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7. UNDERGROUND MINING:

a. Shaft:

Minor repairs to shaft timbers during the year.

b. Development:

No extensive development. A few short drifts and raises to develop wash ore areas.

c. Mining

Mining was carried forward during the year by top slicing underground, with an average of thirteen gangs employed. Mining operations entailed the mining back of pillars on the various levels in an orderly manner. Average mining height was 14 feet, with width of slices varying from 10' to 12'. During the summer months, two gangs scrammed from the mill pit with a tractor and bulldozer, cleaning up surface wash from the top of ore. Operations both in underground and mill pit were severely handicapped by floods, due to excessive rains on four separate occasions.

Considerable trouble was encountered all through the year in maintaining the grade of ore due to high silica ores encountered. A study of the ore body, started last year, was completed and approval received for the construction of a small washing plant to concentrate this material. Work was immediately started on construction of stocking trestle so that a sufficient quantity of this high silica ore could be mined during the winter months to allow for uniform feed to the plant during its operation. The latter part of the year, wash ore areas were developed, preparatory to mining this material in 1950.

During the strike, which lasted from September 30th to November 14th, every precaution was taken to keep the mine in shape for immediate reopening. Pumping, shaft repair and drift maintenance was carried forward and operations were resumed immediately upon cessation of the strike.

d. Timber, Explosives, etc:

The supply of timber was ample and of good quality throughout the year.

Lineal feet timber used per ton of ore produced,	0.063
Cost per ton for timber,	$0.098
Cost per ton for lagging, poles and boards,	$0.108
Cost per ton for wire,	$0.016
Pounds of explosives per ton,	0.39
Cost per ton of ore produced for explosives	$0.056

e. Pumping and Drainage:

There were no changes in pumping arrangements during the year. Severe rainstorms caused flooding, but dams held the water until pumps could dewater. A small air-operated sump pump was purchased

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7. UNDERGROUND MINING: (continued)

e. Pumping and Drainage: (continued)
during the year for emergencies. The cost per ton for pumping was $0.049, compared to $0.047 in 1948.

8. COST OF PRODUCTION:

a. Comparative Cost Statement:

	1949 BUDGET	1949 COST PER TON	1948 COST PER TON
PRODUCT:			
Direct Ore, - tons	330,000	315,341	370,256
UNDERGROUND COSTS:			
Structure Drilling,		$ .002	-
Milling Pit,	$ .061	.059	$ .049
Stoping,	.706	.710	.605
Timbering,	.466	.408	.408
Tramming,	.171	.160	.148
Ventilation,	.007	.003	.007
Pumping,	.054	.049	.047
Compressors and Air Pipes,	.038	.030	.032
Underground Superintendent,	.050	.047	.043
Cave-in or Fire in Mine - Flood,	.000	.007	-
Maint: Compressors & Power Drills,	.003	.004	.004
Scrapers & Mech. Loaders,	.077	.078	.067
Tramming Equipment,	.043	.036	.037
Pumping Machinery,	.003	.008	.003
Total Underground Costs,	$ 1.679	$ 1.601	$ 1.450
SURFACE COSTS:			
Hoisting,	$ .043	$ .036	$ .037
Stocking Ore,	.025	.024	.025
Dry House,	.034	.033	.030
General Surface Expense,	.022	.025	.019
Maint: Hoisting Equipment,	.005	.004	.004
Shaft,	.005	.006	.004
Top Tram Equipment,	.005	.006	.004
Docks, Trestles and Pockets,	.000	.000	.000
Mine Buildings,	.008	.005	.007
Total Surface Costs,	$ .147	$ .139	$ .130

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8. COST OF OPERATION: (Continued)

a. Comparative Cost Statement: (Cont'd)

	1949 BUDGET	1949 COST PER TON	1948 COST PER TON
GENERAL MINE EXPENSES:			
Geological,	$ .001	$ .004	$ .001
Mining Engineering,	.015	.018	.013
Mechanical & Electr. Engineering,	.010	.009	.008
Analysis and Grading,	.014	.019	.017
Safety Department,	.009	.007	.006
Telephones & Safety Devices,	.010	.006	.008
Special Expense,	.005	.002	.004
Ishpeming Office,	.002	.003	.003
Mine Office,	.059	.064	.059
Insurance,	.016	.018	.012
Personal Injury,	.023	.032	.009
Social Security Taxes,	.026	.019	.023
Employees Vacation Pay,	.024	.033	.022
Hibbing Office,	.010	.033	.015
Total General Mine Expenses,	$ .224	$ .267	$ .200
COST OF PRODUCTION,	$2.050	$2.007	$1.780

The cost of production was $.043 lower than the budget and $.227 higher than the 1948 cost. The decrease in cost over the budget was due almost entirely to the mining of more of the lower silica mill pit ores than was estimated in an endeavor to overcome the higher silica from underground areas. The large increase over 1948 costs came from the necessity of selective mining in order to make best grade possible with the high silica ores available during the past year.

The above differences were spread proportionately throughout the various items.

9. MAINTENANCE AND REPAIRS:

A continuous program of maintenance and repairs was carried on throughout the year, as the need arose.

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10. EXPLORATION AND FUTURE EXPLORATION:

A program of structure drilling was set up from underground and approved the latter part of the year. Actual drilling was started by the E. J. Longyear Company with one rig on a one-shift basis on December 15th. No results are as yet available. This program entails the drilling of seven holes, with a total footage of approximately 750 feet, from the main level in the west end of the mine. It is expected that this program will prove up an additional tonnage of ore under the main level in this area. Future holes are planned, depending on these results, to try and establish a connection of the main ore body with present isolated ore along the north line of the property.

11. TAXES:

a. Statement of Taxes:

	1949	1948	Increase	Decrease
Sargent Mine,	$42,308.54	$41,248.84	$1,059.70	
Auxiliary Lands,	61.48	47.16	14.32	
Personal Property,	1,074.93	2,998.69		$1,923.76
Total,	$43,444.95	$44,294.69	-	$ 849.74
Average Tax Rate,	213.49	161.02	52.47	

The increase in ad valorem taxes is due to the increase in tax rate.

The decrease in personal property taxes is accounted for by the fact that there was no ore in stockpile in 1949; there was in 1948.

The large increase in the tax rate is due to increases in the rates for the County, Village and School District. The School District is responsible for more than 50% of the increase.

12. ACCIDENTS AND PERSONAL INJURY:

There were four lost-time accidents at this property during the year 1949 and these are described as follows:

Joseph Stanich, Lull Loader Operator - Injured January 27th. Stanich was loading timber on loader when hook he was using slipped and a timber fell, hitting him on the left foot, fracturing his great toe.

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12. ACCIDENTS AND PERSONAL INJURY: (Continued)

Nick Samarzea, Miner - Injured March 17th.
Samarzea was going in to slice while his partner was pulling with tugger. The cable caught onto the other tugger cable. It let loose and snapped back, hitting him on side of right knee.

Waino Lind, Miner - Injured August 1st.
Before blasting some large rocks, the light bulbs were removed. After the blast, Lind went in to replace the bulbs and in doing so he tripped and fell across the scraper, on his stomach.

Andrew Wanhala, Miner - Injured September 30th.
Wanhala was picking down loose ore from the back to make room for fore poles. A slab of hard ore fell, hitting Wanhala on his right shoulder and right side.

13. PROPOSED NEW CONSTRUCTION:

Upon completion of a study as to the amount and feasibility of concentrating the high silica ores in this property, it was found that a sufficient quantity of this material, responding very favorably totreatment in a simple washing plant, was available. Approval for an expenditure of $45,000.00 for the construction of this plant, together with necessary auxiliaries, was received and construction started immediately in September. Due to the strike, construction was delayed, but trestle for stocking of this wash ore was completed so mining of this material could be started January 1st, 1950. The plant structure at the end of the year was 75% complete and plant will be ready for operation in the spring of 1950.

14. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

The following equipment was purchased and put into use during the year:

2 - Joy FA-211 15 H.P. Double-drum scraper hoists
1 - International pickup truck
1 - I.R. #25 Sump pump

Proposed new Equipment

2 - 2 H.P. Blowers
2 - 15 H.P. Double-drum scraper hoists

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1. GENERAL:

The operations for the year consisted essentially of stripping. The contract stripping program from December, 1948 continued until May 10th, 1949, except for a repair shut-down period between January 27th and March 22nd. On May 24th, the stripping operations were resumed with Company crews, and continued through December, except during the steel strike between September 29th and November 14th.

Excavation for the conveyor system was completed, bases poured, and some additional work done on the ore truck dumping pocket.

A power line was installed to the Woodbridge shaft and a 3,500 G.P.M. pump installed and put into operation.

4. ESTIMATE OF ORE RESERVES:

a. Factors:

	Cu. Ft. Per Ton	Rock Deduction	% Recovery
No. 1 Ore,	14	10	100.00
No. 2 Ore,	14	10	100.00

Reserves:

	Reserve 12-31-48	Mined 1949	Bal. After Mining	Reserve 12-31-49
Woodbridge	421,714	-	421,714	421,714
Wanless	1,251,874	-	1,251,874	1,251,874
Total,	1,673,588	-	1,673,588	1,673,588

b. Estimated Analyses:

	Tons	Iron	Phos.	Silica	Mang.	Alu.
Woodbridge:						
No. 1 Ore,	227,006	54.97	.090	6.92	1.28	2.17
No. 2 Ore,	194,708	47.09	.104	12.01	2.44	5.61
Total Woodbridge,	421,714	51.33	.096	9.27	1.82	3.76
Wanless:						
No. 1 Ore,	832,731	54.65	.136	7.48	1.60	3.79
No. 2 Ore,	419,143	48.96	.103	13.35	.89	9.09
Total Wanless,	1,251,874	52.75	.125	9.45	1.36	5.56
Total No. 1 Ore,	1,059,737	54.72	.126	7.36	1.53	3.44
Total No. 2 Ore,	613,851	48.37	.103	12.93	1.38	7.99
Grand Total,	1,673,588	52.39	.118	9.40	1.48	5.11

WANLESS MINE
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5. LABOR & WAGES:

a. Comments:

An ample supply of labor was available in the Buhl district. The strike in the steel industry for pensions and insurance stopped operations from September 29th to November 14th.

b. Comparative Statement of Production & Wages:

PRODUCTION: (by Company crews only)

Stripping, ----------	407,929 Cu. Yds.
Number of Days Operated, ----------	135
Average Number of Men Working, ----------	42.18
Average Wages Per Man, ----------	12.29
Production Per Man Per Day, ----------	71.64
Labor Cost Per Man Per Cubic Yard--------	.172
Total Number of Man Days, ----------	5,694
Amount Paid for Labor, ----------	$69,960.40

6. GENERAL SURFACE:

a. Buildings, Repairs:

In December, a small extension was made to the frame office building to serve as a cold storage warehouse.

b. Transmission Lines and Roads:

A transmission line was constructed for power to the Woodbridge shaft pump. Roads were constructed as required for stripping operations.

7. OPEN PIT:

a. Stripping:

The contract stripping operations by Haley-Young continued from 1948 until January 27, 1949, at which time operations were temporarily suspended. Minor equipment repairs were made during this period and, on March 22nd- when weather conditions were favorable, contract stripping was again resumed and continued until May 10th. From January 1st to May 10th, the contractor stripped 181,904 cubic yards, consisting of 24,441 cubic yards of surface; 66,316 cubic yards of waste material; 33,277 cubic yards of lean ore and 57,870 cubic yards of taconite. The contractor was paid an average of $0.309 per cubic yard for this stripping. The average contract stripping cost for 1948 and 1949, including company expenses, was $.349.

The Haley-Young contract was discontinued on May 10th. Wanless Mine crews started stripping operations on May 24th, and, except for the strike period from September 29th to November 14th,

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7. OPEN PIT:
(Continued)

a. Stripping: (continued)
continued through December 31st. During this period, from May 24th through December 31st, 407,926 cubic yards of material were stripped, consisting of 206,880 cubic yards of surface, 42,441 cubic yards of waste material and 158,605 cubic yards of taconite, and at an average cost of $.433 per cubic yard.

The stripping conditions were adverse, due to soft bottom in the caved areas and delays caused by Diesel shovel breakdowns.

