13	5.15
1910	2907	20	6.88
	13,028	66	5.06
1898 - 1910		121	4.99
1911	2633	5	1.90
1912	2335	4	1.71
1913	2521	11	4.19
1914	2435	10	4.10
1915	3308	5	1.51
	13,332	35	2.70
1916	3063	8	2.61
1917	3457	6	1.73
1918	3765	13	3.45
1919	3938	11	2.79
1920	4125	5	1.21
	18,348	43	2.36
1921	2309	6	2.60
1922	2301	1	.43
1923	2728	6	2.20
1924	2472	5	2.02
1925	2472	2	.81
	12,282	20	1.61

Safety Department

Annual Report

Year 1957

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE 1 (Cont'd)

YEAR	NO. MEN EMPLOYED	NO. OF FATALITIES	FATALITY RATE
1926	2119	55	25.96
1927	1969	4	2.03
1928	1784	4	2.25
1929	2000	4	2.00
1930	2566	5	1.95
	10,438	72	6.90
1931	1651	3	1.82
1932	630	0	0.00
1933	6631	2	3.17
1934	1073	4	3.74
1935	1313	2	1.53
	5,298	11	2.05
1936	2125	2	.94
1937	2763	1	.36
1938	2590	3	1.17
1939	2457	1	.41
1940	2756	5	1.88
	12,691	12	.94
1941	3570	5	1.40
1942	3562	2	.56
1943	3609	4	1.11
1944	3584	3	.84
1945	3078	1	.32
	17,403	15	.86
1946	2791	0	0.00
1947	3942	7	1.78
1948	4003	3	.75
1949	4191	1	.24
1950	4344	5	1.15
	19,271	16	.83
1951	4975	2	.40
1952	4906	5	1.02
1953	4952	2	.40
1954	3946	0	0.00
1955	3742	4	1.07
	22,521	13	.58
1956	3878	0	0.00
1957	3200	2	.62
1911 - 1957	138,662	239	1.72

BASED ON PER THOUSAND EMPLOYEES

Safety Department

Annual Report

Year 1957

11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE II

CLASSIFICATION OF CAUSES OF FATAL ACCIDENTS
FROM DECEMBER 1, 1898 TO DECEMBER 31, 1957.

A.	Fall of Ground	115	
	Run of Mud or Sand	60	
	Fall of Chunk of Ore from Chute	3	
	Stray Chunk or Stick Down Raise or Stope	4	182
B.	Shaft Accidents:		
	Falling Down Shaft	16	
	Rock or Timber Falling Down Shaft	4	
	Struck or Caught by Cage, Skip, Bucket, Tool	8	
	Falling from Cage, Skip or Bucket	11	
	Falling from Ladder in Shaft	5	
	Carried or Pushed Into Shaft by Car	3	
	Jumping on or off Cage, Skip or Bucket	3	
	Struck by Crosshead	5	
	Struck by Falling Material	2	57
C.	Use of Explosives:		
	Explosion of Powder	20	
	Premature Blast	3	
	Fall of Ground or Timber Due to a Blast	4	
	Overcome by Gas	3	
	Miscellaneous Causes	2	32
D.	Mine, Railroad Cars, Trucks, Etc.:		
	Caught by Haulage Cars	16	
	Riding or Attempting to Ride Cars	6	
	Falling with Car from Trestle	4	
	Run Over by Railroad Car	8	
	Struck by Locomotive	3	
	Truck Haulage	1	
	Miscellaneous Causes	1	39
E.	Miscellaneous Causes:		
	Falling in Raise, Stope or Pocket	10	
	Electric Shock	12	
	Falling from Ladder, Trestle, etc.	8	
	By Moving Machinery	8	
	Mine Fires	3	
	Stockpile Slide	3	
	Slipping and Falling	1	
	Miscellaneous Causes	5	50
	TOTALS		360

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE III

CLASSIFICATION OF FATAL ACCIDENTS - 1911 TO 1957, INCLUSIVE
BY THE CENTRAL SAFETY COMMITTEE

I.	Trade Risk		127
II.	Negligence of Company		
	Violation of Rules	6	
	Failure to Provide Safety Devices.	7	
	Improper Method of Doing Work.	12	
	Failure to Provide Tools or Safe Places to Work. .	6	
	Failure to Instruct Men.	5	
	Improper Act or Selection of Improper Method of Doing Work (By Foreman)	1	37
III.	Negligence of Workmen		
	A. Injured Men:		
	Improper Act or Improper Method of Work.	29	
	Violation of Rules	10	
	Failure to Use Tools or Appliances Provided.	4	
	Failure to Use Safety Devices.	4	47
	B. Other Men:		
	Improper Act or Improper Method of Work.	14	
	Violation of Rules	5	
	Failure to Use Tools or Appliances Provided.	1	20
	A.B. Injured Men & Other Men:		
	Improper Act or Improper Method of Work.	4	4
II.-5 IIIA3, IIIB3	Failure to Instruct Men by Foreman and Violation of Rules by Injured Man and Partner.	1	1
II.-5 IIIA4, IIIB4	Failure to Instruct Men as to Method of Work and Improper Method of Doing Work by Injured Workman and Other Workmen.	2	2
II.-2 IIIA2 IIIB2	Failure to Use Proper Tools or Appliances Provided (By the Foreman, Injured Workman And Other Workmen.	1	1
	TOTALS.		239

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries

Causes of Compensable Injuries - Underground

Falls of ground by far caused most of the injuries underground with a total of 20, but the severity was not as high as usual.

Falling chunks and debris in chutes, shafts and raises caused 12 injuries with severity high because of a fatality.

Falls of persons and haulage each caused 9 injuries. It is peculiar that many of the falls were in comparatively good areas with very few stumbling hazards. Drilling equipment and lifting caused 8 injuries each. Most drilling equipment injuries happened when drill rods broke. Lifting caused sprains, strains and hernia.

Of the other 37 injuries they are divided over 16 other causes.

Surface at underground mines

There was a total of 9 compensable injuries, three of which were caused by falling material, two by lifting or pulling and one each of the other four classifications. The Cambria-Jackson, Cliffs Shaft and Maas Mines had no compensable injuries.

Open Pits

A total of 18 compensable injuries were reported and these were from 13 causes. There were two each from hand tools, lifting, falling from a ladder, handling material, and caught in a conveyor belt.

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries

INTERPRETATION OF INJURY RATES

That injury frequency rates are much more significant than sets of abstract figures punctuated with decimal points is forcefully recognized when they are interpreted in terms of employees.

Using an average of 2,000 hours per employee per year, 1,000,000 hours represents the yearly exposure of about 500 employees. An injury frequency rate of 10.0 per 1,000,000 man-hours, then, indicates 10 disabling injuries per year among each 500 employees, or 1 injury among 50. In a plant with a frequency rate of 20.0, approximately one employee out of every 25 is suffering a disabling injury each year.

The severity rate is the number of days lost and charged per each 1,000,000 hours worked. Because of the inclusion of time charges, which generally are in excess of the actual number of days lost, it is incorrect to say that the rate represents days lost in relation to a given number of employees.

The severity rate actually is a single rate which measures both the frequency and severity of injuries. Whereas the frequency rate is determined by counting each injury as 1, regardless of the seriousness of the case, the severity rate is determined by counting each injury the number of times indicated by its time charge--i.e., according to its relative severity.

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE IV

CLASSIFICATION OF COMPENSABLE INJURIES

-CLASSIFICATION-	BUNKER HILL	CAMBRIA JACKSON	CANISTEO	CLIFFS SHAFT	DIAMOND DRILLS	ELEC. POWER DIV.	HAWKINS	HILL TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	MAAS	MATHER MINE "A" SHAFT	MATHER MINE "B" SHAFT	MISCELLANEOUS	ORE IMPRV. PLANT	OHIO	PELLET PLANT	REPUBLIC	SARGENT	STHSE & SHOPS	WANLESS	TOTAL
I. Trade Risk, Incidental and Non-Preventable	4		1	5	1		1	1	1		6	7	6		1					1		35
II. Negligence of Company:																						
1. Failure to Use Safety Devices Provided																						0
2. Failure to Use Proper Tools Provided																						0
3. Violation of Rules					1																	1
4. Improper Act or Selection of Method of Doing Work (By Foreman)																						0
5. Failure to Instruct Men as to Hazards, Method, Etc.				1																		1
6. Failure to Provide Safety Devices				1				1					1				1					4
7. Failure to Provide Tools, Appliances or Places to Work	1			1							1								1			4
III. Negligence of Workmen:																						
A. Injured Workman																						
1. Failure to Use Safety Devices Provided												1										1
2. Failure to Use Proper Tools,Etc. Provided	1																					1
3. Violation of Rules				1								2			2							5
4. Improper Act or Method of Doing Work	9	1	2	6	1		1	2			8	9	12		2			2		1		56
B. Other Workman																						
1. Failure to Use Safety Devices Provided																						0
2. Failure to Use Proper Tools,Etc. Provided																						0
3. Violation of Rules	1												1									2
4. Improper Act or Method of Doing Work													1					1				2

II. ACCIDENTS AND PERSONAL INJURY

b. ALL Injuries (Continued)

TABLE IV (CONT'D)

CLASSIFICATION OF COMPENSABLE INJURIES

(COMBINED) -CLASSIFICATION-	BUNKER HILL	CAMBRIA JACKSON	CANISTEO	CLIFFS SHAFT	DIAMOND DRILLS	ELEC. POWER DIV.	HAWKINS	HILL TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	MAAS	MATHER MINE "A" SHAFT	MATHER MINE "B" SHAFT	MISCELLANEOUS	ORE IMPROV. PLANT	OHIO	PELLET PLANT	REPUBLIC	SARGENT	STHSE & SHOPS	WANLESS	TOTAL
III-A-4 and III-B-4			1				1			1	2	4			1							10
II-5, III-A-4 & III-B-4	1											1				1						3
III-A-3 & III-B-3	2									1												3
II-7 & III-A-3	1																					1
II-4, II-6 & III-A-3			1																			1
II-7 & III-A-4			1							1								1				3
II-7, IIIA-$ & III-B-4			1																			1
II-3 & III-B-3										1	1											2
III-A-2 & III-A-4										1		1										2
II-3 & III-A-3											1											1
III-A-3 & III-A-4												1										1
II-5 & II-7												1										1
II-6 & III-A-3																	1					1
TOTALS *	20	1	3	19	3	0	2	5	1	0	20	23	29	0	6	1	1	4	2	2	0	142

* Totals are for This Page and Preceding Page.

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11. ACCIDENDS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE V

NUMBER OF MAN-SHIFTS WORKED
AND TONS OF ORE PRODUCED PER FATALITY

YEAR	NUMBER OF FATALITIES	NUMBER OF MAN-DAYS WORKED PER FATALITY	NUMBER OF TONS OF ORE MINED PER FATALITY
1938	3	163,434	385,954
1939	1	564,433	3,713,389
1940	5	142,878	1,156,387
1941	5	182,340	1,456,528
1942	2	512,356	3,808,258
1943	4	269,351	1,624,315
1944	3	331,090	1,995,787
1945	1	915,666	5,970,577
1946	0	747,079 *	4,416,253 **
1947	7	153,031	1,130,679
1948	3	386,965	2,869,090
1949	1	1,013,442	7,162,324
1950	5	233,060	1,647,066
1951	2	679,740	4,507,045
1952	5	239,483	1,493,841
1953	2	617,377	4,482,063
1954	0	884,848 *	6,280,483 **
1955	4	223,940	2,147,324
1956	0	911,240 *	8,908,456 **
1957	2	463,167	4,367,207
TOTALS	55	17,599,801	135,787,234
20 Year Average	2.75	319,996	2,468,859

* Man-Days Worked During Year Without Fatality

** Amount of Ore Mined During Year Without Fatality

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VI

RESUME OF ALL LOST TIME INJURIES & FATALITIES

Mine or Plant	Less Than 7 Days	7 Days Or More	Fatalities	TOTAL
BUNKER HILL	10	19	1	30
CAMBRIA JACKSON	3	1		4
CANISTEO	0	3		3
CLIFFS SHAFT	6	19		25
DIAMOND DRILLS	1	3		4
ELEC. POWER DEPT.	0	0		0
HAWKINS	3	2		5
HOLMAN CLIFFS	3	1		4
HILL TRUMBULL	2	5		7
HUMBOLDT	1	0		1
MAAS	11	20		31
MATHER MINE, "A" SHAFT	20	23		43
MATHER MINE, "B" SHAFT	39	28	1	68
MISCELLANEOUS - MICHIGAN	0	0		0
MISCELLANEOUS - MINNESOTA	0	0		0
OHIO	0	1		1
ORE IMPROVEMENT PLANT	1	6		7
PELLETIZING PLANT	5	1		6
REPUBLIC	0	4		4
RESEARCH LABORATORY	0	0		0
SARGENT (OPEN PIT)	0	2		2
STHSE & SHOPS	0	2		2
TILDEN	0	0		0
WANLESS	0	0		0
TOTALS	105	140	2	247

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VII

CAUSES OF COMPENSABLE INJURIES -- UNDERGROUND

CAUSE	BUNKER HILL	CAMBRIA JACKSON	CLIFFS SHAFT	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	TOTAL
Fall of Ground	2		3	2	7	6	20
Falling Chunks, Etc. (Shafts, Chutes, Raises)	4		3	3	1	1	12
Persons Falling (Shafts, Raises, Scaffolds, Etc.)				2		3	5
Persons Falling (Slipping and Stumbling)	2		4	2	1		9
Haulage	1		4	2	1	1	9
Flying Objects	2		1		1		4
Drilling Equipment	1	1	1	3		2	8
Lifting or Pulling	3			2	1	2	8
Handling Material	1				1	2	4
Falling Material					3	3	6
Electricity	2						2
Rolling Chunks			1	2	1		4
Falling from Bench			1				1
Chemical Burns			1				1
Bumping Timber Cap				1			1
Jumping from Coupling				1			1
Caught by Conveyor					2		2
Bouncing Scraper Rope					1		1
Loading Equipment						1	1
Flying Particles						1	1
Explosives						1	1
Hand Tools						2	2
TOTAL	18	1	19	20	20	25	103

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VII (Cont'd)