Ore production was postponed until 1950 and the stripping program extended further to the North Woodbridge area which would permit better mining conditions and avoid further stripping in the wet caved area until more effective drainage was secured.

c. Pumping and Drainage:

Due to the fact that the stripping operations were greatly hampered by the high water table and by the extreme wet conditions in the caved areas in the Wanless Mine, it was necessary to improve the pumping operations at the property. The 1,000 G.P.M. deep-well pump, which had been installed in the Woodbridge shaft, was replaced with a 3500 G.P.M. pump. This assisted in lowering the water in the vicinity of the Woodbridge and the water flowing in from the Dean, but did not have any affect in the caved area in the Wanless section of the pit. It was, therefore, necessary to install a 1800 G.P.M. deep-well pump in the Wanless shaft in December, 1949. This aided considerably in draining the area in the Wanless pit proper.

8. MAINTENANCE & REPAIRS:

During the temporary shut-down of stripping from January 27th to March 22nd, the Haley-Young Mining Company made minor repairs to the shovel and mobile equipment. Subsequently, during operations such additional repairs as were required were made. Major repairs are necessary on the shovels for the 1950 operating season.

10. COST OF OPERATION:

No ore was produced in 1949.

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11. EXPLORATION AND FUTURE EXPLORATION:

No exploration work was done during 1949. In 1950, three exploration holes will be drilled.

12. TAXES:

The following is a statement of taxes at the Wanless Mine for the years 1949 and 1948:

	1949	1948	Increase	Decrease
Wanless Mine,	$15,464.86	$10,640.35	$ 4,824.51	
Personal Property,	2,857.78		2,857.78	
Total,	$18,322.64	$10,640.35	$ 7,682.29	
Average Tax Rate,	91.23	78.99	2.24	

The increase in ad valorem taxes is the result of an addition to the reserve tonnage and the increase in tax rate.

There was no personal property tax in 1948, In 1949, equipment was moved into this property, which accounts for the tax.

The increase in the tax rate is due to the increased rate in the County and School District.

13. ACCIDENTS AND PERSONAL INJURY:

Number of compensable accidents, ----------	1
Compensable days lost, ----------	36
Number of injuries, no lost time, ----------	12

14. PROPOSED NEW CONSTRUCTION:

In 1950, the construction will consist of completion of the ore-loading pocket, installation of crusher, erection of a conveyor from loading pocket to railroad hopper, and construction of the hopper to load ore into the railroad cars. No other construction is anticipated.

15. EQUIPMENT RECEIVED AND PROPOSED NEW EQUIPMENT:

During the year the following equipment was purchased and put into service:

1 - 3-1/2 cubic yard Lima shovel
1 - Used No. 12 Motor Grader
1 - Hystaway attachment for 6 D-8 tractors

Purchase of additional equipment for 1950 is not anticipated.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents

The one fatal accident which we had to record for the Year 1949 was hard to accept and was much involved. Although our severity rating is considerably below the average of the Lake Superior District Iron Mines, the time charge of 6,000 days is more than half of the total days lost from all injuries. The fatality rate for the year of 1949 is .24 per 1,000 employees; the third best in the history of the company. Only 1932 and 1946 were better, when there were no fatal injuries.

Interesting is the fact that in the ten-year period previous to 1911, the fatality rate was 5.1 per thousand employees compared to .87 for the last ten years.

A brief summary of the fatal accident follows:

Toivo Holmi, Maas Mine:

Toivo Holmi was injured at 11:15 P.M. on June 1st when he stepped and fell on the 6th Level Station. The injury was a simple fracture of the right leg. Because the injury was not considered very serious, it was investigated only by the foreman who was at the station at the time of the accident. Holmi was immediately taken to the hospital where in a short time he went into a deep state of physical shock from which he did not recover. He died on June 4th. Holmi's physical condition was very poor, and this was the main contributary cause of death.

According to the foreman's report, Holmi, who was a brakeman on a haulage train, had ridden to the shaft station at quitting time. He stepped off the locomotive, started to walk towards a bench where he intended waiting for the cage to be hoisted to surface, and either slipped on the plank flooring of the station or the haulage rail and fell. He must have had an unusual fall because both bones in the leg were broken. Good housekeeping had always been observed at this station. There were no obstructions of any kind. The haulage track rails to the cage compartment are not more than one-half inch above the plank flooring. Accidents of this kind are next to impossible to avoid except by the man himself. Also, when the man's physical condition is such that he cannot fight off physical shock, our efforts in accident prevention receive quite a set-back.

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE I

FATAL ACCIDENT RECORD
THE CLEVELAND-CLIFFS IRON CO. AND CLIFFS POWER & LIGHT CO.
1898-1949, 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

(Cont'd.)

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE I (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	631	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	4305	3	.70
1949	4191	1	.24
1911 - 1949	105,021	219	2.08

BASED ON PER THOUSAND EMPLOYEES

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE II

CLASSIFICATION OF CAUSES OF FATAL ACCIDENTS FROM DECEMBER 1, 1898 TO DECEMBER 31, 1949

A.	Fall of ground	110	
	Run of mud or sand	60	
	Fall of chunk of ore from chute	2	
	Stray chunk or stick down raise or stope	4	176
B.	Shaft Accidents:		
	Falling down shaft	15	
	Rock or timber falling down shaft	3	
	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	55
C.	Use Of Explosives:		
	Explosion of powder	16	
	Premature blast	3	
	Fall of ground or timber due to a blast	4	
	Overcome by gas	3	
	Miscellaneous causes	2	28
D.	Mine And Railroad Cars:		
	Caught by haulage cars	15	
	Riding or attempting to ride cars	6	
	Falling with car from trestle	4	
	Run over by railroad car	8	
	Struck by locomotive	2	
	Miscellaneous causes	1	36
E.	Miscellaneous Causes:		
	Falling in raise, stope or pocket	9	
	Electric shock	11	
	Falling from ladder, trestle, etc.	8	
	By moving machinery	7	
	Mine fires	3	
	Stockpile slide	3	
	Miscellaneous causes	3	
	Slipping and falling	1	45
	TOTALS		340

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11. ACCIDENTS AND PERSONAL INJURY

a. Fatal Accidents (Continued)

TABLE III

CLASSIFICATION OF FATAL ACCIDENTS-1911 TO 1949, INCLUSIVE, BY THE CENTRAL SAFETY COMMITTEE

I.	Trade Risk		121
II.	Negligence Of The Company		
	Violation of rules	6	
	Failure to provide safety devices	6	
	Improper method of doing work	12	
	Failure to provide tools or safe places to work ..	5	
	Failure to instruct men	5	
	Improper act or selection of improper method of doing work (By Foreman)	1	35
III.	Negligence of Workmen		
A.	Injured Men:		
	Improper act or improper method of work	25	
	Violation of rules	10	
	Failure to use tools or appliances provided	4	
	Failure to use safety devices	3	42
B.	Other Workmen:		
	Improper method of doing work	14	
	Violation of rules	4	
	Failure to use tools or appliances provided	1	19
A-B.	Injured Men and Other Workmen:		
	Improper act or selection of improper method of doing work	1	1
II.			
III.			
A-B.	Failure to instruct men by foreman and violation of rules by injured man and partner	1	1
	TOTALS		219

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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 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.

Safety Department

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Year 1949

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries

During 1949 we had a total of 355 lost-time injuries, of which 229 caused loss of from 1 to 6 days and 126 were compensable (loss of over 6 days). This compares with 415 lost-time injuries during 1948, of which 270 caused loss of from 1 to 6 days and 145 were compensable. This gives us 60 fewer injuries during 1949. There were 19 fewer compensable injuries and 41 fewer non-compensable injuries. Our Frequency Rate is 43.91 for 1949 compared to 45.01 in 1948 and severity rating is 1.459 compared to 3.57 in 1948. The severity rating is far below the average rate for the Lake Superior District Iron Mines for 1949.

Falling chunks down raises and persons slipping and falling each caused 13 compensable injuries and head the list of causes. Falls of ground and haulage each caused 11 compensable injuries. These four causes total up to 47 compensable injuries and have not only received the attention of the Safety Department, but also that of the Central Safety Committee.

Falling chunks down raises have been classified as "Trade Risks" in most cases because there is no "sure" way to prevent this type of accident. In order to loosen chunks in mill raises and chute openings it is necessary to be exposed to the hazard of the chunks. Many different devices and methods have been used but few have proved satisfactory. A study of this problem will continue.

Slipping & Falling injuries continue to plague us. Many of the injuries have occurred where the footing has been as perfect as a parlor floor, but a little slip, mis-step or the man in too much of a hurry has caused him to fall. An example is the one fatal accident which occurred during the year. In this case, the conditions were ideal for an underground shaft station. Most of the travel-ways underground on the main level are good, and, of course, in the work places quite rough; especially in the hard ore mines. Still, there is more slipping and falling where travel is better. Our only hope to prevent this type is through education.

Falls of ground accidents, which cause more injuries than other types of accidents in the Lake Superior District, did not give us the usual trouble. With close supervision on the part of shift bosses and underground foremen, I believe we can eliminate even more of these accidents. Our rules, which require forepoling and side support in all drifts and slices are two of our best mining rules. We have had some violations of this rule and supervisors have been responsible as well as the miners and should be disciplined the same as the miners. The small amount of time saved and ore produced does not pay for the injuries which falls of ground can cause.

Haulage, which caused as many injuries as falls of ground, and some quite severe, is of much concern to all of us. Misunderstanding and violations of rules have caused most of these injuries but, in my opinion, recklessness has certainly played its

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

part. Very few of the old time locomotive operators have trouble operating their haulage trains, and many have been on the job for years without any more trouble than a car derailed. The young men who operate the locomotives are interested in this work for only a short time and then want the better paying jobs such as mining. If it were possible to put haulage crews on a contract basis, I believe they would perform better and safer work.

Other causes of compensable injuries are of concern to us, but most of them are not considered too serious. Most of these injuries are preventable, with the exception of those, such as drilling. Very often the drill steel breaks and causes the man to fall forward if he is holding the machine. In such a case, and this happened a number of times, the accident is hard and sometimes impossible to foresee. In the handling of material the men very often become careless and also fail to plan their work.

On surface at underground mines there were eight compensable injuries, six caused by falling or moving material and all caused by lack of planning work and carelessness. The other two were caused by slipping and falling through no fault of the injured, but rather the weather, over which we have no control. The surface record certainly is good, considering the extremely bad weather conditions of the past year.

The open-pit properties had a good year with a Frequency of 24.86 and severity of .548. Total number of compensable injuries for the seven mines was 14. Falling or moving material caused five of the 14 injuries and it is surprising that this figure is so low considering the great amount of construction and repair work done each year. Slipping and falling caused three compensable injuries and again I feel this is a low figure because of the hazards of winter weather. Haulage, which caused five compensable injuries during 1948, caused only two during 1949 and this, I believe, is because of some of the new rulings for truck operations. The other four injuries were caused by flying particles, bumping against objects, lifting and burns.

The Cliffs Power & Light Company had but one lost-time injury when an employee was burned by electricity while at work near Manistique on strange equipment which was not the property of the Company. This was the first lost-time injury suffered by an employee of the power company for 66 months.

The one injury charged to the Storehouse & Shops was caused by falling material from a drill rig. Since that time drill men are required to wear hard hats. A hard hat would have prevented this injury.

The following tables give a detailed account of accident rates, causes, place of accident, etc.:

TABLE IV

CLASSIFICATION OF COMPENSABLE ACCIDENTS

	MATHER MINE, "A" SHAFT	MAAS	MATHER MINE, "B" SHAFT	LLOYD	CLIFFS SHAFT	CAMBRIA-JACK.	ATHENS	SPIES-VIRGIL	NEGAUNEE	STHSE. & SHOPS	C.P.& L. CO.	WANLESS	AGNEW	SARGENT	HAWKINS	HILL-TRUMBULL	CANISTEO	HOLMAN CLIFFS	ATKINS	TOTALS
I. Trade Risk, Incidental and Non-Preventable	7	2		3	5	2	5	1	1				1	1		1	1			30
II. Negligence Of Company:																				
1. Failure to Use Safety Devices Provided																				0
2. Failure to Use Proper Tools Provided																				0
3. Violation Of Rules																				0
4. Improper Act Or Selection Of Method Of Doing Work(By Foreman)				1																1
5. Failure To Instruct Men As To Method, Ha-zards, Etc.		1					1									1				3
6. Failure To Provide Safety Devices						2														2
7. Failure To Provide Tools, Appliances Or Places To Work	2			1									1				1			5
III. NEGLIGENCE OF WORKMAN:																				
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	3				1							1	1	1						7
4. Improper Act Or Method Of Doing Work	14	9		5	5	5	4	2	1				2	2	2	1	1	1		54
B. Other Workman																				
1. Failure To Use Safety Devices Provided																				0
2. Failure To Use Proper Tools, etc. Provided																				0
3. Violation Of Rules																				0
4. Improper Act Or Method Of Doing Work				1	1					1			1							4

(Cont'd. - Next Page)

TABLE IV (Continued From Previous Page)

CLASSIFICATION OF COMPENSABLE ACCIDENTS

	MATHER MINE, "A" SHAFT	MAAS	MATHER MINE, "B" SHAFT	LLOYD	CLIFFS SHAFT	CAMBRIA-JACK.	ATHENS	SPIES-VIRGIL	NEGAUNEE	STHSE. & SHOPS	C.P.:& L. CO.	WANLESS	AGNEW	SARGENT	HAWKINS	HILL-TRUMBULL	CANISTEO	HOLMAN CLIFFS	ATKINS	TOTALS
COMBINED CLASSIFICATIONS:																				
III-A-4 and III-B-4	1	2	1	1		1	3						1							10
III-A-3, III-B-3 & II-7																			1	1
III-B-4, II-7	1																			1
III-A-4, II-5		1																		1
III-A-4, II-4							1									1				2
III-A-4, II-7							1									1				2
III-A-1, III-A-3 & II-5											1									1
III-A-3, III-B-3 & II-3		1																		1
TOTALS	28	16	1	13	12	10	15	3	2	1	1	1	7	4	2	6	3	1	1	127

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11. ACCIDENTS 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
1931	3	165,137	529,680
1932	0	189,000 *	486,750 **
1933	2	94,689	398,357
1934	4	80,477	451,046
1935	2	196,883	1,136,215
1936	2	283,945	1,850,898
1937	1	765,702	5,216,879
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
TOTALS	49	12,833,657	82,137,655
19 Year Average -	2.58	261,911	1,676,278

* 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 INJURIES & FATALITIES

Mine Or Plant	Slight	Less Than 7 Days	7 Days Or More	Fatal-ities	TOTAL
AGNEW	111	22	7		140
ATHENS	95	32	15		142
ATKINS	15	0	1		16
CAMBRIA-JACKSON	25	10	10		45
CANISTEO	84	9	3		96
C.P.& L. CO.	8	0	1		9
CLIFFS SHAFT	73	25	12		110
GENERAL ROLL	0	0	0		0
HAWKINS	32	6	2		40
HILL-TRUMBULL	47	6	6		59
HOLMAN CLIFFS	86	1	1		88
LLOYD	24	9	13		46
MAAS	77	28	15	1	121
MATHER MINE, "A" Shaft	168	51	28		247
MATHER MINE, "B" Shaft	22	9	1		32
MISCELLANEOUS	10	0	0		10
NEGAUNEE	10	4	2		16
SARGENT	102	13	4		119
SPIES-VIRGIL	16	2	3		21
STHSE. & SHOPS	18	2	1		21
TILDEN	0	0	0		0
WANLESS	12	0	1		13
TOTALS	1,035	229	126	1	1,391

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VII

CAUSES OF COMPENSABLE INJURIES (Including Fatalities)

UNDERGROUND

CAUSE	AGNEW	ATHENS	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	NEGAUNEE	SARGENT	SPIES-VIRGIL	TOTAL
Falls Of Ground	2	2	1		1	1	3			1		11
Falling Chunks - Shafts, Chutes, Raises		4		2	2	1	4					13
Rolling Chunks	1		1	1			1				1	5
Persons Falling - Shafts, Chutes, Raises		2					1					3
Persons Falling - Slipping&Stumbling		1	1	3	2	2	3			1		13
Haulage		1	3		1	3	2		1			11
Drilling Equipment				2	1		2					5
Loading Equipment					1							1
Machinery (Moving)	2	1	1								1	5
Hand Tools				1	1	3	2					7
Flying Particles Or Objects			1	1		1	1					4
Handling Materials						1	4					5
Lifting Or Pulling	1				2							3
Burns				1		1			1			3
Falling Or Moving Materials		4			1	1	2					8
Wire Ropes			1				2			1		4
From Spikes Or Sharp Objects						1	1					2
TOTALS	6	15	9	11	12	15	28	0	2	3	2	103

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE VII (Cont'd.)

SURFACE (Underground Mines)

CAUSE	AG-NEW	CAMBRIA-JACKSON	CLIFFS SHAFT	MATHER MINE "B" SHAFT	LLOYD	MAAS	SAR-GENT	SPIES	TOTAL
Falling Or Moving Material	1	1		1	1		1	1	6
Persons Falling, Slipping&Stumbling			1			1			2
TOTALS	1	1	1	1	1	1	1	1	8

OPEN PITS

CAUSE	CANI-STEO	HAWKINS	HILL-TRUMBULL	HOLMAN CLIFFS	WANLESS	ATKINS	TILDEN	TOTAL
Falling Or Moving Material	1	1	2		1			5
Persons Falling, Slipping&Stumbling	1	1		1				3
Flying Particles			1					1
Bumping Against Objects			1					1
HAULAGE			1			1		2
Lifting Or Pulling	1							1
Burns			1					1
TOTALS	3	2	6	1	1	1	0	14

OTHER OPERATIONS

CAUSE	GARAGE, STHSE. & SHOPS	CLIFFS POWER & LIGHT CO.	TOTAL
Falling Or Moving Material	1		1
Electricity		1	1
TOTALS	1	1	2

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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		Frequency * Rate
		NON-FATAL	FATAL	
1935	393,967	35	2	11.74
1936	567,891	33	2	7.70
1937	765,701	58	1	9.65
1938	491,303	46	3	12.49
1939	564,542	44	1	9.96
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

* Based on 1-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
1935	3,225	1.023	12,000	15,225	4.830
1936	3,509	.772	12,000	15,509	3.413
1937	7,881	1.286	6,000	13,881	2.266
1938	6,290	1.600	18,000	24,290	6.181
1939	3,264	.723	6,000	9,264	2.051
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

* Based On Days Lost By Injuries Per 1,000 Man-Hours Of Labor

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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 1948	Frequency 1949	Severity 1948	Severity 1949
AGNEW	37.05	34.87	21.978	1.141
ATHENS	16.07	22.03	.784	.843
ATKINS	--	11.65	---	2.329
CAMBRIA-JACKSON	31.49	21.89	12.806	1.386
CANISTEO	13.26	9.22	.482	.556
C.P.& L. CO.	--	6.91	---	.311
CLIFFS SHAFT	14.13	13.45	1.010	.295
GENERAL ROLL	--	--	---	---
HAWKINS	10.48	7.42	.887	.200
HILL-TRUMBULL	13.76	20.99	.636	.574
HOLMAN CLIFFS	9.24	2.53	.276	.248
LLOYD	18.55	47.08	11.847	1.163
MAAS	17.74	20.98	.630	8.714
MATHER MINE, "A" SHAFT	27.29	21.77	5.626	.814
MATHER MINE, "B" SHAFT	13.82	4.24	27.903	.034
MISCELLANEOUS	--	--	---	---
NEGAUNEE	14.14	12.46	.927	1.969
SARGENT	27.85	17.05	1.803	.328
SPIES-VIRGIL	7.14	13.43	.614	1.683
STHSE. & SHOPS	2.62	3.04	.819	.021
TILDEN	23.98	--	2.877	---
ALL PROPERTIES	15.94	15.66	3.502	1.390

TABLE X

COMPENSABLE INJURIES INCLUDING FATALITIES

	Mine Or Plant	Tons Of Ore Mined	Hours Of Labor	No. Of Comp. Injuries	No. Of Fatalities	Days Lost Comp.	Time Charges	Total Days Lost	Frequency	Severity	Av. Days Lost Per Injury
UNDERGROUND	AGNEW	280,401	200,686	7		229		229	34.87	1.141	32.7
	ATHENS	550,000	680,961	15		574		574	22.03	.843	38.3
	CAMBRIA-JACKSON	434,210	456,718 ½	10		333	300	633	21.89	1.386	63.3
	CLIFFS SHAFT	492,405	891,564 ½	12		263		263	13.45	.295	21.9
	LLOYD	207,954	276,176	13		321		321	47.08	1.163	24.7
	MAAS	603,306	762,429	15	1	644	6,000	6,644	20.98	8.714	415.2
	MATHER MINE,"A"SHAFT	1,062,164	1,285,830 3/4	28		972	75	1,047	21.77	.814	37.4
	MATHER MINE,"B"SHAFT		235,619 3/4	1		8		8	4.24	.034	8.0
	NEGAUNEE	86,676	160,506 3/4	2		316		316	12.46	1.969	15.8
	SARGENT	315,341	234,507	4		77		77	17.05	.328	19.3
	SPIES-VIRGIL	150,022	223,423 ½	3		76	300	376	13.43	1.683	125.3
	TOTALS	4,182,479	5,408,422 3/4	110	1	3,813	6,675	10,488	20.52	1.939	94.5
OPEN-PIT	ATKINS	453,221	85,871	1		200		200	11.65	2.329	200.0
	CANISTEO	565,072	325,491	3		181		181	9.22	.556	60.3
	HAWKINS	604,928	269,579	2		54		54	7.42	.200	27.0
	HILL-TRUMBULL	560,365	285,827	6		164		164	20.99	.574	27.3
	HOLMAN CLIFFS	707,756	395,385	1		98		98	2.53	.248	98.0
	WILDEN	88,503	31,335	0		0		0	--	---	-- -
	WANLESS		54,819	1		36		36	18.25	.657	36.0
	TOTALS	2,979,845	1,448,307	14		733		733	9.67	.506	52.4
INDEPENDENT UNIT	MISCELLANEOUS		155,419 ½	0		0		0	--	---	-- -
	STHSE. & SHOPS		329,113 3/4	1		7		7	3.04	.021	7.0
	C.P.& L. CO.		144,620 ½	1		45		45	6.91	.311	45.0
	GENERAL ROLL		536,836 est.	0		0		0	--	---	-- -
	MISC. OPEN PITS		85,216	0		0		0	--	---	-- -
	TOTALS		1,251,205	2		52		52	1.60	.042	26.0
	GRAND TOTALS	7,162,324	8,107,935 ½	126	1	4,598	6,675	11,273	15.66	1.390	88.8

THE CLEVELAND-CLIFFS IRON COMPANY

SAFETY DEPARTMENT, ACCIDENT STATISTICS, YEAR 1949

MINE OR PLANT	Tons Of Ore Mined	Hours Of Labor	No. Of Fatalities	No. Of Comp. Injuries	No. - Non-Comp. 1 - 7 Days	Days Lost, Fatalities	Compensable Days Lost	Total No. Lost-Time Injuries Incl. Fatals.	Days Lost, Non-Comp., 1 - 7 Days	No. of Slight Injuries - No Lost-Time	Total Days Lost, All Inj. & Fatals.	Frequency	Severity	Average Days Lost Per Accident
AGNEW	280401	200686		7	22		229	29	52	111	281	144.49	1.400	9.7
ATHENS	550000	680961		15	32		574	47	84	95	658	69.02	.966	14.0
CAMBRIA-JACKSON	434210	456718 ½		10	10		633	20	27	25	660	43.79	1.445	33.0
CLIFFS SHAFT	492405	891564 ½		12	25		263	37	63	73	326	41.50	.366	8.8
LLOYD	207954	276176		13	9		321	22	27	24	348	79.65	1.259	15.8
MAAS	603306	762429	1	15	28	6000	644	44	70	77	6714	57.71	8.806	152.5
MATHER MINE, "A" SHAFT	1062164	1285830 3/4		28	51		1047	79	105	168	1152	61.44	.896	14.6
MATHER MINE, "B" SHAFT		235619 3/4		1	9		8	10	23	22	31	42.44	.131	3.1
NEGAUNEE	86676	160506 3/4		2	4		316	6	10	10	326	37.38	2.031	54.3
SARGENT	315341	234507		4	13		77	17	31	102	108	72.49	.460	6.4
SPIES-VIRGIL	150022	223423 ½		3	2		376	5	3	16	379	22.38	1.696	75.8
TOTALS	4182479	5408422 3/4	1	110	205	6000	4488	316	495	723	10983	58.43	2.031	35.1
ATKINS	453221	85871		1	0		200	1		15	200	11.65	2.329	200.0
CANISTEO	565072	325491		3	9		181	12	20	84	201	36.88	.618	16.7
HAWKINS	604928	269579		2	6		54	8	20	32	74	29.67	.274	9.2
HILL-TRUMBULL	560365	285827		6	6		164	12	19	47	183	41.99	.640	15.2
HOLMAN CLIFFS	707756	395385		1	1		98	2	1	86	99	5.06	.250	49.5
TILDEN	88503	31335		0	0		0	0	0	0	0	0.00	0.000	0.0
WANLESS		54819		1	0		36	1	0	12	36	18.25	.657	36.0
TOTALS	2979845	1448307		14	22		733	36	60	276	793	24.86	.548	21.0
C.P.& L. CO.		144620 ½		1	0		45	1	0	8	45	6.91	.311	45.0
GENERAL ROLL		536836 est.		0	0		0	0	0	0	0	0.00	0.000	0.0
MISCELLANEOUS		155419 ½		0	0		0	0	0	10	0	0.00	0.000	0.0
MISCELLANEOUS, OPEN PITS		85216		0	0		0	0	0	0	0	0.00	0.000	0.0
STOREHOUSE & SHOPS		329113 3/4		1	2		7	3	5	18	12	9.12	.036	4.0
TOTALS		1251205 3/4		2	2		52	4	5	36	57	3.20	.046	14.2
GRAND TOTALS	7162321	8107935 ½	1	126	229	6000	5273	356	560	1035	11833	43.91	1.459	33.2