CAUSES OF COMPENSABLE INJURIES -- OPEN PITS

CAUSE	CANISTEO	HAWKINS	HILL TRUMBULL	HOLMAN CLIFFS	HUMBOLDT	OHIO	REPUBLIC	SARGENT	TILDEN	WANLESS	TOTAL
Chunk From Shovel Bucket	1										1
Hand Tools	1		1								2
Falling Into Classifier			1								1
Struck by Swinging Shovel Bucket	1										1
Lifting or Pulling		1		1							2
Falling from Ladder		1					1				2
Handling Material			1				1				2
Caught by Conveyor			1					1			2
Truck Tail-gate			1								1
Caught in Sheave						1					1
Jumping from Truck							1				1
Electricity							1				1
Dropping R. R. Cars								1			1
TOTAL	3	2	5	1	0	1	4	2	0	0	18

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VII (Cont'd)

CAUSES OF COMPENSABLE INJURIES -- SURFACE (Underground Mines)

CAUSE	BUNKER HILL	CAMBRIA JACKSON	CLIFFS SHAFT	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	TOTAL
Slipping and Stumbling	1						1
Falling Material	1				1	1	3
Dropping R. R. Cars					1		1
Lifting or Pulling					1	1	2
Falling from Ladder						1	1
Chemical Burns						1	1
TOTAL	2	0	0	0	3	4	9

OTHER OPERATIONS

CAUSE	ELEC. POWER DEPT.	DIAMOND DRILL DEPT.	ORE IMP. PLANT	PELLET PLANT	STHSE SHOPS GARAGE	MISC. MICH.	MISC. MINN.	TOTAL
Drilling Equipment		2	1					3
Burns from Boiler		1						1
Handling Material			1		1			2
Electricity					1			1
Dropping R. R. Cars			2					2
Falling Material			1					1
Caught by Conveyor			1	1				2
TOTAL	0	3	6	1	2	0	0	12

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VIII

FREQUENCY RATES, ALL COMPENSABLE INJURIES

YEAR	TOTAL MAN DAYS WORKED	NUMBER OF COMPENSABLE INJURIES NON-FATAL	FATAL	FREQUENCY * RATE
1940	714,391	59	5	11.19
1941	918,300	79	5	11.43
1942	1,024,713	75	2	9.39
1943	1,077,402 ¼	171	4	20.30
1944	993,272 ½	121	3	15.61
1945	915,665 3/4	107	1	14.74
1946	747,079	101	0	16.89
1947	1,071,219	149	7	18.20
1948	1,160,896 ¼	145	3	15.94
1949	1,013,442	126	1	15.66
1950	1,165,301 ½	145	5	16.09
1951	1,359,479 3/4	136	2	12.69
1952	1,197,416 ½	152	5	15.87
1953	1,234,755 ¼	152	2	15.39
1954	884,848	99	0	13.99
1955	895,762	121	4	17.44
1956	911,240 ¼	139	0	19.07
1957	926,334	140	2	19.16

* Based on One Million Man-Hours of Labor.

TABLE VIII-A

SEVERITY RATES, ALL COMPENSABLE INJURIES

YEAR	NON-FATAL DAYS LOST	RATE	FATAL DAYS LOST	DAYS LOST ALL INJURIES	SEVERITY * RATE
1940	3,442	.602	30,000	33,442	5.852
1941	5,403	.735	30,000	35,403	4.819
1942	5,851	.500	12,000	17,851	2.177
1943	10,355	1.201	24,000	34,355	3.986
1944	7,759	.976	18,000	25,759	3.242
1945	7,624	1.041	6,000	13,624	1.860
1946	7,994	1.337	0	7,994	1.337
1947	9,946	1.161	42,000	51,946	6.062
1948	14,526	1.564	18,000	32,526	3.502
1949	5,833	.719	6,000	11,833	1.390
1950	7,063	.757	30,000	37,063	3.976
1951	10,657	.979	12,000	22,657	2.083
1952	17,716	1.849	30,000	47,716	4.981
1953	8,587	.869	12,000	20,587	2.084
1954	6,502	.919	0	6,502	.919
1955	7,392	1,832	24,000	31,392	4,381
1956	5,560	.763	0	5,560	.763
1957	6,302	.850	12,000	18,302	2,470

* Based on Days Lost by Injuries Per 1,000 Man-Hours of Labor except for Years 1955, 1956 and 1957 which are based on new rate - 1,000,000 Man-Hours of Labor.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE IX

COMPARISON OF COMPENSABLE ACCIDENTS, INCLUDING FATALITIES
(BY MINES)

Mine or Plant	FREQUENCY 1956	FREQUENCY 1957	SEVERITY 1956	SEVERITY 1957
BUNKER HILL	23.08	29.48	614	9,791
CAMBRIA JACKSON	10.83	4.13	1,318	136
CANISTEO	15.38	10.80	435	443
CLIFFS SHAFT	13.17	28.37	661	1,220
DIAMOND DRILL DEPT.		29.52		876
ELEC. POWER DEPT.	.00	.00	0	0
GENERAL ROLL	.00	.00	0	0
HAWKINS	9.66	7.22	258	437
HILL TRUMBULL	7.53	17.05	147	634
HOLMAN CLIFFS	16.97	3.99	316	60
HUMBOLDT	21.86	.00	780	0
MAAS	38.03	44.76	1,694	2,742
MATHER MINE, "A" SHAFT	23.06	21.13	845	817
MATHER MINE, "B" SHAFT	26.07	23.37	1,156	5,529
MISCELLANEOUS - MICH.	.00	.00	0	0
MISCELLANEOUS - MINN.	.00	.00	0	0
OHIO	15.85	12.89	396	5,157
ORE IMPROVEMENT PLANT		79.96		4,971
PELLETIZING PLANT	48.52	5.67	954	91
REPUBLIC	18.60	22.74	211	625
SARGENT (OPEN PIT)	25.64	75.32	308	12,993
STHSE & SHOPS	16.95	7.51	944	207
TILDEN	.00	.00	0	0
WANLESS	25.60	.00	563	0
All Properties	19.07	19.16	763	2,470

Note: Severity rating based on 1,000,000 Man-Hours of Labor.

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE X

COMPENSABLE INJURIES INCLUDING FATALITIES

Mine or Plant	Tons Of Ore Produced	Hours Of Labor	No. Of Fatalities	No. Of Comp. Inj.	Days Lost, Fatalities	Compensable Days Lost	Total Days Lost - Fatalities & Compens.	Frequency	Severity
AGNES	724								
BUNKER HILL	503,604	678,345	1	19	6,000	642	6,642	29.48	9,791
CAMBRIA JACKSON	169,400	242,366		1		33	33	4.13	136
CLIFFS SHAFT	760,695	669,681		19		817	817	28.37	1,220
MAAS	492,725	446,786		20		1,225	1,225	44.76	2,742
MATHER MINE "A" SHAFT	1,350,201	1,088,387		23		889	889	21.13	817
MATHER MINE "B" SHAFT	1,296,499	1,241,170	1	28	6,000	863	6,863	23.37	5,529
TOTALS	4,573,848	4,366,735	2	110	12,000	4,469	16,469	25.65	3,771
CANISTEO	790,405	277,806		3		123	123	10.80	443
HAWKINS	673,248	276,930		2		121	121	7.22	437
HILL TRUMBULL	659,078	293,231		5		186	186	17.05	634
HOLMAN CLIFFS	859,204	250,596		1		15	15	3.99	60
HUMBOLDT	283,206	194,479						.00	0
OHIO	116,701	77,560		1		400	400	12.89	5,157
REPUBLIC	323,860	175,901		4		110	110	22.74	625
SARGENT	76,629	26,553		2		345	345	75.32	12,993
TILDEN	201,161	18,780						.00	0
WANLESS	177,074	30,054						.00	0
TOTALS	4,160,566	1,621,890		18		1,300	1,300	11.10	802
DIAMOND DRILL DEPT.		101,643		3		89	89	29.52	876
ELECTRIC POWER DEPT.		73,931						.00	0
GEN. STHSE & SHOPS		266,157		2		55	55	7.51	207
GENERAL ROLL		631,242						.00	0
HIBBING - MISC.		42,186						.00	0
MISCELLANEOUS		55,360						.00	0
PELLETIZING PLANT		176,493		1		16	16	5.67	91
ORE IMPROVEMENT PLANT		75,038		6		373	373	79.96	4,971
TOTALS		1,422,050		12		533	533	8.44	375
GRAND TOTALS	8,734,414	7,410,675	2	140	12,000	6,302	18,302	19.16	2,470

THE CLEVELAND-CLIFFS IRON COMPANY
SAFETY DEPARTMENT, ACCIDENT STATISTICS, YEAR 1957

Mine or Plant	Position Rating	Hours Labor	No. of Fatals	Compens. Injuries	Non-Comp. 1 - 7 Days	Compen. Days Lost	Days Lost Non-Compen. 1 - 7 Days	Lost Time Injuries Incl. Fatals	Days Lost, All Injur. & Fatals	Frequency	Severity	Avg. Days Lost Per Injury	Type Of Operation
CAMBRIA JACKSON	1	242,366		1	3	33	7	4	40	16.50	165	10	Underground
MATHER MINE, "A" SHAFT	2	1,088,387		23	20	889	58	43	947	39.51	870	22	
CLIFFS SHAFT	3	669,681		19	6	817	23	25	840	37.33	1,254	34	
MAAS	4	446,786		20	11	1,225	38	31	1,263	69.38	2,827	41	
MATHER MINE, "B" SHAFT	5	1,241,170	1	28	39	6,863	119	68	6,982	54.79	5,625	103	
BUNKER HILL	6	678,345	1	19	10	6,642	38	30	6,680	44.23	9,847	223	
TOTAL		4,366,735	2	110	89	16,469	283	201	16,752	46.03	3,836	83	
WANLESS	1	30,054								.00	0	0	Open-Pit
TILDEN	2	18,780								.00	0	0	
HUMBOLDT	3	194,479			1		2	1	2	5.14	10	2	
HOLMAN CLIFFS	4	250,596		1	3	15	10	4	25	15.96	100	6	
CANISTEO	5	277,806		3		123		3	123	10.80	443	41	
HAWKINS	6	276,930		2	3	121	9	5	130	18.06	469	26	
REPUBLIC	7	175,901		4		110		4	110	22.74	625	27	
HILL TRUMBULL	8	293,231		5	2	186	8	7	194	23.87	662	28	
OHIO	9	77,560		1		400		1	400	12.89	5,157	400	
SARGENT	10	26,553		2		345		2	345	75.32	12,993	172	
TOTAL		1,621,890		18	9	1,300	29	27	1,329	16.65	819	49	
GENERAL ROLL	1	631,242								.00	0	0	Independent
ELEC. POWER DIV.	2	73,931								.00	0	0	
MISCELLANEOUS	3	55,360								.00	0	0	
MISC. - HIBBING	4	42,186								.00	0	0	
PELLETIZING PLANT	5	176,493		1	5	16	14	6	30	34.00	170	5	
STHSE & SHOPS	6	266,157		2		55		2	55	7.51	207	27	
DIAMOND DRILLS	7	101,643		3	1	89	4	4	93	39.35	915	23	
ORE IMPROVEMENT PLANT	8	75,038		6	1	373	4	7	377	93.29	5,024	54	
TOTAL		1,422,050		12	7	533	22	19	555	13.36	390	29	
GRAND TOTALS		7,410,675	2	140	105	18,302	334	247	18,636	33.33	2,515	75	

TABLE XI (1)

THE CLEVELAND-CLIFFS IRON COMPANY
SAFETY DEPARTMENT, ACCIDENT STATISTICS, YEAR 1957

Mine or Plant - MICHIGAN	Position Rating	Hours Labor	No. of Fatals	Compens. Injuries	Non-comp. 1 - 7 Days	Compens. Days Lost	Days Lost Non-comp. 1 - 7 Days	Lost Time Injur. Incl Fatals	Days Lost All Injur. & Fatals	Frequency	Severity	Avg. Days Lost Per Injury
GENERAL ROLL	1	488,682		00						.00	0	0
ELEC. POWER DIV.	2	73,931								.00	0	0
MISCELLANEOUS	3	55,360								.00	0	0
TILDEN	4	18,780								.00	0	0
HUMBOLDT	5	194,479			1		2	1	2	5.14	10	2
CAMBRIA JACKSON	6	242,366		1	3	33	7	4	40	16.50	165	10
PELLETIZING PLANT	7	176,493		1	5	16	14	6	30	34.00	170	5
STHSE & SHOPS	8	266,157		2		55		2	55	7.51	207	27
REPUBLIC	9	175,901		4		110		4	110	22.74	625	27
MATHER MINE, "A" SHAFT	10	1,088,387		23	20	889	58	43	947	39.51	870	22
DIAMOND DRILLS	11	101,643		3	1	89	4	4	93	39.35	915	23
CLIFFS SHAFT	12	669,681		19	6	817	23	25	840	37.33	1,254	34
MAAS	13	446,786		20	11	1,225	38	31	1,263	69.38	2,827	41
ORE IMPROVEMENT PLANT	14	75,038		6	1	373	4	7	377	93.29	5,024	54
OHIO	15	77,560		1		400		1	400	12.89	5,157	400
MATHER MINE, "B" SHAFT	16	1,241,170	1	28	39	6,863	119	68	6,982	54.79	5,625	103
BUNKER HILL	17	678,345	1	19	10	6,642	38	30	6,680	44.23	9,847	223
TOTAL		6,070,759	2	127	97	17,512	307	226	17,819	37.23	2,935	79
MICHIGAN MINES		6,070,759	2	127	97	17,512	307	226	17,819	37.23	2,935	79
MINNESOTA MINES		1,339,916		13	8	790	27	21	817	15.67	610	39
GRAND TOTALS		7,410,675	2	140	105	18,302	334	247	18,636	33.33	2,515	75

Frequency - Lost Time Acc. x 1,000,000 Man Hours Worked
Severity - Days Lost x 1,000,000 Man Hours Worked

TABLE XI (2)

Freq. = Lost Time Acc. x 1,000,000 / Man Hours Worked

THE CLEVELAND-CLIFFS IRON COMPANY

Sev. = Days Lost x 1,000,000 / Man Hours Worked

SAFETY DEPARTMENT, ACCIDENT STATISTICS, YEAR 1957

Mine or Plant - MINNESOTA	Position Rating	Hours Labor	No. of Fatals	Compens. Injuries	Non-Compe 1-7 Days	Compen. Days Lost	Days Lost Non Comp. 1-7 Days	Lost Time Inj., Inc. Fatals	Days Lost all Injur. & Fatals	Frequency	Severity	Avg. Days Lost Per Injury
GENERAL ROLL	1	142,560								0.00	0	0
MISCELLANEOUS - HIBBING	2	42,186								0.00	0	0
WANLESS	3	30,054								0.00	0	0
HOLMAN CLIFFS	4	250,596		1	3	15	10	4	25	15.96	100	6
CANISTEO	5	277,806		3		123		3	123	10.80	443	41
HAWKINS	6	276,930		2	3	121	9	5	130	18.06	469	26
HILL-TRUMBULL	7	293,231		5	2	186	8	7	194	23.87	662	28
SARGENT (OPEN PIT)	8	26,553		2		345		2	345	75.32	12,993	172
TOTALS		1,339,916		13	8	790	27	21	817	15.67	610	39
MINNESOTA MINES		1,339,916		13	8	790	27	21	817	15.67	610	39
MICHIGAN MINES		6,070,759	2	127	97	17,512	307	226	17,819	37.23	2,935	79
GRAND TOTALS		7,410,675	2	140	105	18,302	334	247	18,636	33.33	2,515	75