FREQUENCY - No. Of Injuries Per Million Man Hours

SEVERITY - No. Of Days Lost Per Thousand Man Hours

Safety Department

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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	35	First Half Of Day Shift
12:00 Noon to 4:00 P.M.	35	Second Half Of Day Shift
4:00 P.M. to 8:00 P.M.	19	First Half Of Afternoon Shift
8:00 P.M. to 12:00 M.N.	20	Second Half Of Afternoon Shift
12:00 M.N. to 4:00 A.M.	7	First Half Of Night Shift
4:00 A.M. to 8:00 A.M.	6	Second Half Of Night Shift
No Time Stated	6	
TOTALS	127	

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XIII

PERCENTAGES OF COMPENSABLE INJURIES OF THE VARIOUS AGE GROUPS
MESABA RANGE PROPERTIES, 1949

AGE GROUPS	NO. OF COMP. INJURIES	PERCENTAGE OF EMPLOYEES	PERCENTAGE OF INJURIES	PERCENTAGE OF TIME LOST	FREQUENCY RATING	SEVERITY RATING
18 to 25	2	20.34	8.00	1.83	3	2
26 to 30	0	10.84	--	--	1	1
31 to 35	3	13.53	12.00	14.34	4	5
36 to 40	2	16.68	8.00	3.56	3	3
41 to 45	3	10.17	12.00	6.74	4	5
46 to 50	1	7.73	4.00	5.77	2	4
51 to 55	0	8.74	--	--	1	1
56 to 60	10	9.75	40.00	52.55	6	7
61 to 65	4	7.14	16.00	15.21	5	6
66 & Over	0	.08	--	--	1	1
TOTALS	25	100%	100%	100%		

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XIV

PERCENTAGES OF COMPENSABLE INJURIES OF VARIOUS AGE GROUPS
MARQUETTE AND MENOMINEE RANGE PROPERTIES - 1949

AGE GROUPS	NO. OF COMP. INJURIES	PERCENTAGE OF EMPLOYEES	PERCENTAGE OF INJURIES	PERCENTAGE OF TIME LOST	FREQUENCY RATING	SEVERITY RATING
18 to 25	14	13.4	13.7	5.7	8	8
26 to 30	7	11.6	6.9	3.0	2	4
31 to 35	14	13.8	13.7	2.2	8	2
36 to 40	11	13.8	10.8	4.2	5	6
41 to 45	13	11.8	12.7	62.0	7	10
46 to 50	11	9.4	10.8	3.2	5	5
51 to 55	12	8.1	11.8 +	5.3	6	7
56 to 60	10	8.8	9.8	2.9	4	3
61 to 65	9	8.1	8.8	11.3	3	9
66 & Over	1	1.2	1.0	.2	1	1
TOTALS	102	100%	100%	100%		

11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XIV-A

PERCENTAGES OF COMPENSABLE INJURIES OF VARIOUS AGE GROUPS
ALL PROPERTIES - 1949

AGE GROUPS	NO. OF COMP. INJURIES	PERCENTAGE OF EMPLOYEES	PERCENTAGE OF INJURIES	PERCENTAGE OF TIME LOST	FREQUENCY RATING	SEVERITY RATING
18 to 25	16	13.4	12.6	5.4	5	6
26 to 30	7	11.6	5.5	2.7	2	2
31 to 35	17	13.8	13.4	3.4	7	3
36 to 40	13	13.8	10.2	4.1	4	4
41 to 45	16	11.8	12.6	56.9	6	9
46 to 50	12	9.4	9.5	3.4	3	3
51 to 55	12	8.1	9.5	4.8	3	5
56 to 60	20	8.8	15.7	7.5	8	7
61 to 65	13	8.1	10.2	11.6	4	8
66 & Over	1	1.2	.8	.2	1	1
TOTALS	127	100%	100%	100%		

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XIV-B

PERCENTAGES OF EMPLOYEES IN VARIOUS AGE GROUPS

YEARS (Inclusive)

Mine Or Plant	18-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-Over
AGNEW	10.70	6.80	8.70	12.80	7.80	6.80	17.40	15.50	13.50	--
ATHENS	8.59	14.05	11.75	13.47	13.75	11.17	9.74	7.16	9.46	.86
ATKINS & WANLESS	42.60	9.30	16.70	14.80	6.50	3.70	2.80	1.80	1.80	--
CAMBRIA-JACKSON	10.87	7.39	17.38	18.26	15.22	8.70	6.09	8.26	6.96	.87
CANISTEO	19.40	9.00	15.40	17.90	10.90	8.00	4.00	9.40	6.00	--
C.P.& L. CO.	10.77	7.69	7.69	15.39	18.46	7.69	10.77	4.61	13.85	3.08
CLIFFS SHAFT	9.57	11.92	13.62	16.38	12.34	9.36	7.45	8.72	8.51	2.13
GENERAL ROLL	17.25	12.64	13.22	12.07	7.47	7.47	5.17	9.77	12.64	2.30
HAWKINS	25.70	11.90	11.90	9.60	4.90	6.60	12.00	9.60	7.80	--
HILL-TRUMBULL	17.30	12.50	11.90	7.70	14.90	8.90	10.10	6.60	10.10	--
HOLMAN CLIFFS	19.50	10.90	12.70	11.80	15.00	9.50	6.80	8.20	5.60	--
LLOYD	10.56	8.45	8.45	9.16	15.49	12.68	11.27	14.08	9.86	--
MAAS	6.05	10.79	13.95	14.74	11.05	11.05	8.95	10.26	10.79	2.37
MATHER MINE,"A"SHAFT	13.25	14.46	16.57	16.87	12.05	10.69	5.72	6.03	3.46	.90
MATHER MINE,"B"SHAFT	13.45	15.13	15.96	17.65	12.60	12.61	5.04	5.04	1.68	.84
MISCELLANEOUS	15.19	8.86	10.13	8.86	15.19	6.33	11.39	10.13	11.39	2.53
NEGAUNEE	--	3.12	9.37	6.25	9.37	6.25	6.25	21.88	34.38	3.13
O.P. MISCELLANEOUS	20.00	12.50	17.50	10.00	17.50	10.00	5.00	5.00	2.50	--
SARGENT	10.90	10.90	10.90	10.10	7.60	8.40	10.90	21.80	7.70	.80
SPIES-VIRGIL	11.54	15.38	12.50	10.57	8.65	11.54	9.62	10.58	9.62	--
STHSE. & SHOPS	9.27	8.61	13.25	11.26	8.61	9.27	11.92	7.95	13.25	6.62
TILDEN	9.09	--	4.55	13.64	27.27	13.64	13.64	9.09	9.09	--
LABORATORY	--	15.00	30.00	5.00	20.00	5.00	10.00	10.00	5.00	--
HIBBING OFFICE	15.63	17.19	23.44	4.68	3.13	6.25	12.50	9.37	7.81	--
MESABA PROPERTIES	20.34	10.84	13.53	11.68	10.17	7.73	8.74	9.75	7.14	.08
MARQ. & MEN. RANGES	10.63	11.86	13.93	14.66	12.40	10.13	7.89	8.40	8.43	1.67
ALL PROPERTIES	13.40	11.60	13.80	13.80	11.80	9.40	8.10	8.80	8.10	1.20

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11. ACCIDENTS AND PERSONAL INJURY

b. All Injuries (Continued)

TABLE XV

SHOWING OCCUPATION OF INJURED WORKERS
Compensable Injuries

UNDERGROUND		SURFACE		OPEN-PIT	
Miners	63	Blacksmith	1	Foreman	1
Laborers	2	Miner	1	Laborer	2
Timberman	11	Laborer	2	Drill Helper	2
Machine Operators	4	Pocketman	1	Loco. Brakeman	1
Timber Hoisters	3	Truck Driver	2	Welders	2
Chuteman	5	Machine Operator	1	Repairman	2
Motor Brakeman	8	Electrician	1	Carpenter	1
Motorman	5	Diamond Driller	1	Machine Operator	2
Skip Tender	1			Electrician's Helper	1
Pipeman	1				
TOTALS	103		10		14

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection

With the addition of Captain Thomas Tippett to the Safety Department for safety inspection work, we have been able to increase the number of inspections made during the year. There is no doubt in my mind that we should have at least one more man to make safety inspections and assist with dust and ventilation work.

Mr. H. F. Rogers and Mr. Thomas Tippett have been making out written reports on all their inspections and my recommendations and suggestions have been made verbally in nearly all cases. Cooperation on the part of all the supervisors on the Marquette and Menominee Ranges has been good.

On the Mesaba Range two men assist Mr. G. R. Whittington, Safety Supervisor, in making all inspections of the open-pit and underground mines and washing plants. Inspection trips I've made on the Mesaba Range proved to me that the additional help that Mr. Whittington has, has assisted greatly in the accident prevention work there.

Inspection reports turned in by the safety inspectors do not include all of the unsafe practices or hazards noticed. It is the policy of the company that a supervisor accompany an inspector on all of his trips and if the supervisor corrects any unsafe practices, it is not reported on the inspection report. If he fails to notice any bad conditions he is notified verbally and the inspector makes a report of the same.

Members of the department inspected all active properties during the year, including all Cliffs Power & Light Company plants. All airways and second outlets to the underground mines are inspected periodically and recommendations and suggestions made when necessary. All mines have second outlets with the exception of the Athens Mine, where 700' of raising would be necessary to connect it to the 1,000' Level of the Negaunee Mine. Because the Negaunee Mine shaft may be sunk deeper, and connected to the Athens Mine, this would give us a very much needed second outlet and would tend to make our ventilation work considerably easier for the entire Athens Mine. Mather Mine, "B" Shaft, which is now in the process of development, will be connected to Mather Mine, "A" Shaft sometime during 1950, which will give the Mather Mine, "B" Shaft the needed outlet.

Idle Properties

Usually idle properties are inspected twice a year. This is done during the spring and the fall, at which times it is easy to make this inspection. During 1949 we were forced to do more than the usual amount of fencing and repair work because of taking over the old properties in the neighborhood of Humboldt, Michigan and because of the high winds which felled many trees on the fences and broke them down. Much of the damage done by falling trees was repaired by members of the Safety Department during the mines strike. At the end of the year all fences had been repaired with the exception of a short section at one of the open-pit mines south of Negaunee. Most of the repairs to fences, old shafts and test pits were made by a crew under the supervision of Mr. Julian Payen, who reports to the Safety Department when repairs have been completed.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Fire Patrol Inspections

Inspections are made at all underground properties of all fire hazards, on the last shift preceding an idle period and once every 24 hours thereafter until the mine resumes normal operation. The purpose of these inspections is to catch any fire in the incipient stage and put it out before it has a chance to gain any head-way. In most cases, the inspectors are the shift bosses, but other men are also assigned to this work. These men also check all electrical switches to make sure they're open and any other hazard which they may note and a written report is made to the mine superintendent.

The surface inspections are made by the watchmen or policemen. During the past year there were no incipient fires reported, either underground or on surface. If these inspections are made conscientiously by the men, there is little chance of any fire getting out of control.