Frequency - Lost Time Acc. x 1,000,000 Man Hours Worked
Severity - Days Lost x 1,000,000 Man Hours Worked

TABLE XI (2 A) 384

A - No. of Accidents

DL - Days Lost

THE CLEVELAND-CLIFFS IRON COMPANY

CAUSES OF LOST TIME ACCIDENTS, JANUARY 1, 1957 to JANUARY 1, 1958 - MARQUETTE RANGE

TYPE OF ACCIDENT	BUNKER HILL	CAMB. JACK-SON	CLIFFS SHAFT	DIA. DRILLS SURF.	HUMBO-LDT	MAAS	MATHER "A"	MATHER "B"	OHIO	ORE IMPR. PLANT	PELL. PLANT	REPUB-LIC	STHSE. & SHOPS	TOTALS
	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A. DL	A . DL
Falls & Slides of Ground	4.107		4.80			2.148	7.208	9.188						26 . 731
Falling Chunks & Materials (Shafts, chutes, mills, raises)	5.6087		4.57			5.132	1. 7	4. 39						19 . 6322
Falling Material	1. 10					1. 2	6. 58	7.199		1. 40		1. 32	1.31	18 . 372
Haulage (underground)	1. 92		4.120			5. 87	4. 67	2. 75						16 . 441
Persons falling, (Ladders, roofs, platforms, etc.)		1. 2						2. 40				2. 69		5 . 111
Persons faling, (Slipping & Stumbling)	3. 34		4.147	1. 4		2. 15	3. 75	5.20			2. 8			20 . 303
Drilling Equipment	2. 13	2.36	1. 11	2.79		4. 73		6. 31		1. 13				18 . 256
Handling Materials	1. 10					2. 5	5. 56	6. 90		1. 40				15 . 201
Flying Particles		1. 2						2. 9			2. 4			5 . 15
Rolling Chunks	1. 4		2. 87			2.400	2.262	2. 7						9 . 760
Flying Objects	3.151		3.262				1. 13	2. 5						9 . 431
Hand Tools	1. 3				1. 2	1. 2	2. 7	4. 39			1. 2			10 . 55
Lifting or Pulling	2.128		1. 3			2. 65	4. 71	9. 66						18 . 333
Burns	2. 10		1. 7	1.10		1. 3		1. 8						6 . 38
Electricity	3. 27											1. 9	1.24	5 . 60
Falling down raises						2.264	1. 4	3. 8						6 . 276
Loading Equipment								1.134						2 . 534
Nails, Spikes or Sharp Objects	1. 4						1. 2	1. 2	1.400					3 . 8
Falling from Bench in Stope			1. 66											1 . 66
Bumping Cap or Chute						1. 13	1. 2							2 . 15
Jumped from Car Coupling						1. 54								1 . 54
Caught by Conveyor							2. 44			1. 50	1.16			4 . 110
Railroad Cars							1. 33			2.124				3 . 157
Falling into Trench								1. 22						1 . 22
Explosives								1.6000						1 . 6000
Bouncing Rope							2. 38							2 . 38
Jumping from RR Car										1.110				1 . 110
TOTALS	30.6680	4.40	25.840	4.93	1. 2	31.1263	43.947	68.6982	1.400	7.377	6.30	4.110	2.55	226 . 17819

NOTE: Miscellaneous and Tilden had no accidents.

TABLE XI (2 B)

A - No. of Accidents
DL - Days Lost

THE CLEVELAND-CLIFFS IRON COMPANY -SAFETY DEPARTMENT
CAUSES OF LOST TIME ACCIDENTS, JANUARY 1, 1957 - JANUARY 1, 1958 - MESABA RANGE

	CANISTEO		HAWKINS		HILL-TRIMBELL		HOLMAN CLIFFS		MISC. HIBBING		SARGENT		WANLESS		TOTALS	
TYPE OF ACCIDENT	A	DL	A	DL	A	DL	A	DL	A	DL	A	DL	A	DL	A	DL
Chunk from Shovel Bucket	1	17													1	17
Hand Tools	1	16	1	2	1	20	1	5							4	43
Lifting Or Pulling			1	21	1	5	1	15							3	41
Falling Into Classifier					1	46									1	46
Falling Off Air Tank While Fueling Truck			1	5											1	5
Twisting Under Truck			1	2											1	2
Caught By Conveyor Belt					1	45					1	195			2	240
Lowering RR Cars											1	150			1	150
Shovel Bucket	1	90													1	190
Falling From Ladder			1	100											1	100
Handling Material					1	35									1	35
Steaming Car-Dirt In Eyes							1	2							1	2
Media In Eyes							1	3							1	3
Falling From RR Car					1	3									1	3
Truck Tail-gate					1	40									1	40
TOTALS	3	123	5	130	7	194	4	25	0	0	2	345	0	0	21	817

TABLE XI (2 C)

THE CLEVELAND-CLIFFS IRON COMPANY

SAFETY DEPARTMENT - ACCIDENT STATISTICS

EYE INJURIES - YEAR 1957

MICHIGAN Mine or Plant	Slights	Compensables*	Total Injuries	Days Lost
BUNKER HILL	3		3	0
CAMBRIA JACKSON	5		5	2
CLIFFS SHAFT	11	1	12	9
DIAMOND DRILLS	0		0	0
ELECTRIC POWER DIV.	1		1	0
ENGR - GEOL. DEPTS	0		0	0
GENERAL STOREHOUSE	7		7	0
HUMBOLDT	1		1	0
MAAS	5		5	2
MATHER MINE "A" SHAFT	7		7	0
MATHER MINE "B" SHAFT	19	1	20	9
OHIO	2		2	0
ORE IMPROVEMENT PLANT	5		5	0
PELLETIZING PLANT	3		3	2
REPUBLIC	2		2	1
RESEARCH LAB	2		2	0
TILDEN	0		0	0
TOTAL	73	2	75	25

* Each compensable accident caused 7 days lost time.

MINNESOTA Mine or Plant	Slights	Compensables	Total Injuries	Days Lost
CANISTEO	12		12	1
HAWKINS	7		7	2
HILL TRUMBULL	1		1	0
HOLMAN CLIFFS	7		7	5
SARGENT	0		0	0
WANLESS	3		3	0
TOTAL	30	0	30	8
GRAND TOTAL	103	2	105	33

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

Other Miscellaneous Operations

Twelve compensable injuries were reported from these operations. Three of these injuries were caused by drilling equipment. Two each from handling equipment, dropping R. R. cars and two caught by conveyor belts.

The frequency rate for all compensable injuries is 19.16 and the severity rate 2,470. For all injuries it is frequency 33.33 and severity 2,515.

For underground mines, the Cambria-Jackson leads with a nice frequency of 16.50 and severity of 165. The Mather Mine "A" Shaft had a rather high frequency of 39.51 but a very good severity of 870.

For open pit operations, the Wanless and Tilden Mines had no injuries to report. With the exception of the Ohio and Sargent Mines the accident records are very good. The Ohio Mine had only one injury to report but the time charge was 400 days and with only 77,560 man hours worked it brought the severity rate up high (5,157). The Sargent had two injuries with 345 days lost time, so with only 26,553 hours of labor, the severity rate is 12,993. Average severity rate for all open pit properties is a nice 819.

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XII

SHOWING TIME PERIODS WHEN COMPENSABLE INJURIES OCCURRED

TIME	NUMBER	WORKING PERIOD
8:00 A.M. TO 12:00 NOON.....	44	..... FIRST HALF OF DAY SHIFT
12:00 NOON TO 4:00 P.M.....	32	..... SECOND HALF OF DAY SHIFT
4:00 P.M. TO 8:00 P.M.....	23	..... FIRST HALF OF AFTERNOON SHIFT
8:00 P.M. TO 12:00 MIDNIGHT...	22	..... SECOND HALF OF AFTERNOON SHIFT
12:00 MIDNIGHT TO 4:00 A.M....	11	..... FIRST HALF OF NIGHT SHIFT
4:00 A.M. TO 8:00 A.M.....	10	..... SECOND HALF OF NIGHT SHIFT
TOTAL.....	142	

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XIII

SHOWING OCCUPATION OF INJURED WORKERS
(Compensable Injuries)

UNDERGROUND		SURFACE		OPEN-PIT	
Miner	58	Hoistman	1	Truck Driver	1
Motor Brakeman	13	Tunnel Brakeman	1	Sample Car Loader	1
Stope Scraperman	12	Lander	1	Tire Repairman	1
Timberman	6	Fork Lift Operator	1	Shovel Oiler	1
Motorman	6	Oiler and Greaser	1	Plant Repair Helper	2
Chute Tapper	4	Dryman	1	Maintenance Mechanic	2
Trackman	2	Maintenance Mechanic	1	Screen Plant Oiler	2
Car Dumper	1	Laborer	1	Trackman	1
Repairman	1	Auto Mechanic	1	Electricians Starter	1
Conveyor Belt Attendant	1			Tractor Operator	1
Timber Hoister	1			Welder Starter	1
Mechanic	1			Plant Repairman	1
Diamond Drill Helper	1			Mechanic Helper	1
Welder	1			Flotation Helper	1
				Wash Plant Leadman	1
TOTALS	103		9		18

ORE IMPROVEMENT PLANT		STOREHOUSE & SHOPS		DIAMOND DRILL DEPT.	
Car Rider	3	Steel Erector	1	Drill Helper	2
Repairman Helper	1	Electrician	1	Drill Runner	1
Conveyor Attendant	1				
Crusher Attendant	1				
TOTALS	6		2		3

PELLETIZING PLANT

Maintenance Helper	1
TOTAL	1

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection

Cooperation of all supervisory personnel has been very good during the year. All inspections are made in company of a supervisor or the safety foreman, if one is employed at the property. A labor union representative, if one is available, also makes the inspection at the same time. The safety inspector makes notes of the supervisor's recommendations, suggestions and orders which have a bearing on safety and these notes are included in his report. On completion of each day's work these reports are discussed with the Mine Captain and/or the Superintendent if they are available at the time. The union representative is always asked to submit a written report of his findings. Sometimes this is not done. Most of the union representatives have very little to offer. Copies of all reports are sent to those people concerned with the inspections. Inspections made daily by the mine safety foreman are reported to the Mine Superintendent with a copy to the Safety Department.

Idle Property

All idle properties are inspected at least twice a year and some must be checked many times for subsidence. Some old shafts which have been filled continue to subside and must be again filled or a concrete cover will have to be placed over the collar. Each year, fences have to be repaired because the weight of snow, falling trees, and people break them down. Shafts filled or refilled during the year 1957 were East end of the Lake mine, two Fitch Mine shafts, and East end of the Michigamme. At the Princeton Mine near Number 2 shaft, more caving occurred increasing the hazard so this area was fenced with hog fencing and extended to the #2 shaft pillar.

Mather Mine "B" Shaft fenced the entire area over the active mining area where surface subsidence is expected at some future date.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Fire Patrols and Inspections

Our safety rules call for fire patrols at all underground properties during idle days. This is good insurance for all properties. There were no major underground fires during the year. Surface fire patrols are made by the police and watchmen at the various properties.

The Negaunee Fire Department assisted in testing fire hydrants at the Ore Improvement Plant with the use of their pumper hooked up to the plant line. Enough pressure was built up in the line to force water completely over the buildings.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XIV

1957

Mine or Plant	Violations Of Standards	Safety Suggestions	Recommendations	Fire Hazard	Total
BUNKER HILL	32	57	32	1	122
CAMBRIA JACKSON		1			1
CLIFFS SHAFT	9	26	6		41
DIAMOND DRILLS		8	3	2	13
HUMBOLDT	3	6	3		12
MAAS	11	8	3	3	25
MATHER MINE "A" SHAFT	17	44	11	1	73
MATHER MINE "B" SHAFT	6	19	13		38
OHIO	1	7			8
ORE IMPROVEMENT PLANT	10	7	8		25
PELLETIZING PLANT	3	15	5		23
REPUBLIC		4	5	1	10
STHSE & SHOPS		4	1		5
Research Laboratory					
TILDEN					
TOTALS	92	206	90	8	396

TABLE XV

1956

Mine or Plant	Violations Of Standards	Safety Suggestions	Recommendations	Fire Hazard	Total
BUNKER HILL	25	35	11	1	72
CAMBRIA JACKSON		5	2		7
CLIFFS SHAFT	12	53	16	20	101
DIAMOND DRILLS		1	3	1	5
HUMBOLDT	6	13	5	5	29
MAAS	9	36	7		52
MATHER MINE "A" SHAFT	12	36	9	1	58
MATHER MINE "B" SHAFT	13	41	16	3	73
OHIO	8	5	3	1	17
PELLETIZING PLANT	6	6	5		17
PRIVATE DWELLINGS				3	3
REPUBLIC	1	26	10	7	44
STHSE & SHOPS					
TILDEN	3	1	2		6
TOTALS	95	258	89	42	484

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Blasting Inspections

The trend to electric blasting shows up in the supervisor's reports. Of a total of 1,124 reports, 868 were on electric blasting and 256 on safety fuse blasting. There were only 47 violations of rules and most of these were failure to use stemming. This is the first full year when the electric blasting report was used. It is a simple form and was well accepted. A new safety fuse report form is now in use for trial. It also is simplified to make it easy for the supervisor making the report.

Safety Department

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Year 1957

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XVI

NUMBER OF INSPECTIONS MADE DURING THE BLASTING PROCEDURE IN VARIOUS MINING CONTRACTS.

Mine	Fuse Blasting	Electric Blasting	No. of Violations	No. of Inspections
BUNKER HILL	28	17	13	45
CAMBRIA JACKSON	50	1	26	51
CLIFFS SHAFT	0	306	1	306
MAAS	23	11	5	34
MATHER MINE "A" SHAFT	148	84	0	232
MATHER MINE "B" SHAFT	7	449	2	456
TOTALS	256	868	47	1,124

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Safety Rules and Regulations

The new underground rule books were distributed during the year. A total of 1832 employees at underground mines received these rules. Only 3 surface and 174 open-pit and concentration plant rule books were issued.