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XVI

1949

MINE OR PLANT	VIOLATIONS OF STANDARDS	SAFETY SUGGESTIONS	RECOMMENDATIONS	FIRE HAZARD	TOTAL
ATHENS	21	17	8	2	48
CAMBRIA-JACKSON	20	16	4		40
DIAMOND DRILLS			4	2	6
GEN. STHSE. & SHOPS		1	1	2	4
LLOYD	11	11	1		23
MAAS	16	22	6	4	48
MATHER MINE, "A" SHAFT	24	14	11		49
MATHER MINE, "B" SHAFT	1	1	2		4
SPIES-VIRGIL	6	4		1	11
TOTALS	99	86	37	11	233

TABLE XVII

1948

MINE OR PLANT	VIOLATIONS OF STANDARDS	SAFETY SUGGESTIONS	RECOMMENDATIONS	FIRE HAZARD	TOTAL
ATHENS	52	26	8	1	87
CAMBRIA-JACKSON	3	2	4		9
CLIFFS SHAFT	15	31	5		51
DIAMOND DRILLS	1	2	1		4
LLOYD	2	9	2		13
MAAS	9	9	2		20
MATHER MINE, "A" SHAFT	12	18	7	2	39
MATHER MINE, "B" SHAFT	1	2	2		5
NEGAUNEE		1	1		2
NEGAUNEE DISPENSARY			3	1	4
RESEARCH LABORATORY		2	5	1	8
SPIES-VIRGIL	1	1	2	1	5
STHSE. & SHOPS	1		1	3	5
TOTALS	97	103	43	9	252

Safety Department

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Year 1949

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Blasting Inspections

In order to keep the blasting safety rules continually in the minds of miners, the company requires that shift bosses inspect and report the blasting procedure used by each mining contract in the mines at least 6 times a year. The miners do not know when these inspections are to be made and the shift boss is permitted to make the inspections as he sees fit. These rules which are so important in the prevention of serious accidents, have not been followed closely at all mines. Because of the fact that these reports are not sent to the Safety Department until the end of the year, we do not know exactly how well the inspections are being made. In the future, members of the Safety Department will check these reports at the individual mines on a monthly basis.

During the past two years, 1948 and 1949, the Athens Mine has reported only one blasting inspection. The Lloyd Mine, during 1949, made no blasting inspections. The Mather Mine, "B" Shaft which did not report any blasting inspections, did have a shift boss supervise every blast made in the shaft and development work.

A total of 929 inspections were made on the Marquette and Menominee Ranges in 1949 with 105 violations shown. Most of the violations were failure to use tamping in the hole.

We have been very fortunate in not having any serious accidents from blasting. As the years go by, there is considerably more blasting done with electricity and prima-cord. This is a considerably safer method than the use of fuse but cannot be used in all places. Also, during the past year we have had very little trouble with defective blasting supplies.

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XVIII

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

Mine	No. Of Inspections	No. Of Violations Reported
ATHENS	0	0
CAMBRIA-JACKSON	90	55
CLIFFS SHAFT	335	1
LLOYD	0	0
MAAS	197	18
MATHER MINE,"A" SHAFT	307	31
NEGAUNEE	0	0
SPIES-VIRGIL	0	0
TOTALS	929	105

MATHER MINE,"B" SHAFT - No report on blasting inspections, but shift boss supervised all blasts made in shaft and development work.

Safety Department

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Year 1949

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Rules & Regulations

A total of 117 rule books were distributed to men during the year. Of these, 26 went to surface employees and 91 to underground employees.

Our latest book of rules was published in 1948 and must be revised soon to include changes made by the Central Safety Committee. Each person receiving a rule book must sign a receipt which is turned back to the Safety Department.

The Mesaba Range does not use a rule book covering all operations but print pamphlets and posters which are distributed to the men and placed in strategic places.

Because of the changing methods of mining, and new types of equipment, there is no opportunity to keep rules up to date. Members of the Central Safety Committee, which includes Superintendents and Heads of Departments, must distribute new rules to the men, either as posters or they may be given verbally. The minutes or proceedings of the Central Safety Committee meetings give all these changes and these minutes are distributed to all concerned.

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XIX

RULE BOOKS DISTRIBUTED AT MICHIGAN MINES AND PLANTS

Mine Or Plant	Surface	Underground	Total
ATHENS	1	5	6
CAMBRIA-JACKSON	0	12	12
C.P.& L. CO.	2	0	2
CLIFFS SHAFT	0	9	9
GEN. STHSE. & SHOPS	7	0	7
LLOYD	1	15	16
MAAS	1	22	23
MATHER MINE, "A" SHAFT	0	15	15
MATHER MINE, "B" SHAFT	2	1	3
NEGAUNEE	0	6	6
SPIES-VIRGIL	0	4	4
TILDEN	10	0	10
GENERAL	2	2	4
TOTALS	26	91	117

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Inspection Reports From Mines & Plants

All safety inspections are not made by members of the Safety Department. There are twelve (12) inspections made by foremen and others at the various properties. All the inspections these men make are reported in writing to the mine superintendent and Safety Department for checking. Dividing these inspections among the bosses and supervisors makes them more conscious of safety, and serves a dual purpose in this way.

These inspections include:

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 (Ø-Four times a year)
FIRE PREVENTION (Once a year)
BLASTING INSPECTIONS (Six times a year - each contract)
OLD STOPE INSPECTIONS (Cliffs Shaft Mine)
FIRE PATROL INSPECTIONS (Underground)

11. ACCIDENTS AND PERSONAL INJURY

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 XX

TYPE OF INSPECTION	AG-NEW	ATH ENS	CAMB. JACK.	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE A-SHAFT	MATHER MINE B-SHAFT	NEG.	SAR-GENT	SPIES-VIRGIL	TOTAL
Hoisting Ropes	52	271	228	241	466	232	239		193	52	210	2,184
Skip & Cage Roads	45	82	116	24	58	54	41	26	18		46	510
Ladder Road	46	43	10	12	22	34	41	35	16	46	43	348
Cage Safety Catches	11	11	6	12	21	10	8		8		12	99
Slack Rope Alarm		9	6	12	4	5	11		4		12	63
Hoist Inspection		24	12	24	24	24	24	12	24		24	192
Fire Extinguishers	2	2	2	2	2	1	2	2	2	2	2	21
Fire Equipment	4	2	3		1	1	2		3	4	1	21
Fire Prevention	2	18	11	26	6	16	5	5	23	6	11	129
Hoist Engr. Spec. Report	47									46		93
C.O. Alarm						12						12
Air-Ways									16			16
TOTALS	209	462	394	353	604	389	373	80	307	156	361	3,688

MINE OR PLANT	FIRE EXTINGUISHERS	FIRE PREVENTION	FIRE EQUIPMENT	TOTAL
Atkins	2	3	4	9
Canisteo	2	9	4	15
C.P.& L. Co.	14	7		21
General Office (Ishpeming)	2			2
Hawkins	2	35	4	41
Hibbing Office	2	2		4
Hill-Trumbull	2	16	4	22
Holman Cliffs	2	18	4	24
Ishpeming Hospital		2		2
Negaunee Dispensary		2		2
Princeton		2		2
Rented Buildings	2			2
Sthse. & Shops & Garage	2	12		14
Tilden	2	14		16
Wanless	1	2	3	6
TOTALS	35	124	23	182

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XXI

TYPES AND TOTALS OF FIRE EXTINGUISHERS INSTALLED AT VARIOUS PROPERTIES

Mine Or Plant	2½ Gal. Soda Acid	2½ Gal. Non-Freeze	2½ Gal. Foam Type	1 & 1½ Qt. Vaporizing	1 Gal. Vaporizing	2 to 3½ Gal. Vaporizing	15 lb. Dry-Powder Type	20 lb. Dry-Powder Type	30 lb. Dry-Powder Type	150 lb. Dry-Powder. Engine	TOTAL
AGNEW	1			2	1	2			1		7
ATHENS	8	7		19		1	6				41
ATKINS	1			9		1			3		14
CAMBRIA-JACKSON	10	3		14	2			2	5		36
CANISTEO	5		1	37			11		9		63
C.P.& L. CO.	3	2		3		2					10
CLIFFS SHAFT	11	7	2	39		3			5		67
GEN. STHSE. & SHOPS	13	9		33							55
HAWKINS	10			18	5	6	4		4		47
HILL-TRUMBULL				21	2	1	19		14		57
HOLMAN CLIFFS	4			65			5		17		91
LLOYD	8	2	1	27		4	4				46
MAAS	6		1	17		7	5				36
MATHER MINE,"A"SHAFT	9	2		33					22		66
MATHER MINE,"B"SHAFT	5			19			2		5		31
NEGAUNEE	7	3		17		3	6				36
SARGENT	3			9		1			2		15
SPIES-VIRGIL	3	11		19		4	6		5		48
TILDEN	3	4		37		1	3				48
MCCLURE PLANT				3		2			2		7
CARP PLANT				4		2			2		8
HOIST PLANT				1		2			2		5
REPUBLIC PLANT				1		1			1		3
ESCANABA PLANT				1		2			1		4
AUTRAIN PLANT				1		2			1		4
DIESEL PLANT			5	3						1	9
WANLESS				6		1	1		1		9
HIBBING DIST. OFFICE	4		1			1					6
ISHPEMING HOSPITAL	9			13							22
NEGAUNEE DISPENSARY	3			5							8
ISHPEMING GEN. OFFICE	6			8							14
RENTED HOUSES				16							16
TOTALS	132	50	11	500	10	49	72	2	102	1	929

All Fire Extinguishers Are Inspected January and July Of Each Year.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Disciplinary Action

Disciplinary action was taken in 148 cases during the year, which is two more than the previous year. There were 48 cases where men left the job without first reporting to the supervisor. Most of the other disciplinary action was practically the same as a year ago. Six men were found smoking underground, but it nowhere indicates or represents the no. who do smoke underground. Violation of rules accounted for 17 disciplinary action cases. The use of intoxicating liquors is usually the cause of considerable trouble due to excessive use, reporting to work under the influence and not reporting for work and giving no reason.

The total mentioned in this report is only for the Marquette and Menominee Ranges. The Mesaba Range does not report disciplinary action taken against employees, but we do hope to include it during the coming year.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XXII

CAUSES AND NUMBER OF DISCIPLINARY ACTIONS

CAUSE	ATHENS	CAMBRIA-JACKSON	CLIFFS SHAFT	GEN. STHSE.	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	NEGAUNEE	SPIES-VIRGIL	TILDEN	TOTAL
Excessive absenteeism due to alcoholism	1	2	2	2	3	2		1				13
Reporting to work under the influence of liquor			3				8					11
Excessive absenteeism without reason			11			7	8					26
Violation of rules	1						16					17
Leaving job without authority							48					48
Sleeping on the job	1		1				10					12
Violation of "No Smoking" rules		2	3				1					6
Carelessness					1							1
Loafing at work			2				5					7
Insubordination		1					5		1			7
TOTALS	3	5	22	2	4	9	101	1	1	0	0	148

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Central Safety Committee

This committee is composed of Management, Heads of Departments and Superintendents. This committee met eleven times during the year to classify accidents, discuss methods of accident prevention and attempt to foresee hazards in various occupations and mining methods and make plans to prevent injury. A brief summary of the various topics discussed by the committee follows:

Safe Automobile Driving
Relationship between auto accidents and auto insurance premiums.

Second Outlet In Mines
Emergency or second outlets must be kept in excellent condition because if used in an emergency, men sometimes become panicky and may be seriously injured if outlets are obstructed in any way.

Tail Lamps
Closer check on underground haulage tail lamps to prevent injury.

Blasting Reports
Shift bosses failed to make blasting inspections in some mines. Company rules require these inspections and they keep both miners and the bosses on their "toes".

Cage-At-Level Signal Lights
To indicate if cage is at shaft station, two red signal lights have been installed in some mines. If cage is at station, red lights cannot be seen, but can be seen if cage is not there.

Method Of Anchoring Snatch Block
To prevent loss of pulleys in case of caving or dangerous mining conditions, a wire rope is used, by passing rope through eye of pulley over cap and back to timber leg away from danger and anchored there. When miners want to remove the block or pulley, they release rope where it is anchored and then pull the block out of danger with scraper hoist.

Two-inch Water Lines
Approved use of two-inch water lines on all levels for use in emergency fire-fighting.

Powder Delivery
Request for change in blasting powder delivery time refused.

Compressor Accident
Description of air compressor accident as an aid to prevent another similar one. No one injured in this case, by accident, but many exposed to hazard.

Exhibits For Safety Council Annual Meeting
All committee members asked to contribute models or photographs of safety "gadgets" made in local shops and used by company so they can be exhibited at Duluth, Minnesota

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Central Safety Committee (Cont'd.)

Non-Occupational Deaths
Outline was made to use in case of non-occupational death on company property.

Safe-I Goggle Shield
Approval for above tinted goggle to be used over safety eye-glasses to protect against pitting and glare in welding process.

Shaft Inspection
No shaft inspection permitted unless measuring pockets are empty. Shaft men should not do repair work in skip dump.

Changing Of Cage & Skip Ropes
Interpretation of Rule 2, Sub-section, "Ropes", was clarified for all concerned.

Storage Of Hoist Ropes
Instruction on storage of hoist ropes to prevent deterioration.

Maas Mine Counter-Weight For Cage
Instructions to increase weight of counter-weight to conserve on power consumption and better balance.

Acetylene Cutting Of Galvanized Metal
Cutting to be permitted only in well ventilated places because of toxic fumes.

Oil Cans For Drill Machines
Cans should be of a better construction and provided with a cap with chain to prevent loss.

Steel Sets
Discussion on best methods of spragging of steel sets to prevent collapse.

Brush Adjustments On Ventilation Fans
Recommended brush adjustments on D.C. fan motors to care for each job, to obtain best results and lower maintenance costs.

Diamond Drills
Recommended safety hats with winter lining for drill men.

Safety Hat Replacement
Safety hats should be replaced at company expense only if they have been broken as the result of an accident.

Safety Eye Glasses
Should be worn at all times by supervisors to set an example for men and finally lead up to 100% use at all properties.
Replace eye glasses at company expense only if they are damaged on the job.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Central Safety Committee (Cont'd.)

Mine Fire

As a result of a fire at the Webb Mine, Mesaba Range, I recommended that water lines for fire fighting should be installed before building commences. Considerable loss of property at Mesaba Range Mines because of lack of water.

Union Representatives

Safety Department should be notified by letter of any change in authorized union representative who will accompany safety inspector on trips through company mines.

Loading Chairs

Recommended only manually operated loading chairs because of previous experience with same.

Tugger Hoists

All ropes should be removed from drums before sending to Brownstone Shops for repairs.

Exchange Data Letters

1. Information on new methods, practices and equipment to be exchanged within company.

2. Accident data from Lake Superior Mines Safety Council members to be screened by Safety Department, mimeographed and sent to Superintendents.

3. Safety exchange among companies of District permits us to ask any question on safety or policy of the 11 member companies.

Water Pressure Reducers

Found not too satisfactory under certain conditions.

Insert Bits

Discussions on merits of various insert bits and experience with bits after chrome-plating process to add life to the bits.

#7000 Series R.R. Cars

Safety department's responsibility to have step plates on #7000 series L.S.& I. R. R. cars removed.

Thimbles

Mechanical Department delegated to recommend standard thimble for mine ropes.

ACCident Statistics

Six-month records discussed.

Explosives

Storage in paper cartons in mining contracts hazardous and should be stored only in wood boxes or standard powder bag.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Central Safety Committee (Cont'd.)

Side Spiling In Drifts & Slices

No compensable injury for six months. Use of side spiling or support credited for big share of this record.

Rock Work

Instructed to use standard methods of dust elimination. Bosses should make sure water and air are piped to place before starting miners and see that miners are equipped with safety eye glasses and dust respirators.

Hose Clamps

Wire hose clamps permitted on ½ or 3/4" compressed-air hose but for larger size hoses a punch lock or bolted lock clamp is recommended.

Selection Of Delegates To Safety Conferences

Safety Department picks delegates and General Manager or Manager approves delegates to conferences and rotation system is used. Purpose is to learn other people's methods of safety and exchange ideas. Probably convert some of our delegates.

Safety Clothing Charges

Safety Department obtained list of prices charged at various mines for safety clothing. Attempt to set up standard charge at all mines.

Mine Rescue Training

All mines to furnish ten or more men for M. R. Training.

Gasoline Containers

Gasoline not to be dispensed from Company pumps except into approved containers.

Workmens' Compensation

Compensation Department informed committee of new rates.

Carbon-Tet. Extinguishers

Safety Department warns against use of commercial carbon-tetrachloride in fire extinguishers.

Fog Nozzles

Can be bought at 1/3 regular price from war surplus stores.

Underground Man-Trip Cars

Discussion with Lake Shore Engineering Company representative on merits of new type man-trip cars. Cliffs Shaft Mine probably could use these cars to advantage.

Parking Lot Injuries

Companies liability in case of injury in company parking lot discussed.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Lake Superior Mines Safety Exchange

The exchange was organized to handle special problems of the safety men of the District. Eleven of the major companies of the district are members of the Exchange. Each company can send questions or problems to the other ten companies for their consideration and answer. These questions are answered within a certain time limit. The Exchange meets once every three months, usually the day following the Lake Superior Mines Safety Council meeting so as to cut down on travel and time. Attendance is limited to one or two men from each company. Mr. George Whittington attended those meetings which required little or no travel on his part and I attended those in Michigan.

Lake Superior Mines Safety Council

This council is the largest of its kind in the United States. The council was organized to handle safety problems of the Lake Superior District and attendance was only from the district, but in recent years mining men from all over the United States and Canada have attended and taken part in the annual meeting. Each year there are eight sectional or range meetings and one annual meeting, held at Duluth, Minnesota, which is the central location of the district.

During the last fiscal year I was President of the Council and a member of the Executive Committee. I therefore attended all meetings during the year.

The meetings held during the year were as follows:

January 13, 1949 - Virginia, Minnesota - Attendance, 144
February 10, 1949 - Duluth, Minnesota - Attendance, 24
March 17, 1949 - Ironwood, Michigan - Attendance, 114
April 7, 1949 - Ironton, Minnesota - Attendance, 66
May 5, 1949 - Duluth, Minnesota - Attendance, 16
May 18-19, 1949 - Duluth, Minnesota - Attendance, 660
Sept. 27, 1949, - Duluth, Minnesota - Attendance, 17
November 10, 1949 - Ely, Minnesota - Attendance, 77
December 7, 1949 - Ishpeming, Michigan - Attendance, 130

Total Attendance at All Meetings During Year - 1,248

Members of our company participating in these programs, are as follows:

Ishpeming, Dec. 7th

A. J. Stromquist, Chairman
F. J. Haller, Supt. - Mather Mine, "A" Shaft
"Support Of Ground With Steel Sets"
T. A. Kauppila, Operations Engineer
"Safety Experience In Block Caving"
John Bjorne, Mining Captain
William Nicholas, Underground Foreman (Panel Discussion)
"Foreman's Responsibility For Safety Of His Men"

Cont'd.

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c. Safety Inspection (Continued)

Lake Superior Mines Safety Council (Cont'd.)

Duluth, Minnesota

A. C. Brown, President - The Cleveland-Cliffs Iron Company
"Safety From Management's View-Point"

R. M. Belliveau, District Supt.,
"Slides and Falls Of Banks - Open-Cut Mines"

Ironton, Minnesota

W. R. Atkins, Supt. - Cambria-Jackson Mine
"Accident Investigation"

Ironwood, Michigan

A. J. Stromquist, Director of Safety
"Potential Hoisting Rope Accident"

The annual meeting at Duluth, Minnesota, held May 18-19, was known as the Silver Conference as it was the 25th annual meeting. We were very fortunate in having our company President, Mr. A. C. Brown, as opening speaker of the meeting. His talk on "Safety From Management's View-Point" was very well received and was proof that management of our company is interested in the safety and welfare of its employees. Fifty-two employees of the company were present for this meeting, including top management to shift boss. Total attendance of 660 was the largest attendance in the history of the council.

The Ishpeming, Michigan meeting of the council on December 7th was also a success with attendance of 130, including 54 Cleveland-Cliffs Iron Company employees. This meeting was organized by the safety personnel of the local companies. I was Chairman of the committee.

National Safety Council

Our company is a charter member of this organization and we have received good services from the council.

The annual meeting was held October 24-28 at Chicago, Illinois. Delegates to the conference from our company were: A. J. Stromquist, H. F. Rogers, James Westwater, W. C. Oliver, L. C. Moore and Wilfred Tippett. Mr. L. C. Moore presented a paper and slides on, "Experience With Hoisting Ropes".

I was Chairman of the Poster & Visual Aids Committee for the past several years, but was relieved of this duty after being elected 3rd Vice-Chairman of the Mining Section.

Safety "Banner-Flag Awards"

The Banner Flags which are awarded each year to the properties having the best safety record, based on their severity rating were awarded as follows:

Underground Operation

Mather Mine, "B" Shaft. Severity Rating - 0.131. There were a total of 10 lost-time injuries causing loss of 31 days total or an average of 3.1 days lost per injury.

(Cont'd.)

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Safety "Banner-Flag Awards" (Cont'd.)

Open-Cut Operation

Tilden Mine. Severity Rating - 0.000. There were no lost-time injuri es at this open-cut mine during the year.

Independent Unit

Storehouse & Shops. Severity Rating - 0.036. This operation had three lost-time injuries, causing loss of 12 days or 4 days per injury.

The Cleveland-Cliffs "Orbit"

Most of the material for this publication was furnished by Mr. Walter F. Gries, Supt. of Welfare and myself.

Only three issues were published during the year.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Foremens' Safety Bonus

A total of 97 supervisors participated in this safety bonus plan. A total of $5,507.22 was paid to these men. Penalties imposed for failure to follow safe practices, amounted to $198.71. The only mines where penalties were not imposed were the Mather Mine, "A" and "B" Shafts.

I still feel that superintendents are a little too lenient with their supervisors, for the purpose of the bonus is to create interest in safety, and when a supervisor is responsible for unsafe practices he should lose part of his bonus and if necessary, all of it. I do not believe this is being done as well as it should be.

Also, I believe that shaft foremen should receive a larger bonus per man because of the hazardous work his crews must do and, of course, he nearly always has a small crew.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XXIII

SAFETY BONUSES PAID TO FOREMEN

MINE OR PLANT	AMOUNT	MEN PARTICI-PATING	AMOUNT OF PENALTIES IMPOSED
ATHENS	$ 752.23	13	$ 32.55
CAMBRIA-JACKSON	511.92	10	27.71
C.P.& L. CO.	105.72	3	--
CLIFFS SHAFT	1,034.58	14	14.42
LLOYD	255.82	6	44.77
MAAS	782.00	11	52.67
MATHER MINE,"A" SHAFT	1,434.90	21	--
MATHER MINE,"B" SHAFT	253.94	7	--
NEGAUNEE	204.76	8	10.94
SPIES-VIRGIL	171.35	4	15.65
TOTALS	$ 5,507.22	97	$198.71

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XXIV

OCCUPATIONS OF MEN PARTICIPATING IN BONUS

TITLE	ATHENS	CAMBRIA-JACKSON	C.P.& L. CO.	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	NEGAUNEE	SPIES-VIRGIL	CLIFFS SHAFT	TOTAL
SHIFT BOSS	11	7		3	8	18	3	5	2	10	67
TIMBER FOREMAN	1	1		1	1		1	1		1	7
MECHANICAL FOREMAN		1		1	1	1	1	1	1	1	8
U.G. MECH. FOREMAN										1	1
ELECTRICAL FOREMAN						1	1				2
SURFACE FOREMAN	1	1		1	1	1	1	1	1	1	9
DIST. ELEC. FOREMAN			2								2
DIESEL PLANT FOREMAN			1								1
TOTALS	13	10	3	6	11	21	7	8	4	14	97

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d. Ventilation

Underground mine ventilation, which was not considered important at one time, now is considered important enough to be included in all mining plans. Our company now has main mine fans for all underground mines with the exception of the shallow mines on the Mesaba Range. Some of our mines are equipped with booster fans and all of them have small auxiliary fans to care for dead-ended drifts and raises. A brief account of the ventilation at each mine follows:

Athens Mine

The Athens Mine is equipped with an American Blower, high-speed fan and at the present time is handling almost 75,000 cubic feet of air per minute. The ventilation system has been built up so that at the present time there is very little recirculation of air in the mine. The management has built up and maintained a system of air doors on all levels to prevent any major short-circuit of air. Because the air for this mine must be taken down the cage compartment and exhausted through the skip compartment, it has always presented a tough ventilation problem. Some of the air from the mine exhausts through to surface through subsidence cracks. This could not be considered a loss of air because it has already been used in some of the contracts; these contracts being located on the 7th Level. Distribution of air throughout the mine has been very good during the past year.