A committee composed of Safety, Mechanical and Electrical personnel studied Conveyor Belt hazards and drew up a set of proposed rules. These will be acted on by the Central Safety Committee in the near future.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XVII

RULE BOOKS DISTRIBUTED AT MICHIGAN MINES AND PLANTS

Mine or Plant	Surface	Underground	Open-Pits & Concentrating Plants	Total
BUNKER HILL		227		227
CAMBRIA JACKSON		80		80
CLIFFS SHAFT		303		303
CLIFFS SHAFT LABORATORY				0
DIAMOND DRILL DEPT.		10		10
ELECTRIC POWER DEPT.	2			2
ENGR. & GEOL. DEPTS.				0
HUMBOLDT			3	3
MAAS		213		213
MATHER MINE "A" SHAFT		445		445
MATHER MINE "B" SHAFT		552		552
MISCELLANEOUS				0
OHIO			2	2
ORE IMPROVEMENT PLANT			116	116
PELLETIZING PLANT			28	28
REPUBLIC			24	24
STHSE & SHOPS	1	2		3
TILDEN			1	1
	3	1,832	174	2,009

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Central Safety Committee

The committee met twelve times during the year, at which time all compensable accidents were classified. Also, prevention was discussed as were various hazards which appear from time to time.

During the early part of the year the proposed underground rules were approved and sent to the printers. Proceedings of all meetings were distributed to all members of the committee.

Supervisors Safety Meetings

The supervisors' meetings were called eleven times during the year. These meetings are always interesting and usually good discussions are held. All new and proposed safety rules were discussed and many good ideas were received on conveyor belt safety. Accidents are classified during the meetings and suggestions and recommendations are made to prevent similar accidents.

Lake Superior Mines Safety Council

This council is composed of iron and copper mining and quarrying companies of the Lake Superior District. Twenty-six companies are paid members. The annual meeting is held in Duluth, Minnesota during the latter part of May month of each year.

During the other months of the year meetings are held on the various iron and copper ranges. During the year these meetings were held at Ely, Minnesota; Houghton, Michigan; Hibbing, Minnesota; Negaunee, Michigan; Grand Rapids, Minnesota; Gaspian, Michigan; Crosby, Minnesota; Ironwood, Michigan; and Duluth, Minnesota. I was elected President of the Council during the last annual meeting. This is the second time I have been President of the council. As President I am required to attend all meetings and preside at all executive committee meetings as well as assist in making up programs. I believe we have an excellent council and the reputation of the council is internationally known. Local or Range meetings have attendances of from 90 to 135 people and the annual meeting has drawn up to 815 mining people from many states in the Union and some foreign countries. As a part of the council's work we have the "Accident

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Exchange" through which we let known our frequency and severity rates each month, exchange ideas on new safety equipment, new home made safety devices, and send out questionnaires on our local problems.

The Cleveland-Cliffs Iron Company is a charter member of the Council which was organized in 1919.

National Safety Council

This council is composed of all Industry, Local, State, Federal and International organizations from which much valuable information on safety can be had. The National Safety Council was organized in 1913 but the initial meeting was in 1912 at Milwaukee, Wisconsin. Our former safety director gave a paper at this meeting and we have been members ever since.

Our company has prepared and presented a number of papers on safety subjects for the mining section of the council and I have served on several committees and also as General Chairman of the Mining Section and Executive Committee.

I believe our fee as a member has been well spent when consideration is given to the services we receive such as safety posters, information circulars, new safety rules and devices, etc.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Inspection Reports From Mines and Plants

The following inspection reports are made by Mine or Department supervisors or employees appointed by the Superintendent and are checked by the Safety Department:

HOISTING ROPES (Daily)
SKIP & CAGE ROADS (Twice a Week)
SAFETY CATCHES ON CAGES (Monthly)
LADDER ROADS (Weekly)
SLACK ROPE ALARM (Monthly)
HOISTING ENGINES (Monthly)
FIRE EXTINGUISHERS (Twice a Year)
FIRE EQUIPMENT (Four times a Year)
FIRE PREVENTION (Once a Year)
BLASTING INSPECTION (Six times a Year - Each Contract)
OLD STOPE INSPECTION (Cliffs Shaft Mine)
FIRE PATROL INSPECTION (Idle Periods)

c. Safety Inspection (Continued)

Following are tables showing the kind and number of safety inspection reports made by the mine and plant foremen which were received and checked by this department:

TABLE XVIII

Type of Inspection	Athens	Bunker Hill	Cambria Jackson	Cliffs Shaft	Maas	Mather "A"	Mather "B"	Total
HOISTING ROPES		206	217	241	31	207	200	1,102
SKIP & CAGE ROADS	1	33	151			47	46	278
LADDER ROADS	4	43	12		4	46	44	153
CAGE SAFETY CATCHES		10	11			12	12	45
SLACK ROPE ALARM			8			7	11	26
HOIST INSPECTION		24	12	48	17	24	24	149
SKIP, CAGE, LADDER				48				48
FIRE EXTINGUISHER		2	2	2	1	2	2	11
FIRE EQUIPMENT						1	1	2
FIRE PREVENTION			15	16		8	9	48
TOTALS	5	318	428	355	53	354	349	1,862

Mine or Plant	Fire Extinguishers	Fire Prevention	Total
CANISTEO	2	16	18
DIAMOND DRILLS	2		2
ELEC. POWER DEPT.	16	8	24
GENERAL OFFICE	2	1	3
GENERAL SHOPS	2	7	9
HAWKINS	2		2
HIBBING OFFICE	2	1	3
HILL TRUMBULL	2	17	19
HOLMAN CLIFFS	2	22	24
HUMBOLDT	2		2
MATHER INN	2		2
OHIO	2		2
ORE IMPROVEMENT	1		1
PELLETIZING PLANT	2	11	13
RENTED BUILDINGS	2		2
REPUBLIC	2	5	7
RESEARCH LABORATORY	2	1	3
SALLY	1		1
SARGENT	1	2	3
TILDEN	1	6	7
WANLESS	2	8	10
TOTALS	52	105	157

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c. Safety Inspection (Continued)

Fire Extinguisher Reports

In our chart on fire extinguishers, it is shown that we have a total of 1,315 in service. The Michigan properties outlawed the carbon tetrachloride extinguishers several years ago but a few were still in service at the end of the year. These, outside of private homes, have now been abandoned.

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c. Safety Inspection (Continued)

TABLE XIX

TYPES AND TOTALS OF FIRE EXTINGUISHERS INSTALLED AT VARIOUS PROPERTIES

Mine Or Plant	2½ - 3 Gal. Soda - Acid	1 - 5 Gal. Non-Freeze	2½ - Gal. Foam Type	4 Lb. Dry Powder	5-10-15 Lb. Dry Powder	20 - 30 Lb. Dry Powder	1 - 1½ Qt. Vaporizing	1 - 3½ Gal. Vaporizing	Automatic Carb. Diox.	5-10-15-30 Lb Carb. Diox.	150 Lb. Dry Powder & Nitrogen Engines	TOTAL
BUNKER HILL	12	5		10	5	44						76
CAMBRIA JACKSON	10	3		2		16		5				36
CANISTEO	3		1		4	11	30	5				54
CLIFFS SHAFT	12	3		12		51		1				79
DIAMOND DRILLS		3		13		9						25
GENERAL STHSE & SHOPS	19	22	1	44		16	2					104
HAWKINS	8	2		1	3	25	26	9			1	75
HILL TRUMBULL	5				16	21	31	4				77
HOLMAN CLIFFS	11			1	6	27	50	6				101
HUMBOLDT	3	6				30						39
MAAS	1	4				12						17
MATHER INN	14			4		1	1					20
MATHER MINE "A" SHAFT	9	13		20	2	80						124
MATHER MINE "B" SHAFT	29	16		1	1	106						153
OHIO	6	2		10		11						29
ORE IMPROVEMENT PLANT		8				18						26
PELLETIZING PLANT				2		16		5			2	25
REPUBLIC	2				3	67		21			2	95
SARGENT		1			2	3	4	2			1	13
TILDEN		5			3	3		1				12
WANLESS						9	5	1			1	16
McCLURE PLANT				2		2				2		6
CARP PLANT				1		2				2	1	6
HOIST PLANT						2				2		4
REPUBLIC PLANT						1				1		2
ESCANABA PLANT						1				1		2
AU TRAIN PLANT						1				1		2
DIESEL PLANT			5							2	1	8
STEAM PLANT				4					5	10		19
HIBBING OFFICE	4	1					3	1				9
ISHPEMING GENERAL OFFICE	7	3	1			2						13
RENTED HOUSES	4	6		16	1	1	1					29
RESEARCH LABORATORY						13		4				17
SALLY					1	1						2
TOTALS	159	103	8	143	47	602	153	65	5	21	9	1,315

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XX

SUMMARY OF DISCIPLINARY ACTION REPORTS

Mine or Plant	TOTAL		Influence of Liquor		Violation of Safety Rule		Sleeping on Job		Loss of Time		Insubordination		Smoking Underground		Carelessness		Miscellaneous		No. Converted to Discharge
	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.
MAAS & BUNKER HILL	22	105	1	6	2	6	3	9	10	59			1	10	1	3	4	12	1
CAMBRIA JACKSON	2	16							2	16									
CLIFFS SHAFT	9	51	2	12			1	3	2	7	1	13	1	10			2	6	1
DIAMOND DRILLS	9	15½					1	2	4	3½					1	3	3	7	1
HUMBOLDT	4	12							1	1	1	5			2	6			1
MATHER MINE, "A"	28	134	1	2	1	3	6	17	11	44	2	2	6	63			1	3	1
MATHER MINE, "B"	67	280½	1	7	24	98½	15	53	8	35¼	3	9	5	50	8	18	3	9	1
OHIO	4	10							2	6					2	4			1
GENERAL SHOPS	0	0																	0
GENERAL STOREHOUSE	0	0																	0
PELLET PLANT	10	29	2	4					7	23					1	2			0
REPUBLIC	1	3							1	3									0
DISTRICT LAB.	2	6															2	6	0
ORE IMPROVEMENT PLT.	5	19							3	9					2	10			0
ELEC. POWER DIV.	1	3	1	3															0
CANISTEO	1	1							1	1									0
HILL TRUMBULL	8	24	2	8					3	9					3	7			1
HAWKINS	4	14	2	8					1	3					1	3			1
TOTALS			12	50	27	107½	26	84	56	220¼	7	29	13	133	21	56	15	43	9
	177	722-3/4																	

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d. Ventilation

The ventilation of our mines is probably a little above average for the district. Each year our operators increase the amount of air entering each mine because it increases the efficiency of all employees and makes working conditions considerably better. With our large underground mines it requires considerable air to keep the mines clear of blasting powder smoke and to dilute the dust to below maximum required limits. Normally the required amount of air forced into a mine should be at least 500 C.F.M. per man. Our mines now provide from a low of about 500 C.F.M. to about 1000 C.F.M. The Safety Dpt. has tried to make at least two ventilation surveys of each mine each year but because of lack of personnel this has been impossible during 1957 but with the help of the engineering departments of each mine the ventilation systems have been kept up and no unusual conditions have occurred.

The Cambria Jackson Mine, which is the smallest mine, is furnished with 52,000 C.F.M. and at the present time the Cliffs Shaft Mine is forcing over 200,000 C.F.M. through the mine. The Bunker Hill-Maas combination has been a complicated system of ventilation but is well ventilated throughout

Dust Sampling and Analysis

Most of this work during the year has been confined to the Humboldt and Republic Mines, the Pellet Plant, Ore Improvement Plant and the Cliffs Shaft Mine 15th Level crushing and loading installation. These test samples will not all show in our annual report because of tests being made to learn the source of dust from the various procedures. Great improvement has been made at all these installations in dust allaying. As shown in the charts, many of the dust counts are below the maximum standards. With all these new installations I believe we have made progress. At the Pellet Plant there seems to be a relationship between dust counts and production. Tests are being made for dust counts and at the same time production of pellets is added to the report. To date it seems that when production of pellets is high the dust counts are lowest.

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

The tables on this and following pages give location and various occupations where dust counts were taken; also, total averages of counts since 1933, when the first counts were taken:

TABLE XXI

DUST SAMPLES COLLECTED -- ROCK AND ORE WORK

Mine or Plant	1957 Misc.	1957 IN ORE	1957 IN ROCK	1957 TOTAL	1933 - 1957 TOTAL
ATHENS *	0	0	0	0	843
BUNKER HILL	0	0	0	0	30
CAMBRIA JACKSON	0	0	0	0	394
CLIFFS SHAFT	0	4	0	4	1,956
HUMBOLDT	0	10	0	10	80
LLOYD **	0	0	0	0	775
MAAS	0	0	0	0	878
MATHER MINE "A" SHAFT	0	9	0	9	911
MATHER MINE "B" SHAFT	0	0	0	0	564
NEGAUNEE **	0	0	0	0	830
PELLET PLANT	25	0	0	25	35
PRINCETON **	0	0	0	0	85
REPUBLIC	0	12	0	12	27
RESEARCH LABORATORY	0	0	0	0	48
SPIES VIRGIL **	0	0	0	0	203
TILDEN	0	5	0	5	103
MISC. (test samples)	16	30	0	46	259
MESABA RANGE	0	0	0	0	20
TOTALS	41	70	0	111	8,041

* Now a part of the Bunker Hill Mine
** No longer in operation

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXII

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

Occupation	CLIFFS SHAFT	HUMBOLDT	MATHER MINE "A" SHAFT	PELLET PLANT	REPUBLIC	TILDEN	TOTALS
DRILLING	3		1				4
SCRAPING	1		3				4
CRUSHING ORE		10	4		12	3	29
PLACE IDLE			1				1
TEST SAMPLES	30			16			46
PELLETIZING				25			25
LOADING AT POCKETS						2	2
	34	10	9	41	12	5	111