Cambria-Jackson Mine

The Cambria-Jackson Mine is equipped with a Jeffery fan. This fan, at the present time, is handling 30,864 cubic feet of air per minute. There is also a total of 12,767 cubic feet per minute coming from the Mather Mine, "A" Shaft.

Recirculation of air in this mine has been bad because of the stopes on the west end of the mine. At the present time the ventilation system is being changed so that instead of exhausting on the 7th Level, the air will be exhausted on the 6th Level. With the installation of a door on the 6th Level between the fan and the stopes, of the west end of the mine, recirculation of air will be prevented. Also, a booster fan is being installed on the west end of the 7th Level. This fan will also help to ventilate the new level, which is now being developed.

Distribution of air through the mine has been poor during the past year but this will be corrected with the new ventilation set-up.

Cliffs Shaft Mine

The main ventilation fan at the Cliffs Shaft Mine is handling approximately 130,000 cubic feet of air per minute. Part of this air is recirculated through the fan brattice. Readings taken in the exhausts of "A" and "B" Shafts show that a total of 110,758 cubic feet of air per minute is passing through the mining areas. It will be a number of years before we can control all of this air directly into the working contracts because of the large stopes in this mine.

Since the large fan was installed at the Cliffs Shaft Mine, air conditions have been very good. Distribution of the air is very much better, as was expected when the fan was first installed.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

Lloyd Mine

The Lloyd Mine is equipped with a B. F. Sturtevant #60 fan handling 18,000 cubic feet of air per minute. A booster fan located on the 8th Level handles the same amount of air. The ventilation of the mine was very good for awhile but some of the air-ways have not been kept up and therefore ventilation to some contracts has been poor.

Maas Mine

The Maas Mine is ventilated with a large Jeffery Fan located at the Negaunee No. 2 Shaft. Because the Negaunee Mine is closed at the present time, all air entering the Maas Mine is fresh air. The total volume of air handled by the fan is 73,000 cubic feet per minute. The Maas Mine also has two booster fans which are used in remote areas. With the exception of one small mining area, the distribution of air is very good. There is no recirculation of air in this mine.

Mather Mine, "A" Shaft

The Mather Mine, "A" Shaft fan is handling 100,083 cubic feet of air per minute, of which 20,010 cubic feet per minute is lost around the fan pillar through the air lock doors. This leaves 80,073 cubic feet per minute which enters the mine workings. It has been impossible to measure the amount of recirculation in the mine. Most of this recirculation is in the shaft itself. The ventilation system here is fresh air down the cage compartment of the shaft and exhaust up the skip compartment. It has been found that there is considerable leakage through the seal between the two compartments. Considerable work has been done in the shaft to prevent this recirculation. It will require the better part of a year to remedy this condition. Because the mine is increasing in size, the main mine fan will be stepped up to handle considerably more air than it is now handling. This will be done by further adjustment of the fan blades to a top position. When this has been done and the sealing of the shaft compartment completed, the fan will adequately care for all ventilation in the mine.

Distribution of air through the mine has been very good. Auxiliary fans are used to ventilate all dead-ends.

Mather Mine, "B" Shaft

Mather Mine, "B" Shaft, which is in the process of development, is equipped only with a high-pressure auxiliary fan. This fan discharges air through metal tubing to the bottom of the shaft. Smaller auxiliary fans are used to ventilate development work at the shaft plats. Total amount of air is approximately 3,000 cubic feet per minute. This fan can be reversed to remove smoke after blasting. This mine, as in Mather Mine, "A" Shaft, has a partition between the cage and skip compartments. A test of this seal shows that there is considerable leakage from top to bottom of the shaft. These seals will have to be repaired in order to have efficient ventilation before the mine becomes of any size, because the air must be taken down one side and exhausted up the other and there will be considerable short-circuiting of air until these seals are made air-tight. As development continues, a larger fan already at the mine will be installed.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

Negaunee Mine

At the present time, the only work being done at the Negaunee Mine is an air raise from the 14th to 13th Level. All air entering the mine with the exception of a few thousand cubic feet per minute is distributed to the Maas Mine for ventilation of that mine. The main mine fan is located at No. 2 Negaunee Shaft. A split allows part of the air to leave Negaunee 13th Level and enter the Maas 4th Level. The other split is from the Negaunee 14th Level to the Maas 5th and 6th Levels. A small amount of air discharges up the Negaunee hoisting shaft.

Spies-Virgil Mine

The main mine fan of the Spies-Virgil Mine is located on surface over the air shaft. This fan, at the present time, is handling 16,328 cubic feet of air per minute. There is no recirculation of air in this mine. The major portion of the air enters the mine on the 6th Level and goes through the stopes to 4th Level, then through stopes above the 4th Level into the air shaft to surface. A small volume of air enters the 4th Level and joins the air from the 6th and goes to the air shaft.

Distribution of air in this mine is very good. The only auxiliary fans used at the present time are for development work.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

DUST ANALYSIS & ELIMINATION

The following tables XXV through XXX inclusive, give a detailed over-all picture of the dust elimination work being done at our mines on the Marquette & Menominee Ranges and show conditions mainly in the more hazardous work places. When time permits, dust samples are taken in all work places in the mine; otherwise, samples are taken where we know a close check is necessary. The company rules and safe practices make the use of dust respirators compulsory when working in any type of rock heading, regardless of what other precautions have been taken. This is extra insurance and certainly is real protection. In all other work, men are instructed by supervisors when it is necessary to use dust respirators.

Maximum recommended limits of dust particles established by the company are ten million particles per cubic foot in ore and five million particles in rock. Under close supervision these limits are not a hardship and proof of this are the average dust counts made during the sinking of "A" and "B" Shafts of the Mather Mine. The average dust count when sinking "A" Shaft to a depth of 2,360 feet was 3.68 and the average in sinking "B" Shaft to a depth of 3,080 feet was 3.63.

Because good ventilation and plenty of water are required to remove dust in working places, it has increased the effeciency of the places because of quick removal of smoke and gases along with the dust. The miners therefore lose less time in getting back to the contract to start their work.

Raise mining still shows the highest dust counts and probably will continue to do so. This is not because we lack efficient methods, but because standard methods of dust removal are not kept up as well in raises as in other places because it requires more work to install ventilation pipes, the pipe must be cut into short lengths and at times they are accidently blasted out. Also, we find that many raise miners object to the noise of the ventilation fan and also to compressed-air. The reason, of course, is because it is difficult to hear ground movement. In cases of this kind the supervisor must decide which of the two evils, falls of ground or dust, is the most serious. The answer is usually is, "Use the respirator to avoid dust and be careful of falls of ground."

Six of the nine mines where dust counts were taken show an improvement over the previous year in average dust counts for all samples. The averages in ore at six of eight mines were improved over those of a year ago, and five of the eight mines had averages below the maximum limits of 10 million. In rock, five of the eight mines improved their dust counts and four of the eight were below the recommended maximum limits of 5 million.

It can be noted that in dust counts taken at Mather Mine, "A" Shaft, the average counts for stoping in ore are high. This condition is caused mainly because the ore is very dry and after blasting, the dust is found everywhere until air currents have carried it through water mists. If water was used, there would be considerable difficulty in handling the wet ore.

The Lloyd Mine also has dry ore, but dust counts should be lower in this mine. Because of its small size, it is easy to ventilate, with the air current traveling from the bottom level through the work places and to the exhaust airways. These airways should be kept open at all times.

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 XXV

DUST SAMPLES COLLECTED IN ROCK AND ORE WORK

Mine Or Plant	1949 In Ore	1949 In Rock	1949 TOTAL	1933 - 1949 TOTAL
ATHENS	26	17	43	683
CAMBRIA-JACKSON	20	9	29	226
CLIFFS SHAFT	71	17	88	1,664
LLOYD	34	-	34	642
MAAS	23	14	37	630
MATHER MINE, "A" SHAFT	31	56	87	596
MATHER MINE, "B" SHAFT	-	20	20	72
** NEGAUNEE	-	-	-	769
** PRINCETON	-	-	-	85
SPIES-VIRGIL	6	-	6	129
TILDEN	4	-	4	54
MISCELLANEOUS	-	-	-	111
TOTALS	215	133	348	5,661

** Closed Down.

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXVI

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

OCCUPATION	ATHENS	CAMBRIA-JACKSON	CLIFFS SHAFT	LLOYD	MAAS	MATHER MINE, "A" SHAFT	MATHER MINE, "B" SHAFT	NEGAUNEE	SPIES-VIRGIL	TILDEN	TOTALS
DRILLING	14	12	46	14	11	26	13	-	4	-	140
SCRAPING	13	13	24	12	11	27	-	-	-	-	100
USING AIR LOADER TO FILL CARS	3	-	-	-	-	8	-	-	-	-	11
BLASTING	-	-	5	-	-	5	-	-	-	-	10
TIMBERING	4	1	-	-	3	12	-	-	1	-	21
HAND SHOVELING	-	-	-	1	-	-	-	-	-	-	1
BARRING BACK	2	-	3	-	2	-	-	-	-	-	7
BLOWING CARS	2	-	-	3	1	-	-	-	-	-	6
LOADING CARS AT CHUTE	1	1	-	-	-	-	-	-	-	-	2
GENERAL MINE AIR	1	-	2	2	1	4	-	-	1	-	11
CHARGING HOLES	1	-	1	-	1	2	-	-	-	-	5
BREAKING CHUNKS	1	-	-	1	-	1	-	-	-	-	3
CRUSHING ORE SAMPLE	-	-	3	-	-	-	-	-	-	-	3
PULVERIZING ORE SAMPLE	-	-	4	-	-	-	-	-	-	-	4
CRUSHING ORE	-	-	-	-	-	-	-	-	-	2	2
LOADING AT POCKET	-	-	-	-	-	-	-	-	-	2	2
CRIBBING RAISE	-	2	-	1	2	-	-	-	-	-	5
USING MECH. MUCKER	-	-	-	-	-	-	7	-	-	-	7
BARRING MILL RAISE	1	-	-	-	-	-	-	-	-	-	1
SINKING WINZE	-	-	-	-	5	-	-	-	-	-	5
PLANKING RAISE	-	-	-	-	-	2	-	-	-	-	2
TOTALS	43	29	88	34	37	87	20	-	6	4	348

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXVII

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

(Cont'd. - Next Page)

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXVII (Cont'd.)