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXIII

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

Mine or Plant	1933	1934	1935	1936	1937	1938	1939	1940	1941
ATHENS		32.90	14.12	28.32	26.69	12.85	12.59	9.89	7.28
CAMBRIA JACKSON *									
CLIFFS SHAFT	17.94	14.56	8.29	8.98	15.53	9.86	10.36	7.77	8.18
LLOYD		9.90	12.42	39.25	20.25	10.84	13.47	11.73	8.05
MAAS		7.46	27.55	35.75	150.98	11.24	36.90	8.71	17.29
MATHER MINE, "A" SHAFT									2.42
MATHER MINE, "B" SHAFT *									
NEGAUNEE		53.80	17.77	33.25	59.06	56.26	25.49	10.79	14.02
PRINCETON *									
SPIES VIRGIL					70.61	26.99	1.80	8.40	6.97
TILDEN				67.52	285.27	74.60	60.40		49.60
GARDNER MACKINAW		27.77		8.61	48.53				
MISCELLANEOUS			8.66	3.00	6.80	14.73			

* Not in Operation During This Period

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXIII (Cont'd)

Mine or Plant	1942	1943	1944	1945	1946	1947	1948	1949	1950
ATHENS	25.80	4.90	8.33	6.64	4.17	7.39	7.49	7.07	4.71
CAMBRIA JACKSON		12.10	6.21	17.05	11.99	9.30	13.81	6.86	9.50
CLIFFS SHAFT	7.55	5.99	6.23	8.18	6.34	8.64	5.12	6.26	3.46
LLOYD	6.95	5.01	14.45	6.49	9.38	11.17	12.97	11.72	11.32
MAAS	8.46	12.48	8.78	8.17	9.29	6.08	21.08	10.55	4.45
MATHER MINE, "A" SHAFT	5.58	6.64	7.57	8.39	7.72	10.88	9.50	8.40	7.01
MATHER MINE, "B" SHAFT						2.23	4.16	2.46	6.68
NEGAUNEE	17.02	4.65	11.81	11.92	6.67	7.05	5.48		
PRINCETON		10.59	6.32	8.48					
SPIES VIRGIL			5.59	14.22	3.59	11.65	5.24	10.12	18.78
TILDEN				24.18	66.92	33.65	2.93	4.38	3.74
GARDNER MACKINAW	*								
MISCELLANEOUS	3.00								

* No Longer In Operation

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXIII (Cont'd)

Mine or Plant	1951	1952	1953	1954	1955	1956	1957
ATHENS *	4.15	2.71	2.37				
BUNKER HILL				1.19	2.33	3.00	
CAMBRIA JACKSON	8.32	4.54	6.80	1.38	4.56	2.17	
CLIFFS SHAFT	4.90	2.76	4.45	2.79	2.31	(All Test Samples-'56)	1.95
HUMBOLDT			1.59	27.57	6.34	10.04	3.15
LLOYD **	6.28	4.72	5.17	4.58	5.09		
MAAS	4.84	4.93	7.06	5.25	4.14	1.73	
MATHER MINE, "A" SHAFT	8.75	5.86	5.15	3.77	1.38	5.29	7.50
MATHER MINE, "B" SHAFT	5.04	5.40	5.56	6.41	4.81	2.36	
MESABA RANGE				20.28			
NEGAUNEE *	2.27	1.70	2.60				
pellet plant						17.65	9.77
PRINCETON **							
REPUBLIC						4.67	3.65
RESEARCH LAB.						5.29	
SPIES VIRGIL **	6.05	5.29	4.75	4.14			
TILDEN	6.34		3.05		2.36	1.68	1.82

* Now a part of Bunker Hill Mine

** No Longer in Operation

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety, First-Aid and Mine Rescue Courses

First Aid and Mine Rescue Training

During the year members of the Safety Department trained 243 employees in first aid to the injured. A new movie-sound film was used to train in three different methods of artificial respiration. This film was furnished by the U. S. Bureau of Mines. Most of the men received the additional training of eight hours and the initial or new men received sixteen hours training. We also had the assistance of a Bureau of Mines Instructor for one of the initial first aid classes.

Mine Rescue Training

Here again the Safety Department personnel conducted the training, most of which was the eight hour refresher course. The initial course was for twenty-four hours and covered the use of all mine rescue equipment. A total of 205 employees took this course.

All first aid material is purchased and distributed by the department to the various properties, as are all safety poster units.

11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety, First-Aid and Mine Rescue Courses (Continued)

TABLE XXIV

MINE RESCUE TRAINING - MICHIGAN MINES

FEBRUARY 1957

Mine or Department	No. of Men Trained
BUNKER HILL	39
CAMBRIA JACKSON	13
CLIFFS SHAFT	27
ENGR. & GEOL. DEPTS.	12
MATHER MINE, "A" SHAFT	66
MATHER MINE, "B" SHAFT	48
TOTAL	205

FIRST AID TRAINING - MICHIGAN MINES

JULY - AUGUST, 1957

Mine or Department	No. of Men Trained
CAMBRIA JACKSON	7
CLIFFS SHAFT	27
ENGINEERING DEPT.	12
HUMBOLDT	1
INDUSTRIAL ENG. DEPT.	1
MAAS-BUNKER HILL	55
MATHER MINE "A" SHAFT	77
MATHER MINE "B" SHAFT	47
OPERATING RESEARCH DEPT.	3
PELLET PLANT	2
REPUBLIC	6
RESEARCH LABORATORY	5
TOTAL	243

11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety, First-Aid and Mine Rescue Courses (Continued)

TABLE XXV

FIRST-AID SUPPLIES DISTRIBUTED

MATERIAL	NO. DISTRIBUTED
1" Compresses (Band Aids)	74,826
Cotton-Tipped Merthiolate Applicators	3,024
Knuckle-Bandages	1,872
Plain Gauze Pads (3"x3")	492
Oz. of Spirits of Ammonia	385
Rolls of Adhesive Tape (½")	220
Oz. of Tincture of Merthiolate	208
2" Compress Bandages	190
Picric Acid Gauze Pads (For Burns)	187
5/8 Oz. Tubes of Foille (For Burns & Abrasions)	169
1" Roll Bandages	161
3" Compress Bandages	114
Leather Finger Cots	112
2" Roll Bandages	91
Triangular Bandages (40" Cravat)	91
3" Roll Bandages	67
2 Oz. Bottles (For Tincture of Merthiolate)	31
Oz. of Absorbent Cotton	30
Scissors	2
TOTAL	82,272

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous

Mine Rescue equipment was checked monthly by a member of the department. Also, invited a U. S. Bureau of Mines representative to make a complete inspection of all equipment and facilities. His report was completed and received with many favorable comments.

A program of air sampling in the Jet Piercers at the Humboldt and Republic Mines which was started in 1955 was completed during the year. Vacuum bottles for samples were furnished by the U. S. Bureau of Mines. The Bureau also made analysis of these samples at no cost. These samples plus those taken with C.O. testers indicated good conditions nearly 100% of the time but during heavy sultry weather with no wind movement it was possible to get samples which almost reached the danger mark of 0.02% C.O.

The Bureau of Mines tested the cabs of some Jet Piercers used in Minnesota and found conditions similar to ours.

Considerable work was done on underground safety rules. These rule books were printed and distributed during the year. Also started a check of conveyor belt hazards and began preparation of rules covering same .

Attended meetings of the Negaunee Business & Professional Association each month.

Two new mine boots were tried out during the year. One made by the Collins Shoe Company in Canada proved to be too stiff over the instep because of the heavy metal and rubber guards. They also accumulated too much damp and wet ore between the buard bars of the instep so they became a stumbling hazard. The new Lehigh Company boot built on the same principal as the Collins but with smaller instep guards were in use only six weeks when the rubber cracked through near the base of the toes. This boot is light in weight and found favor with the men but the cost would be high for the wearer if they only last six weeks.

As a result of an accident in the Bunker Hill Shaft, a committee was formed to investigate possibility of better cage and skip bonnets. Some of the new type bonnets for cages and skips have been installed and seem to be a big improvement over the old ones.

Requested and received "Certificates of Honor" from The Joseph A. Holmes Safety Association for employees who have worked forty or more years without a lost time injury.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous (Continued)

Movies on Drilling, Blasting and Rock Bolting were shown to foremen at all U. G. properties. Other movies shown were "Falls of Ground Accidents", "Your Worst Enemy", "Accidents Just Don't Happen", and "Blasting Caps". The movie "Blasting Caps" was shown in the Negaunee Fire Hall, Negaunee and Ishpeming Schools and over WDMJ-TV. We also arranged for the "Magic of Fire Demonstration" for employees, foremen, the public at Negaunee Fire Hall, and the Negaunee and Ishpeming High Schools.

Member of the Department attended "Orientation Classes" supervised by the Industrial Relations Department.

An exhibit was arranged for Michigan Tech and the annual meeting of the Lake Superior Mines Safety Council.

Comparison of Available Accident Statistics

As usual, the only available statistics which we can use which include most mining in the States for purposes of comparison, are a year old but they still are interesting. It will be noted our severity rates are very favorable but frequency rates are generally higher.

We also have a table on fourteen members of the Lake Superior Mines Safety Exchange and here our severity rates is just a little better than average. As is well known, many of the participating companies do not operate any underground mines and naturally should have a better record than the underground mines.

f. Miscellaneous (Continued)

TABLE XXVI

COMPARISON OF FREQUENCY, SEVERITY RATINGS
(Taken From Available Statistics)

		Frequency	Severity	1956 LAKE SUPERIOR DISTRICT Frequency	Severity
1956	National Rating, Coal Mining (Underground)	23.07	5,770		
1956	" " Other Mining (Not Incl. Coal)	19.93	2,290		
1956	" " Metal Mining (Underground)	28.20	2,259		
1956	Lake Superior District Mines (26 Cos. Reporting)	16.69	2,663		
1957	The Cleveland-Cliffs Iron Co., Compensable Injuries	19.16	2,470		
1957	" " " All Injuries	33.33	2,515	16.69	2,663
1957	" " " Open-Cut Mining	13.18	669	7.00	1,278
1957	" " " Concentrating Plants	34.01	1,326	17.54	2,071
1957	" " " Sub-Level Caving	16.50	165	23.72	6,607
1957	" " " Stoping	37.33	1,254	41.55	6,502
1957	" " " Blocking Caving	49.79	4,594	37.90	1,416
1957	" " " General Shops	7.51	207	8.91	1,557
1957	" " " Top Slicing	0.00	0	21.62	649
1957	" " " Shaft Sinking & Develop.	0.00	0	63.59	2,114
1957	" " " Elec. Power Dept.	0.00	0		
1957	" " " General Roll	0.00	0		
1957	" " " Miscellaneous	14.65	341	0.53	342

f. Miscellaneous (Continued)

TABLE XXVII

COMPARATIVE ACCIDENT STATISTICS
LAKE SUPERIOR MINES SAFETY COUNCIL EXCHANGE GROUP
Year 1957

Company or Division	Man Hours Worked	Disabling Injuries: Fatalities	Permanent Partial	Tot. Disab. Injuries	Days Lost *	Frequency	Severity
RESERVE MINING COMPANY	4,868,214	0	2	9	592	1.85	121
REPUBLIC STEEL CORPORATION	480,980	0	0	3	81	6.19	167
SNYDER MINING COMPANY	1,003,889	0	0	23	429	22.90	427
JONES AND LAUGHLIN STEEL CORP. MICHIGAN ORE DIVISION	692,699	0	1	24	855	34.64	1,234
PICKANDS MATHER & COMPANY	11,325,013	1	9	82	14,670	7.20	1,295
THE M. A. HANNA COMPANY	6,860,948	2	4	50	14,398	7.00	2,099
THE CLEVELAND-CLIFFS IRON CO.	7,410,675	2	3	247	18,636	33.33	2,515
OLIVER IRON MINING DIV. U. S. STEEL CORPORATION	13,168,460	4	13	82	33,552	6.23	2,548
INLAND STEEL COMPANY	1,962,104	1	0	28	6,809	14.27	3,470
JONES AND LAUGHLIN STEEL CORP. MINNESOTA ORE DIVISION	1,228,167	1	1	4	6,091	3.26	4,959
OGLEBAY NORTON COMPANY	1,450,639	1	3	78	7,528	53.77	5,189
NORTH RANGE MINING COMPANY	1,621,967	0	4	54	8,492	33.29	5,235
WHITE PINE COPPER COMPANY	2,527,596	2	0	118	14,627	46.60	5,786
CALUMET AND HECLA COMPANY	3,658,924	3	7	94	29,155	25.69	7,968
TOTALS	58,260,275	17	47	896	155,915	15.38	2,676

* Includes Time Charges.

SUMMARY OF MINING ENGINEERING DEPARTMENT ACTIVITIES - 1957

1. Mr. Grant T. Hollett resigned as Chief Mining Engineer and Messrs. Ralph E. Magnuson, Jr. and Daniel P. Isaacson were appointed Chief Mining Engineer and District Mining Engineer, respectively, effective as of February 1, 1957.

2. The combination of Mr. Magnuson's duties previous to his appointment as Chief Mining Engineer and the duties of Chief Mining Engineer resulted in a very close association of the activities of the Recording, Ad Valorem & Fire Insurance Department and the Mining Engineering Department. The 1957 Mining Engineering Department Annual Report is being expanded to include a report on the Michigan Ad Valorem Taxes, house acquisitions and house moving.

3. The underground properties continued mining and development work which necessitated engineering assistance in the surveying and mapping of this work. Stockpiles were surveyed, estimates of the ore in stock were calculated, ore reserves were estimated for valuation purposes and the shafts were gauged during the year.

4. The open pit properties called for engineering assistance in mine surveying and mapping, drilling and blasting control, checking of tailings basins and the estimating of ore in stockpile. During the year, a change was made from a scale of 1":50' to a scale of 1":100' for the mine maps.

5. The field crews carried on with the necessary subsidence surveys, property line control, drill hole control; assisted in the construction at the Pelletizing and Ore Improvement Plants with the establishment and maintenance of lines and grades for building and machinery installation; assisted at the open pits, when necessary, on pit surveys and stockpile estimating and supplied the necessary engineering control for the Republic Townsite and the Cliffs Fourth Addition to the City of Negaunee.

6. Throughout the year, Mr. Magnuson continued to provide the Cleveland Tax Department with assistance in compiling data for the Federal Income Tax Returns.

7. A reduction in departmental personnel of six men and a reorganization of the remaining personnel was necessary effective December 15th, due to a recession in economic conditions.

A. MINING ENGINEERING DEPARTMENT STAFF

On February 1, 1957, Mr. Grant T. Hollett, Chief Mining Engineer, resigned to accept a position with Reynolds Metals Company at Richmond, Virginia. As Mr. Hollett's replacement, Mr. Ralph E. Magnuson, Jr., Administrative Assistant to the Manager of Ore Development, was appointed Chief Mining Engineer. Mr. Magnuson continued to exercise his previous duties in connection with Federal Income Tax and Michigan Ad Valorem Taxes.

Effective as of February 1, 1957, Mr. Daniel P. Isaacson, Assistant Mining Engineer at the Mather Mine, "A" Shaft, was appointed District Mining Engineer to assist Mr. Magnuson. Mr. Isaacson's new responsibilities were the guidance of the day to day routine work of the Department with particular emphasis as to the direction of the various underground survey crews.

Mr. Magnuson's appointment resulted in bringing the activities in connection with the recording of leases, easements and land transactions, house acquisitions, house moving and Michigan Ad Valorem Taxes into closer association with the Mining Engineering Department. Therefore, reports on these functions will be included in the 1957 Mining Engineering Department Annual Report.

The Tax Department in Cleveland was given assistance throughout the year. This is another responsibility brought into the Mining Engineering Department by Mr. Magnuson and concerns both the Company's Michigan and Minnesota properties. Each quarter a schedule of estimated expenditures for 1957 was compiled, based on the Capital Expenditure Forecast. This data provides the Tax Department with a basis for calculating tentative rates of depreciation for plant and equipment, movable equipment and motorized equipment. The expenditures estimated for development provides information necessary for the development deduction. During the year, a study was made of the composite useful life of the Ore Improvement Plant that will provide a basis for calculating depreciation on this installation. Information was provided throughout the year on the Republic Mine and the Pelletizing Plant which enables the Tax Department to make the periodic progress reports called for in the Certificates of Necessity covering the construction of these facilities. A review of the Company's mineral land account was begun in 1957 but will not be completed until sometime in 1958. This review will provide a basis for revising this account to agree with the aggregation elections made under Section 614 of the 1954 Internal Revenue Code. Data on ore reserves was compiled throughout the year for use by the Tax Department. The need for continuing information throughout the year is emphasized by the declarations of estimated tax which have to be filed by corporations under the provisions of the 1954 Code. A certain percentage of the Company's income tax must be paid currently on an estimated basis.

The following personnel changes were made effective as of February 1, 1957:

1. Clarence P. Ayotte, Jr. was promoted from Surveyor "A" to Assistant Mining Engineer to replace Daniel P. Isaacson on the Mather Mine, "A" Shaft Survey Crew.

2. Holland L. Werner was promoted from Surveyor Helper to Surveyor "B" on the Mather Mine, "A" Shaft Survey Crew.

3. Kenneth P. Nowell was hired on January 21st to replace Holland L. Werner as Surveyor Helper on the Mather Mine, "A" Shaft Survey Crew.

Because additional engineering help was needed at the Humboldt Mine, Martin D. Tasson, Surveyor assigned to the Field Engineering Crew, was assigned to the Humboldt Mine Survey Crew as a Surveyor, effective May 15, 1957.

Due to the curtailment of the Cameo Exploration, the employment of Melvin E. Gustafson, Surveyor Helper, was terminated on May 22, 1957.

Allan L. Bjork, Surveyor assigned to the Cliffs Shaft Mine, was transferred to the Operating Research Department on August 1, 1957. Mr. Bjork's replacement on the Cliffs Shaft Survey Crew was Raymond E. Oja, Surveyor, who was transferred back to the Department in May as a result of the curtailment of the Cameo Exploration.

On October 1, 1957, Allen H. Heikkinen, Mining Engineer assigned to the Ohio and Tilden Mines, was transferred from the Mining Engineering Department to the Ohio or Tilden Mine roll, depending upon which operation is active.

A very abrupt and disconcerting slump in economic conditions during November and December, 1957, predicates a very soft iron ore market for 1958. The Cleveland-Cliffs Iron Company's position as a merchant producer of iron ores is very vulnerable under adverse economic conditions. A reduction in salaried personnel was necessary and the following personnel changes were made in the Mining Engineering Department.

1. Donald G. Johnson and Kenneth P. Nowell were laid off. Both of these men were Surveyor Helpers.

2. Raymond E. Oja, Richard L. Swanson and Holland L. Werner were transferred to the MOC Pilot Plant and Wilburt H. Thomas was transferred to the Research Laboratory. Messrs. Oja and Werner were Surveyors while Messrs. Swanson and Thomas were Surveyor Helpers.

3. Albert Henry was downgraded from Mining Engineer to Surveyor. Henry C. Coron, Jr., William R. Lehmann and Martin D. Tasson were downgraded from Surveyors to Surveyor Helpers. These changes took effect on December 16, 1957.

4. Allan L. Bjork was transferred back into the Mining Engineering Department from the Operating Research Department.

5. The Field Engineering and Townsite Crews were combined into one crew.

The Recording, Ad Valorem and Fire Insurance Department responsibilities are handled by Robert G. Fountain, Donald W. Carlson and Mrs. Bernice Belaire. Mr. Fountain, as Recorder, is responsible for the recording of all land transactions concerning Mining Department lands, the preparation of the annual tax list, Negaunee house acquisitions, etc. Mr. Carlson is re-

sponsible for the various reports, requests, etc., necessary in connection with the payment of Michigan Ad Valorem Taxes, Republic house moving and fire insurance. Mrs. Belaire is the stenographer, assisting Messrs. Fountain and Carlson. Effective December 15, 1957, Mrs. Belaire also assumed the secretarial load of the Safety Department.

The following table shows the personnel of the Mining Engineering Department, their position and the period of employment:

TABLE I

Name	Position	Entered	Left	1957 Employment
Ralph E. Magnuson, Jr.	Chief Mining Engineer	February 1st		11 Months
Grant T. Hollett	Chief Mining Engineer		February 1st	1 Month
Daniel P. Isaacson	District Mining Engineer			12 Months
Eric G. Beinlich, Jr.	Engineer			12 Months
Harley E. Clickner	Engineer			12 Months
Robert J. Flynn	Engineer			12 Months
Oiva W. Hakala	Technical Foreman			12 Months
Allen H. Heikkinen	Engineer		October 1st	9 Months
Albert Henry	Engineer			12 Months
LeRoy Hosking	Engineer			12 Months
R. Charles Kincaid	Engineer			12 Months
Eino A. Koski	Development Engineer			12 Months
Bernhardt H. Petersen	Technical Foreman			12 Months
Clarence P. Ayotte, Jr.	Ass't Engineer			12 Months
Carl A. Koski	Ass't Engineer			12 Months
Frank A. Koski	Ass't Engineer			12 Months
John R. Sleeman	Ass't Engineer			12 Months
William H. Stannard	Chief Draftsman			12 Months
Lembit L. Liivoja	Draftsman			12 Months
Anselm H. Mantyla	Draftsman			12 Months
George B. Manzoline	Draftsman			12 Months
Louis R. Miller, Jr.	Blueprint Machine Operator			12 Months
Jean C. Jensen	Stenographer			12 Months
Clifford H. Amel	Surveyor			12 Months
Clyde C. Anderson	Surveyor			12 Months
Robert E. Anderson	Surveyor			12 Months
Allan L. Bjork	Surveyor	December 1st	August 1st	8 Months
Charles W. Cornish	Surveyor			12 Months
Henry C. Coron, Jr.	Surveyor			12 Months
William R. Lehmann	Surveyor			12 Months
Alfred B. Nault	Surveyor			12 Months
Ernest A. Oja	Surveyor			12 Months
Raymond E. Oja	Surveyor		November 27th	11 Months
Martin D. Tasson	Surveyor			12 Months
Allan E. Wakkuri	Surveyor			12 Months
Melvin E. Gustafson	Helper		May 22nd	5 Months
Arthur W. Hemmila	Helper			12 Months

Name	Position	Entered	Left	1957 Employment
Donald G. Johnson	Helper		November 27th	11 Months
Donald E. Lampi	Helper			12 Months
Kenneth P. Nowell	Helper	January 21st	November 27th	10 Months
Arnold A. Sundell	Helper			12 Months
Richard L. Swanson	Helper		November 27th	11 Months
Wilburt H. Thomas	Helper		November 27th	11 Months
Holland L. Werner	Helper		November 27th	11 Months
Robert L. Herman	Helper	June 17th	September 20th	3 Months

The following table shows the personnel of the Recording, Ad Valorem and Fire Insurance Department, their position and period of employment:

TABLE II

Name	Position	Entered	Left	1957 Employment
Robert G. Fountain	Recorder			12 Months
Donald W. Carlson	Insurance Examiner			12 Months
Bernice Belaire	Stenographer			12 Months

The following table shows the length of service in the Mining Engineering Department of those employed at the end of the year:

TABLE III

Name	Date Entered	Length of Service
Ralph E. Magnuson, Jr.	February, 1957	11 Months
Daniel P. Isaacson	November, 1940	12 Years, 4½ Months
Eric G. Beinlich, Jr.	July, 1952	5 Years, 6 Months
Harley E. Clickner	June, 1952	3 Years, 5 Months
Robert J. Flynn	April, 1953	4 Years, 8 Months
Oiva W. Hakala	July, 1951	6 Years, 6 Months
Albert Henry	June, 1953	4 Years, 6 Months
LeRoy Hosking	March, 1954	3 Years, 10 Months
R. Charles Kincaid	July, 1951	6 Years, 6 Months
Eino A. Koski	March, 1952	5 Years, 9½ Months
Bernhardt H. Petersen	November, 1950	7 Years, 1½ Months
Clarence P. Ayotte, Jr.	April, 1948	9 Years, 8½ Months
Carl A. Koski	June, 1941	13 Years, 1 Month
Frank A. Koski	January, 1936	17 Years, 9 Months
John R. Sleeman	February, 1947	10 Years, 10½ Months
William H. Stannard	November, 1940	17 Years, 2 Months
Lembit L. Liivoja	January, 1952	5 Years, 11½ Months
Anselm H. Mantyla	July, 1948	9 Years, 5½ Months
George B. Manzoline	December, 1947	7 Years, 9½ Months
Louis R. Miller, Jr.	August, 1945	12 Years, 3½ Months
Jean C. Jensen	July, 1951	6 Years, 5½ Months

Name	Date Entered	Length of Service
Clifford H. Amel	May, 1944	13 Years, 7½ Months
Clyde C. Anderson	December, 1950	7 Years, 1 Month
Robert E. Anderson	July, 1948	9 Years, 6 Months
Allan L. Bjork	April, 1952	5 Years, 9 Months
Charles W. Cornish	January, 1951	5 Years, ½ Month
Henry C. Coron, Jr.	April, 1953	4 Years, 6 Months
William R. Lehmann	February, 1952	5 Years, 10 Months
Alfred B. Nault	September, 1946	11 Years, 3½ Months
Ernest A. Oja	March, 1943	13 Years, 10 Months
Martin D. Tasson	August, 1948	7 Years, 5 Months
Allan E. Wakkuri	January, 1951	6 Years, 11½ Months
Arthur W. Hemmila	June, 1953	4 Years, 8 Months
Donald E. Lampi	April, 1951	6 Years, 9 Months
Arnold A. Sundell	February, 1951	6 Years, 11 Months

In the above table, the "Length of Service" covers only that period the men were employed in the Mining Engineering Department. Some of them have been in other Departments and at the mines at one time or another.

The following table shows the length of service in the Recording, Ad Valorem and Fire Insurance Department of those employed during the year:

TABLE IV

Name	Date Entered	Length of Service
Robert G. Fountain	August, 1951	6 Years, 4 Months
Donald W. Carlson	August, 1936	18 Years, 1 Month
Bernice Belaire	September, 1956	1 Year, 3½ Months

In the above table, the "Length of Service" covers only that period the men were employed in either the Mining Engineering Department or the Recording, Ad Valorem and Fire Insurance Department. Some of them have been in other Departments and at the mines at one time or another.

The following sheets show in tabular form (Tables V and VI), the personnel of the Mining Engineering Department and the Recording, Ad Valorem and Fire Insurance Department and the mines to which they were assigned during the majority of the year:

TABLE V

MINING ENGINEERING DEPARTMENT STAFF

	BUNKER HILL—MAAS	CAMBRIA-JACKSON	CLIFFS SHAFT	HUMBOLDT	MATHER "A"
MINE ENGINEER	Harley E. Clickner	Combined		Albert Henry	Oiva W. Hakala
ASS'T MINE ENGINEER			Carl A. Koski		Clarence P. Ayotte, Jr.
SURVEYOR	Clyde C. Anderson Robert E. Anderson	with	Allan L. Bjork	Martin D. Tasson	William R. Lehmann Holland L. Werner
HELPER	Donald G. Johnson Richard L. Swanson	Mather Mine,			Kenneth P. Nowell Wilburt H. Thomas
TECHNICAL FOREMAN	Bernhardt H. Petersen Eric G. Beinlich, Jr. John R. Sleeman (Conveyor Belt Installation)	"B" Shaft			

	MATHER "B"	OHIO	REPUBLIC	TILDEN
MINE ENGINEER	R. Charles Kincaid		Robert J. Flynn	
SURVEYOR	Alfred B. Nault Allan E. Wakkuri	Clifford H. Amel	Charles W. Cornish	Clifford H. Amel
HELPER	Arthur W. Hemmila Arnold A. Sundell			
TECHNICAL FOREMAN	Eino A. Koski (Development Engineer)	Allen H. Heikkinen (Pit Foreman)		Allen H. Heikkinen (Pit Foreman)

	NEGAUNEE & REPUBLIC TOWNSITES	MARQUETTE RANGE GENERAL SURVEY CONTROL	CAMEO PROJECT	OFFICE	
MINE ENGINEER	LeRoy Hosking			DISTRICT ENGINEER	Daniel P. Isaacson
ASS'T MINE ENGINEER		Frank A. Koski	Raymond E. Oja (Surveyor)	DRAFTSMEN	William H. Stannard (Chief) Lembit L. Liivoja Anselm H. Mantyla George B. Manzoline
SURVEYOR	Ernest A. Oja	Henry C. Coron, Jr.			
HELPER	Donald E. Lampi			DEPARTMENT CLERK	Jean C. Jensen
				BLUEPRINT MACHINE OPERATOR	Louis R. Miller, Jr.
				CHAUFFEUR	Henry C. Coron, Jr.

TABLE VI

RECORDING, TAXES AND FIRE INSURANCE DEPARTMENT STAFF

Recorder	- Robert G. Fountain
Taxes and Fire Insurance	- Donald W. Carlson
Stenographer	- Bernice Belaire

1. DISTRIBUTION OF TIME

The following table shows the distribution of time for the year at the different properties and jobs and the percentage of time spent on each property:

TABLE VII

Property or Account	Total	%
Mining Engineering General	1,320.25	13.508
Bunker Hill Mine	800.00	8.185
Cambria-Jackson Mine	103.00	1.054
Cliffs Shaft Mine	396.75	4.059
Humboldt Mine	496.25	5.077
E&A HM-36 (Plant Expansion - Preliminary Design)	76.25	.780
Maas Mine	640.50	6.553
Mather Mine,		
"A" Shaft	1,477.50	15.116
"B" Shaft	1,221.75	12.500
E&A NM-111-B-1-b (Installation of Crushers and Conveyors)	14.00	.143
E&A NM-115 ME (Crusher and Conveyor - 10th Level)	89.00	.911
E&A NM-127 ME (9th Level Conveyor)	95.00	.972
E&A NM-129-9-d (Drifting - 9th Level)	34.75	.356
E&A NM-129-10-d (Drifting - 10th Level)	56.25	.575
E&A NM-135 (Inclined Conveyor System - 12th to 9th Level)	1.50	.015
E&A NM-136 (Negaunee Mine Company Proportion - Railroad Relocation)	5.50	.056
E&A NM-137 (Relocation of Gas Storage Tank)	7.50	.077
Ohio Mine	349.75	3.578
Ore Improvement Plant	128.00	1.310
Republic Mine	552.75	5.655
Pelletizing Plant	111.25	1.138
E&A MI-1 (House Moving Project - Republic)	5.00	.051
E&A MI-8 (First Addition to Plat of Republic)	128.75	1.317
E&A MI-17 (Empire Core Drilling)	67.00	.685
E&A MI-654-G-36 (800 HP Ball Mill)	15.00	.153
E&A MI-654-G-63 (Settling Basin)	47.75	.489
Tilden Mine	133.00	1.361
Deferred Accounts:		
Estimating Empire Reserves	1.00	.010
Electric Power Department - Account P1-721	25.50	.261
Collins Property	13.50	.138
Railroad Relocation	42.00	.430
Maas Lands	1.00	.010

Property or Account	Total	%
Land Offers & Outside Explorations		
Land Offer 3201C	.50	.005
Outside Exploration 1136	1.00	.010
Outside Exploration 1155	2.00	.020
Outside Exploration 1162	14.50	.148
Outside Exploration 1163	5.00	.051
Outside Exploration 1165	127.50	1.305
Outside Exploration 1166	13.00	.133
Outside Exploration 1185	2.50	.026
Outside Exploration 1208	.50	.005
Canadian Cliffs Limited	16.25	.166
E&A AM-36 (Relocation - Healy Avenue and Ann Street)	11.00	.113
E&A CC-619 (Development - Bunker Hill)	84.00	.859
E&A CC-662 (Maas--Bunker Hill Consolidation)	110.00	1.125
E&A CC-685 (Bunker Hill Shop Addition)	12.00	.123
E&A CC-717 (Installation of Replacement Steel Sets)	2.50	.026
E&A CC-754 (Drifting and all other Development Work - Bunker Hill Mine)	6.00	.061
E&A CC-780 (Rock Drilling)	24.00	.246
E&A CC-783 (Perkins Area Drilling)	2.00	.020
E&A CC-788 (East Pit Stripping - Tilden Mine)	9.00	.092
E&A CC-794 (Storage Building and Repair Shop - Bunker Hill Mine)	10.00	.102
E&A CC-801-A-1-f (Cliffs Ore Improvement Plant - Mining Engineering Charges)	189.75	1.941
E&A CC-813 (Tilden Area Drilling)	7.50	.077
E&A CC-814 (New Richmond Drilling)	1.00	.010
E&A CC-822 (Fourth Addition - City of Negaunee)	56.75	.581
E&A CC-825 (Cascade East End Drilling)	106.25	1.087
E&A CC-832 (South Sturgeon-- Indian Lake Area)	27.50	.281
E&A CC-833 (Trenary Area)	1.00	.010
E&A CC-834 (Gladstone--Cornell Area)	1.00	.010
E&A CC-859 (West Tilden Area Drilling)	7.00	.072
E&A CC-867 (Isabella Area Drilling)	14.00	.143
E&A CC-868 (Ogden--Schoolhouse Area Drilling)	11.00	.113
E&A CC-869 (Underground Development Work - Bunker Hill Mine)	255.25	2.611
E&A CC-870 (Underground Development Work - Maas Mine)	129.75	1.327
E&A CC-874 (Diamond Drilling - Maas Mine)	17.00	.174
E&A CC-876 (Communication System, 7th Level - Bunker Hill Mine)	1.00	.010
E&A CC-878 (Diamond Drilling - Bunker Hill Mine)	12.50	.128
E&A CC-879 (New Richmond Area Drilling)	9.50	.097
E&A CC-895 (Cleveland-Cliffs Proportion - Railroad Relocation)	8.50	.087
E&A CC-910 (Chain Conveyor Units - Maas Mine)	3.00	.031
E&A CC-918 (House Moving - Bunker Hill Mine)	4.00	.041
E&A CC-927 (Dismantling of Building, Lot #30, Iron Plat)	1.00	.010
	9,774.50	100.000%

2. COSTS

The following table shows a comparison of costs for the Mining Engineering Department for the last three years:

TABLE VIII

	1955	1956	1957
Salaries	$232,704	$255,394	$261,552
Overtime & Special Allowances	0	6,525	4,269
Travel	772	1,603	567
Dues & Subscriptions	146	173	137
Telephone & Telegraph	575	687	806
Printing, Stationery & Office Supplies	6,062	589	1,023
Heat, Light, Power & Water	224	372	(32)
Furniture, Fixtures & Office Equipment	65	326	467
Payroll Taxes (Unemployment)	12	244	812
Old Age Benefits Tax	84	946	2,360
Auto Expense	7,049	5,155	6,239
Entertainment	0	564	125
Field Equipment & Maintenance	1,418	2,553	1,405
Building Alterations	331	772	143
Repairs & Maintenance	56	49	375
Insurance	837	1,414	708
Postage, Express & Freight	201	214	108
Stock Supplies	492	10,147	4,762
Personal Injury Expense	12	0	0
Miscellaneous	1,647	0	(444)
Depreciation	3,279	4,120	6,881
Donations	0	8	0
Group Annuity	8,015	9,240	10,002
Property & Franchise Taxes	20	0	156
Totals	$264,001	$301,095	$302,421

B. AUTOMOBILES

The Ford Ranch Wagon (1952 model) was operated until May by the Republic Mine Engineering crew when it was replaced by a 1957 model Ford Ranch Wagon. The Ford Ranch Wagon (1953 model) and the Chevrolet Carryall (1955 model) were operated throughout the year by the Field Engineering Crew and Townsite Crew respectively. The Ford Ranch Wagons (both 1956 models) were operated throughout the year by the Humboldt and Ohio--Tilden Engineering Crews. The Plymouth Suburban (1954 model), which had been assigned personally to the Chief Mining Engineer, was traded in on a 1957 model Plymouth Suburban and was assigned to Airport and Depot transportation.

The following table shows the mileage covered in 1957, the total mileage to the end of the year and the date the cars were received in the Department:

TABLE IX

Car	Miles 1957	Miles Total	Date Received	Date Disposed of
Ford Ranch Wagon (1952 model), #29	6,265	74,065	6/20/52	5/10/57
Ford Ranch Wagon (1953 model), #48	9,600	59,850	7/30/53	
Ford Ranch Wagon (1956 model), #77	11,725	24,005	11/30/55	
Ford Ranch Wagon (1956 model), #85	17,202	31,049	6/1/56	
Ford Ranch Wagon (1957 model), #115	11,450	11,450	5/8/57	
Chevrolet Carryall (1955 model), #69	10,137	29,757	5/21/55	
Plymouth Suburban (1957 model), #106	17,001	17,001	3/20/57	

C. MAP REPORTS

Since the discontinuation of the bound volumes containing maps which show the yearly mining activities, such as, the advancement of the underground development and mining, the photographs of construction progress, the open pit cross-sections and the logs of diamond drill holes, the only manner in which this can be made of record is to print additional copies of the large scale, 1":50' mine working maps which are filed for future reference. In addition, the large scale drawings are substituted for the more convenient-sized, annual report maps in order to fulfill the map report requirements called for in the majority of the existing mining leases. These agreements stipulate that map reports showing the status of the various properties as of December 31st shall be submitted.

The following table shows the companies for which sets of working tracing prints were prepared and the Michigan mine or mines in which that company has an interest:

TABLE X

Company	Mines For Itself	Mines As Operating Agent
The Cleveland-Cliffs Iron Company	Bunker Hill Cambria-Jackson Maas Ohio Tilden	Athens Humboldt Mather Republic

Company	Mines
The Athens Iron Mining Company for Pickands Mather & Company	Athens
The Negaunee Mine Company Partner: Bethlehem Steel Company	Mather Mine, "A" Shaft "B" Shaft
Humboldt Mining Company Partner: Ford Motor Company	Humboldt

At the end of each month, the Mining Engineers, assigned to the soft ore properties, inspect the underground workings and post the monthly mining progress, the advance of the development contracts and the diamond drill holes. Two sets of these monthly progress maps are made; one set to be used by the Manager and the other set sent to the Superintendent for his use. Numerous prints of the various sub-level maps upon which there was active mining operations are printed, trimmed and folded to pocket size. These maps are carried by the Mine Captain, Foremen and Shift Bosses who use the maps in their day to day production planning.

The next few paragraphs describe the map reports sent out by the Mining Engineering Department:

ATHENS MINE

Two sets of monthly progress maps, with mining advancement colored in red, were sent to Mr. E. L. Joppa, General Manager, Mines, and Mr. W. A. Knoll, General Superintendent, of the Pickands Mather & Company throughout the year.

CLIFFS SHAFT MINE

One set of mining progress maps of the Bancroft and Section 10 Leases was forwarded to the Duluth office of the Oliver Iron Mining Division after each of the tri-annual surveys, showing the work done during that four-month period in color. The final issue of these progress maps for the year 1957 also shows the ore areas that were used in calculating the estimate of ore reserves as reported to the Michigan State Tax Commission.

HUMBOLDT MINE

Two sets of monthly maps, showing stripping and mining advancement, were prepared and sent to Mr. R. L. Bodor, Manager, Mining Properties, and Mr. V. E. Kral, Resident Manager, of the Ford Motor Company.

Annual maps were also sent to Mr. Harry B. Weber, fee-owner of the Weber Lease.

MATHER MINE

A complete set of working maps of both "A" and "B" Shafts was forwarded to Dr. Donald M. Fraser, Chief Geologist of the Bethlehem Steel Company, at the end of each quarter, showing the mining progress in color.

MICHIGAN STATE TAX COMMISSION

During the first part of September, copies of all maps which show any active workings were sent to Mr. Harry J. Hardenberg, Deputy State Geologist. Outlined on the maps are the known ore areas which are used in calculating the ore reserve tonnages. A supplementary map report is sent to the Michigan State Tax Commission at the end of any year in which any large increase in ore reserves is discovered after the appraisal date of October 1st. No such supplemental report was necessary in 1957. Upon the discontinuance of the making of the annual report-size prints, the large 50':1" working maps were prepared to be used as a permanent record of the ore reserve tonnages reported to the Michigan State Tax Commission. These are kept on file in the Ishpeming Mining Engineering Department.

NEGAUNEE MINE

Prints of the Bunker Hill main levels were sent to the Negaunee Mine fee-owners. The yearly progress for 1957 was colored.

OHIO MINE

Maps of the yearly mining progress, both stripping and ore operations, were sent to the Department of Conservation, State of Michigan, from whom we lease the Beaufort Property. Tables, showing the production from the various leases, the concentrate and heavy media tonnages, percentage recovery, etc., were sent to the State of Michigan in accordance with the Beaufort Lease mill reject agreement.

TILDEN MINE

Maps of the yearly mining progress, both stripping and ore operations, were sent to the Hanna Coal & Ore Company.

D. MINING LEASES - Robert G. Fountain

The following mining leases and options were executed and placed on file in 1957:

Lease No. 110

Fifty-year lease from Michigan Trust Company to The Cleveland-Cliffs Iron Company covering the mineral rights in the NW¼ of SW¼ of Section 24, 43-35, Iron County, except certain platted lots, was sublet to Inland Steel Company as of July 2, 1956 for the term of 47 years.

Lease No. 170

Fifty-year lease from The Department of Conservation of the State of Michigan to The Cleveland-Cliffs Iron Company, covering certain platted lots in Carlson's Maple Valley Addition to the City of Iron River, was sublet together with Cliffs' interest in the balance of the NE¼ of SW¼ of Section 24, 43-35, Iron County, to Inland Steel Company as of July 2, 1956, for the term of 47 years.

Lease No. 171

Option for mining lease from Triana Exploration Limited to Cliffs of Canada, Ltd., dated May 21, 1957, expires December 1, 1959, covering various properties in the Black Lake Area, Athabaska Mining Division, Northern Saskatchewan, Canada.

Option for mining lease from Triana Exploration Limited to Cliffs of Canada, Ltd., dated May 21, 1957, expires December 1, 1959, covering various properties in the townships of Kenning, Case, Abbotsford and Singer in the Larder Lake Mining Division, Province of Ontario, Canada.

Lease No. 172

Option for mining lease from W. H. Meakin to Cliffs of Canada, Ltd., dated August 6, 1957, expires May 31, 1961, covering certain properties in the Rainy River District, Province of Ontario, Canada.

Lease No. 173

Four prospecting permits from the United States Department of Interior, Bureau of Land Management, to The Cleveland-Cliffs Iron Company, dated August 1, 1957, expires August 1, 1959, covering various lands in Delta and Schoolcraft Counties, Michigan.

The following mining leases and options were terminated during 1957:

Lease No. 98

Lease from The Department of Conservation of the State of Michigan to The Cleveland-Cliffs Iron Company, dated July 2, 1951, covering the N½ of SW¼, Section 22, 48-31, Baraga County, Michigan. Notice served December 7, 1957; termination effective December 31, 1957.

Lease No. 128

Option for fifty-year mining lease from Oscar Elo to The Cleveland-Cliffs Iron Company, dated December 16, 1954, expires December 15, 1957, covering the SW¼ of SW¼ of Section 36, 43-23, Delta County (Rock Area). Notice of termination dated November 20, 1957.

Lease No. 129

Option for fifty-year mining lease from Alrick Mikkila and wife to The Cleveland-Cliffs Iron Company, dated December 16, 1954, expires

December 15, 1957, covering the SE¼ of NW¼ of Section 36, 43-23, Delta County (Rock Area). Notice of termination dated November 20, 1957.

Lease No. 140

Option for fifty-year mining lease from G. Harold Earle and wife and Stewart E. Earle and wife to The Cleveland-Cliffs Iron Company, dated January 24, 1955, expires December 15, 1957, covering numerous descriptions in the Rock and Osier Areas. Option terminated as to most descriptions December 4, 1956. Notice of termination as to balance of lands covered dated November 20, 1957.

Lease No. 141

Option for fifty-year mining lease from Clarence J. Larson, et al, to The Cleveland-Cliffs Iron Company, dated January 15, 1955, expires December 15, 1957, covering various descriptions in the Rock Area. Notice of termination dated November 20, 1957.

Lease No. 147

Option for fifty-year mining lease from Frank William Hill and wife to The Cleveland-Cliffs Iron Company, dated January 28, 1955, expires December 15, 1957, covering the NW¼ of NW¼ and the SW¼ of NW¼ of Section 31, 43-22, Delta County (Rock Area). Notice of termination dated November 20, 1957.

Lease No. 157

Fifty-year mining lease from The Department of Conservation of the State of Michigan to The Cleveland-Cliffs Iron Company, dated May 5, 1955, covering various descriptions in T. 43 N., R. 22 W., Delta County (Osier and Rock Areas). All but five descriptions surrendered February 15, 1957. Notice of termination of lease served November 20, 1957; termination effective January 22, 1958.

Lease No. 158

Fifty-year mining lease from The Department of Conservation of the State of Michigan to The Cleveland-Cliffs Iron Company, dated May 5, 1955, covering various descriptions in T. 43 N., R. 23 W., Delta County (Rock Area). Notice of termination served November 20, 1957; termination effective January 22, 1958.

Lease No. 167

Option for fifty-year mining lease from Frank Sacco and wife to The Cleveland-Cliffs Iron Company, dated May 22, 1956, expires June 30, 1959, covering the SW¼ of NW¼ and the NW¼ of SW¼ of Section 36, 43-23, Delta County (Rock Area). Notice of termination dated November 20, 1957.

E. MINE SUMMARIES

1. BUNKER HILL--MAAS MINES - Harley E. Clickner, Mining Engineer

Engineering work at the Bunker Hill--Maas Mines during 1957 was carried on by two, two-man survey crews under the supervision of the Mining Engineer, until November 27, 1957, at which time the survey crew was reduced by two Surveyor Helpers and reorganized as one, two-man crew, consisting of two Surveyors. During the year, John R. Sleeman, Assistant Engineer, devoted his full time to the installation and maintenance of conveyor belts and drag-chain conveyors.

A resume of engineering activities carried on at the Bunker Hill--Maas Mines during the year 1957 is as follows:

a. The 10th Level conveyor installation was completed in April of 1957, and since that time, the majority of the production from the 10th Level mining areas has been conveyed over this installation to ore passes in the North footwall, where it is dropped to the 14th Level belt system.

b. A six-angle survey was conducted on the 6th Level to establish accurate coordinates near the 6th Level crusher station. At the close of the year, rock development for the proposed 6th Level conveyor system was near completion; however, in accordance with the curtailment in production and mine labor force effected in December, all work on the Maas 6th Level conveyor system has been suspended indefinitely.

c. The cage compartment runners in the Bunker Hill Shaft were plumbed from the shaft collar to the bottom of the wooden portion of the shaft--a distance of approximately 1,440 feet. Results of the plumbing were plotted, and during the mine-vacation period, the shaft crew replaced approximately 63 sets and installed approximately 630 feet of shaft runner in the cage compartment.

d. A 60' x 20' x 15" reinforced concrete slab was poured under the rock pocket at the Bunker Hill Shaft. This slab will more uniformly distribute point loads around the shaft, and help relieve the extremely muddy conditions which are prevalent around the shaft during periods of inclement weather.

e. On May 18, 1957, a survey was conducted on the Maas--Race Course stockpile in the West stocking area at the Bunker Hill--Maas Mines. Representative ore samples were collected from the pile, weighed, and a tonnage factor of 13.8 cubic feet per ton was calculated and used in computing the tonnage. Subsequent calculations confirmed the assumption that skips of Maas ore weighed approximately one ton less than the 12 tons per skip being used as a skip factor. This situation was corrected by raising the grizzly rails over the 6th Level measuring pockets 5-1/8 inches and adding 12 inches to the height of the skips.

f. Lines and elevations were established for the installation of the motor for the auxiliary motor-generator set.

g. A survey was conducted to permit the layout of the track and tunnel addition between the new garage building and the timber tunnel.

h. The 2500 cross-cut was holed-through to the 12th Level North main drift. The hole-through was excellent with respect to line and grade.

i. Line and grade were established for approximately 385 feet of surface drain line.

j. The survey crew established grade stakes for the grading of the North parking area. This area was graded and filled with approximately 3 inches of crushed rock to increase parking capacity and facilitate drainage.

k. Center lines and elevations were established for the relocation of the mine timber track and the Northwest loading track.

l. Stockpile surveys were conducted on the West, Northeast and Southeast stockpiles.

m. A new post-type brake was installed on the cage hoist during November. The previous brake footings were modified to meet the specifications of the new brake, and center lines and elevations were established by the survey crew.

n. A series of cross-sections were run across the Bunker Hill Mine timber yard to investigate the feasibility of grading the timber yard.

o. The Maas and Bunker Hill Shafts were gauged during the year and the necessary corrections made to sets and runners.

p. A large majority of the Mining Engineer's time was spent in report writing, mine planning, cash forecasts, block estimates and general supervision of the survey crew.

2. CAMBRIA-JACKSON MINE - R. Charles Kincaid, Mining Engineer

a. Throughout the year, lines and grades were surveyed by one, two-man survey crew in the various development areas.

b. The Mining Engineer was responsible for writing the monthly and annual reports, figuring contract miners' incentive earnings, calculating the Michigan State Tax and Federal Tax Estimates, laying out of mining areas, estimating 1958 production schedule and preparing the Capital Regeneration Study for the Cambria-Jackson Mine.

c. In the spring and fall, the survey crew gauged the shaft runners and assisted in the construction and installation of the South stocking trestle.

3. CLIFFS SHAFT MINE - James P. Meyers, Mining Engineer

a. Engineering personnel assigned to this property gauged all the "C" Shaft runners twice during the year. The runners were gauged in the standard method.

b. In August, 1957, all the counterweight runners in "C" Shaft were gauged for the first time. The runners were found to be in excellent condition. The counterweight runners will be gauged on a semi-annual basis in the future. These runners will have to be gauged by climbing through the shaft ladder road and measuring at each set with a yardstick.

c. Tri-Annual Surveys were conducted, the maps posted and reports compiled and forwarded to the Oliver Iron Mining Division of the United States Steel Corporation.

d. Accurate production, analyses records were maintained throughout the year by the engineering personnel as per the 1954 Mixing Agreement of The Cleveland-Cliffs Iron Company and the Oliver Iron Mining Division of the United States Steel Corporation. All monthly analyses reports to the Lessor were undertaken and prepared by the engineering personnel.

e. Engineering personnel assigned to the property spent considerable time on a number of "time studies" conducted at the mine throughout the year. A number of studies were made on tests of various types of percussion drill machines and a few were made on bits and the D-2 Traxcavator.

f. A ventilation study was made during the year, so that methods of improving ventilation might be investigated. The study resulted in a decision to purchase a larger fan and mount it upon the Moro Shaft. The larger fan should increase the amount of air being delivered to the mine by 60%.

g. Tests with carborized steel were followed and roof-bolting procedures were checked and studied. Tension tests and torque tests were made at intervals during the year to check the mine practice in rock bolting.

h. The installation of another pump in the 15th Level pumphouse required lines and grade work for the foundation of the pump.

i. Progress of several shrinkage stopes in the mine was followed throughout the year by the Mining Engineer and the survey crew and all necessary survey control work was done by the crew.

j. The annual estimate of proven ore reserves and the attending reports were prepared and submitted. Several other reports of other than routine nature were also prepared and submitted.

k. The Mining Engineer and survey crew also assisted in various pillar recovery projects throughout the year.

l. The survey crew was called upon to do some survey control work upon the mine surface preparatory to some experimental geophysical work which was being conducted by the Geological Department.

m. The routine underground surveys necessary for the mining and development contracts, the location and marking of lease boundaries underground, and the surveying of diamond drill holes on the Cliffs Shaft Mine surface were taken care of as called for throughout the year.

n. Results of all testing programs were tabulated and reported upon by the Mining Engineer. Several cost studies were also prepared, specifically, upon the shrinkage method of mining, bit costs, wire rope costs, etc.

o. Time was also spent upon numerous other projects, some of which are as follows:

1. Tabulation of safety infractions and accidents plus the preparation of graphs with this information

2. Fencing of Property

3. Scrap and house cleaning program to clear up the old plant area

4. Cost sheets on underground tractor-loaders

5. Hoist rope inspections

6. Noise Control

4. <u>HUMBOLDT MINE</u> - Albert Henry, Mining Engineer

a. All of the primary drilling was located with the desired depth and chamber. The explosive charges were calculated and the loading was supervised. The jet piercing machines' performance was analyzed for possible improvement.

b. The monthly pit progress was surveyed and mapped. A general area check survey was made for a 1":100' scale map to replace the 1":50' scale. Mining plans, stripping and power line estimates were prepared. The old Barron Mine stopes were first encountered in mining and these voids were entered on the maps. Ledge-depth test holes were bored on the East side of the Concentrator and profile lines were run in the swamp for plant expansion cost estimates.

c. Diamond drill hole #8 was the only test hole drilled during the year. Geophysical survey (superdip) was conducted on the Weber Lease and in the vicinity of the old Foxdale Mine.

d. The mine was short of fresh water throughout the summer. The discoloration of Lake Lory during the past winter prevented the return of a large volume of tailings pond overflow water back to the lake. This situation developed into a crisis until fall rains relieved the situation. The present practice of just skimming the surface for tailings pond overflow water should minimize this condition in the future.

e. Martin D. Tasson was assigned to the Humboldt Mine Engineering Crew in May to aid in the technical duties. His assistance has been greatly valued in correlating the engineering with the complicated pit structure and general operations.

5. MATHER MINE

a. "A" SHAFT - Oiva W. Hakala, Mining Engineer

1. Each month a survey of the mine was made to map the geology and work completed in the various areas of the mine. Four sets of maps were prepared and distributed to the District Superintendent, Mine Superintendent, Mining Engineer and Mine Captain. At the end of each quarter, an additional set of maps was prepared and sent to the Bethlehem Steel Company. Point maps for the supervisory personnel were also prepared each month. In addition to the plan maps, assistance in the posting of drifts and raises on the geological cross-sections is being rendered by the Mining Engineering Department.

2. The routine survey work of providing lines and grades for underground development was carried out by the two, two-man crews. Approximately twenty-five crews on a two and three-shift basis are engaged in development work on the main levels and sub-levels.

3. A major project which was begun during the year was the development of the 12th to 9th Level inclined belt conveyor drift. Careful control was required on the excavation phase of the project in maintaining proper alignment and grade. Rock bolts are being used as the means of support, thus requiring a systematic check to see that the proper cross-sectional area is being maintained as clearances must be adequate for the various pieces of equipment which will have to be taken through the drift.

4. Other projects in connection with the development of the inclined drift were the installation of a man and materials hoist, track and the installation of part of the belt conveyor.

5. Other construction jobs were the installation of three sub-level belt conveyors. Development of two more sub-level belt conveyor drifts is progressing.

6. Routine work accomplished during the year is as follows: Shaft gauging, stope analysis, ore estimates, stockpile analysis, stockpile surveys, accumulation of data on underground water, supply requirements, mine economic studies and mine operations planning.

7. Weekly and monthly reports on progress at the mine were prepared for management.

b. "B" SHAFT - R. Charles Kincaid, Mining Engineer

1. The two, two-man survey crews assigned to this property took care of the day to day surveying of the mining and development contracts, calculating and recording stope analysis data, posting of analysis maps and taking water elevations in the Jackson Pit Area.

2. The Mining Engineer was responsible for the writing of the monthly and annual reports, figuring contract miners' incentive earnings, determining the monthly steel and annual timber requirements, calculating the Michigan State and Federal Tax Estimates, laying out of mining areas and assisting in the Capital Regeneration Study and the 1958 Production and Cost Estimates.

3. The Mather Mine, "B" Shaft's standard and special ore stockpiles were surveyed in the fall to determine the balance of the ore in stock at the end of the shipping season.

4. The test hole drilling program, which has proven to be efficient and economical, continued throughout the year. This program required the presence of the Mining Engineer and survey crews to lay out the drill holes and compile the results.

5. The Mining Engineering Department personnel conducted the check surveys on the footwall heading on the 10th Level and gauged the shaft runners twice during the year.

6. The survey crews assumed the responsibility of recording underground weir readings and pumping data, posting underground water survey information on a special set of water survey maps and took daily water elevation measurements in a surface subsidence drill hole.

7. A considerable amount of the survey crews' time was required with the excavation and installation of the 9th Level mining conveyor and the 10th Level crusher-trench excavation.

6. OHIO MINE - Allen H. Heikkinen, Mining Engineer

A summary of the engineering activities at the Ohio Mine during 1957 is as follows:

a. Planning and supervision of primary drilling and blasting

b. Monthly pit surveying and mapping and computation of ore reserves and stripping estimates

c. Pit planning

d. Survey and supervision of relocation of new tailings discharge line

e. General pit and mill supervision

7. REPUBLIC MINE - Robert J. Flynn, Mining Engineer

PIT WORK

a. The monthly pit progress was surveyed and the maps posted and distributed to the interested personnel.

b. A shovel location map was maintained showing the position of the ore removed on a daily basis - with this is a chart showing the grindability, concentrateability, and other information which may aid in the future concentrating and pelletizing of the Republic orebody.

c. The oxygen calculations are checked on a bi-monthly basis and recorded at the end of the month. To minimize the oxygen loss, the operators are now required to record, every half hour, their meter settings and if needed, reset the meters to the proper oxygen flowage. These readings are then calculated and recorded by the engineering personnel.

d. Sixteen major field blasts were fired during the year. These blasts contained 544 holes. The holes were surveyed, the water level checked, the volume and powder charge calculated and the loading of the holes supervised. During the latter part of the year, a four-inch submersible pump was used to lower the water level in the jet holes. This has enabled us to use more of the prilled ammonium nitrate explosive.

e. The field surveying was done in conjunction with the drawing of a new 100' scale pit map.

f. A volume check was run on a portion of the hangingwall earth stripping to determine the yardage carried by the 34-ton trucks.