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

Mine Or Plant	1942	1943	1944	1945	1946	1947	1948	1949
ATHENS	25.80	4.90	8.33	6.64	4.17	7.39	7.49	7.07
CAMBRIA-JACKSON		12.10	6.21	17.05	11.99	9.30	13.81	6.86
CLIFFS SHAFT	7.55	5.99	6.23	8.18	6.34	8.64	5.12	6.26
LLOYD	6.95	5.01	14.45	6.49	9.38	11.17	12.97	11.72
MAAS	8.46	12.48	8.78	8.17	9.29	6.08	21.08	10.55
MATHER MINE, "A" SHAFT	5.58	6.64	7.57	8.39	7.72	10.88	9.50	8.40
MATHER MINE, "B" SHAFT						2.23	4.16	2.46
* 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
TILDEN				24.18	66.92	33.65	2.93	4.38
* GARDNER MACKINAW								
MISCELLANEOUS	3.00							

* No Longer In Operation

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXVIII

COMPARISON OF DUST COUNTS IN RAISING TO DRIFTING

Mine	Average In Raising	Average In Drifting	General Average
ATHENS	8.86	4.60	7.07
CAMBRIA-JACKSON	2.70	5.25	6.86
CLIFFS SHAFT	8.13	3.83	6.26
LLOYD	16.99	6.25	11.72
MAAS	14.30	5.73	10.55
MATHER MINE, "A" SHAFT	9.78	7.47	8.40
MATHER MINE, "B" SHAFT	--	--	2.46
SPIES-VIRGIL	11.24	8.13	10.12

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXIX

AVERAGES IN ORE COMPARED TO AVERAGES IN ROCK

Mine	Average In Ore	Average In Rock	General Average
ATHENS	5.50	8.43	7.07
CAMBRIA-JACKSON	8.28	2.82	6.86
CLIFFS SHAFT	6.75	4.51	6.26
LLOYD	12.31	3.75	11.72
MAAS	11.43	9.10	10.55
MATHER MINE, "A" SHAFT	11.05	7.56	8.40
MATHER MINE, "B" SHAFT	--	2.46	2.46
SPIES-VIRGIL	9.39	12.33	10.12
TILDEN	4.38	--	4.38

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Continued)

TABLE XXX

COMPARISON OF AVERAGE DUST COUNTS IN VARIOUS OPERATIONS

Operation	ATHENS	CAMB. JACK.	CLIFFS SHAFT	LLOYD	MAAS	Shafts "A" MATHER	Shafts "B" MINE	SPIES
RAISING IN ROCK	9.56	2.70	8.44	--	2.20	12.01	--	12.33
RAISING IN ORE			6.02	16.99	17.10	5.30		10.14
DRIFTING IN ROCK	3.87	2.47	2.70	3.75	4.00	7.52		
DRIFTING IN ORE	4.81	6.36	7.48	7.25	7.11	9.77		8.13
SLICING IN ORE	7.57							
STOPING IN ORE			6.62	9.84	11.74	23.49		9.90
BREAKING CHUNKS				22.79		7.92		
BLOWING OUT CARS	2.27				1.22			
SUB-LEVEL CAVING	1.84	7.70		11.84	11.12	11.17		
BLOCK CAVING	10.24					4.48		
SINKING SHAFT							2.46	
SINKING WINZE		3.13			4.12			
LOADING CARS AT CHUTE		25.92						
SCRAPING FROM TRENCH INTO POCKET					5.03	6.61		

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety And Mine Rescue Courses

Mine Rescue Training

During the period of September 26th - 30th we conducted training for 47 mine rescue men. This was a refresher course of 8 hours for men who had had previous training. We had intended training all of our mine rescue men, but the labor strike started the first of October so the training was dropped. Early in the year we also trained eight men at the Spies-Virgil Mine. Because it is difficult and almost impossible to train men during freezing weather, training will not be started again until mild weather.

We have a total of 153 men who are available for mine rescue work.

The following table shows the number of men trained at each mine.

11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety And Mine Rescue Courses (Cont'd.)

TABLE XXXI

MINE RESCUE TRAINING

Mine	February 1949	Sept. 26-30, 1949	TOTAL
Athens		3	3
Cambria-Jackson		5	5
Cliffs Shaft		9	9
Lloyd		2	2
Maas		9	9
Mather Mine, "A" Shaft		18	18
Mather Mine, "B" Shaft		1	1
Spies	8		8
TOTALS	8	47	55

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety And Mine Rescue Courses (Continued)

Blueberry Mine Fire

Our company was asked by the North Range Mining Company to assist in controlling a mine fire in their Blueberry Mine, located at Diorite, Michigan.

I was first called at 9:00 P.M., December 20th and notified of the fire but was told that it did not amount to much, but was also asked if I would give assistance if trouble was encountered. At 11:00 P.M. I was again called and asked for use of our Chemox Breathing Apparatus. At about midnight I delivered six sets of Chemox Apparatus to the mine along with necessary canisters. During the night, crews attempted to put the fire out which was in a transfer 30 feet above the 16th Level. The fan which ventilated the area had to be shut down and there was but little circulation of air. When the smoke disappeared from the level the crews thought the fire was out, so at 7:00 A.M. on the 21st I left for home. At 12:30 P.M. I was again called and informed that conditions were not satisfactory. On arrival at the mine I changed and went underground with the Safety Director and a foreman. We climbed to the transfer drift and I found the fire was real active and most of the smoke was going up into the old stopes above this area. I was then asked to take charge of the job and immediately made arrangements to have water pumped into the air line as the water line was too small and without pressure. I also started a crew building a wood seal just outside the fire so a fresh air base could be established close to the fire. Previously, trips had to be made wearing oxygen equipment all the way from surface, or a distance of 2,750 feet, leaving but 10 to 15 minutes working time. I also called for Cleveland-Cliffs Mine Rescue crews, getting five men from the Maas Mine and five from the Athens Mine, all of whom were equipped with the McCaa 2-hour Oxygen Apparatus. When these men arrived, I accompanied them to the raise. The water lines had been hooked up and we were ready to fight the fire direct and when about to start up the raise a few chunks of rock fell down the raise. On checking, we found that the fire had burned over the top of the travel raise and ore chute, which prevented us from getting to the fire because this was the only travelway to the fire area. The plans were then changed to seal in the fire and we soon found that gas (carbon-monoxide) was traveling over the tops of worked-out stopes to raises close to shaft. We then built three wood seals on the 16th Level and one on the 13th Level to prevent air from entering the fire area. These seals were finished by Friday morning at 5:00 A.M., December 23rd. We built doors in the seals so we could enter the area. Our mine rescue men were not used after this date.

On Saturday, December 24th, we entered the fire area and found that it was already oxygen-deficient. On December 25th we again entered the seals at 2:00 P.M. and were able to climb the raise, and although we could not get to the transfer because of caved ground, we would easily determine that the fire was out. That night we started ventilation fans and opened all the seals. The main mine fan, which was being moved from the 11th to 12th level at the time the fire began, had

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety And Mine Rescue Courses (Continued)

Blueberry Mine Fire (Cont'd.)

been set up in a temporary brattice and was started also. On December 26th crews started repair work on the 16th Level where we had had a cave-in on the main level and on December 27th normal operation of the mine was started except in the one contract where the fire started.

The fire was started from a short circuit in the electrical system, in or close to the scraper hoist switch box. The cause cannot be determined because to date (February 28) they have not been able to repair and enter the transfer. The scraper hoist has been salvaged by caving it out of the transfer. It had not been burned, but the switch box was so badly burned that it was impossible to determine if the short circuit had been in the box. It is believed that when the miners blasted chunks in the mill raise that a small piece of ore struck the wires, causing the short circuit.

Lessons learned from the fire are:

Power should be shut off in contract during blasting.

Water under good pressure and plenty of volume should always be available in all parts of the mine.

Ventilation system should be in good condition and supervisors should know circulation of air through their sections.

Not less than 15 men should be trained in Mine Rescue and recovery operations.

A complete mine rescue station should be maintained.

Dispose of the idea that wet and green timber will not burn.

Have rigid rules on fire prevention.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Safety And Mine Rescue Courses (Continued)

TABLE XXXII

FIRST AID SUPPLIES DISTRIBUTED

MATERIAL	NO. DISTRIBUTED
Merthiolate Pads (Band-Aids)	44,200
Ounces Of Merthiolate	168
1" Roller Bandage	298
2" Roller Bandage	238
3" Roller Bandage	189
Rolls Of Adhesive Tape	71
Picric Acid Gauze Pads	132
Plain Gauze Pads	423
Leather Finger Cots	117
Merthiolate Applicators	2,068
Ounces Of Aromatic Spirits Of Ammonia	10
Ounces Of Absorbent Cotton	18
Tubes Of Unguentine	20
Triangular Bandages	6
Pairs Of Scissors	1
Bottles ½, 1 and 2 Ounce (Medicine)	15
TOTALS	47,974

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous

Incipient Fires

There were no incipient fires reported during the entire year, either on surface or underground.

Foremens' Meetings

There were a number of these meetings, all held at the various mines at both the Michigan and Minnesota Mines. These meetings are usually held during the cold winter months and usually in the evening, and last approximately two hours.

Fire Prevention Meetings

Fire prevention meetings are held at all mines semi-annually. All supervisors attend these meetings. The Safety Department has taken an active part in all of these meetings

A set of rules for Superintendents gives an outline on fire prevention and segregation.

Safety Department

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Year 1949

11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous (Continued)

Comparison Of Frequency & Severity Ratings

This report would not be complete without a comparison of accident statistics with other groups of mines. Of the following statistics we have used the only available ones, taken from the National Safety Council and the Lake Superior Mines Safety Council, which were compiled for the year of 1948. Those from the Lake Superior Mines Safety Exchange are for the entire year of 1949 and include reports from eleven major iron mining companies who are members of the exchange and represent approximately 90% of the man-hours worked in Lake Superior District iron-ore mines.

In judging any safety record the severity rating is used as the guide. The Frequency rating indicates the number of injuries per million man-hours worked. Our company reports and records every injury in order that we have a complete and honest picture. If an injured employee cannot report to work the day following his injury, it is classed as a lost-time injury. This rule is not followed by all companies and therefore their Frequency rates are lowered, but when a man has a more serious injury it cannot be totally hidden and this must show up in the severity rating. I believe the aim of all safety personnel is to avoid the more serious injuries to employees and to avoid disasters. The minor injuries will always occur regardless of what management and safety departments do. The number of minor injuries have been cut down considerably during the past 20 years, but the more serious have been reduced more so.

The comparison of Frequency and Severity rates in Table XXXIII is a very good guide. To this Table we have added this year the 1948 severity ratings of Lake Superior Iron Mines mining methods, plants and shops for comparison.

Safety Department

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Year 1949

11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous (Continued)

TABLE XXXIII

COMPARISON OF FREQUENCY, SEVERITY RATINGS TAKEN FROM AVAILABLE STATISTICS

	FREQUENCY	SEVERITY	
1948 National Rating, All Mining, Including Coal	43.96	7.14	
1948 National Rating, Coal Mining	53.79	8.79	
1948 National Rating, Metal Mining	52.72	9.14	
1948 Lake Superior District Mines, 24 Companies	18.46	3.96	
1949 Lake Superior Mines Safety Exchange, not including C.C.I.	12.34	3.14	
1949 Lake Superior Mines Safety Exchange, including C.C.I.	18.24	2.82	
1949 The Cleveland-Cliffs Iron Co., Compensable Accidents	15.66	1.39	
1949 " " " " " , All Accidents	43.91	1.46	
1949 " " " " " , Open-Cut Mining	21.86	.50	2.10*
1949 " " " " " , Concentrating Plants	42.25	.83	0.22*
1949 " " " " " , Top Slicing	87.29	1.20	4.23*
1949 " " " " " , Sub-Level Caving	57.09	3.40	8.18*
1949 " " " " " , Stoping	46.01	.76	6.81*
1949 " " " " " , Block Caving	69.02	.97	
1949 " " " " " , Shaft Sinking & Develop.	42.44	.13	
1949 " " " " " , General Shops	9.12	.04	0.26*
1949 " " " " " , C.P.& L. Co.	6.91	.31	
1949 " " " " " , General Roll	0.00	.00	
1949 " " " " " , Miscellaneous	0.00	.00	0.14*

* 1948 Lake Superior District Severity Ratings

ANNUAL REPORT OF THE MINING ENGINEERING DEPARTMENT FOR THE YEAR ENDING DECEMBER 31ST, 1949

This report is accompanied by books of photographic views, mine surface and underground maps, open pit cross-sections and records of drilling and exploration of all mines operated by The Cleveland-Cliffs Iron Company either for itself or as an operating company for others during the year 1949. The mine underground maps show, in red, the areas mined or developed during the year and the cross-sections through the open pits show, in color, the unmined formations at the end of the year. The records of drilling and exploration are shown by maps and sections of the drill holes in color.

Books were prepared for the various companies interested, either bound or loose-leaf. The mines included in the books are shown in the following table:

Company	Mines	
	For Itself	As Operating Agent
The Cleveland-Cliffs Iron Company	Agnew Cambria-Jackson Canisteo Cliffs-Shaft Hawkins Lloyd Maas Sally Sargent Spies-Virgil Tilden Wanless-Woodbridge	Athens Atkins Hill-Trumbull Holman-Cliffs Mather "A" Shaft Mather "B" Shaft Negaunee
The Mesaba-Cliffs Mining Company Partners: Hanna Iron Ore Company Inland Steel Company Jones & Laughlin Steel Corp. Pittsburgh Steel Company Wheeling Steel Company		Hill-Trumbull Holman-Cliffs
The Athens Iron Mining Company for Pickands, Mather & Company		Athens
The Negaunee Mine Company Partner: Bethlehem Steel Company		Mather "A" Shaft Mather "B" Shaft Negaunee

Other loose-leaf books were prepared for other companies, containing the mines in which they were interested:

Company	Mines
Arthur Iron Mining Company	Atkins, Hill-Trumbull, North Star and Bingham Leases of Holman-Cliffs.
Inland Steel Company	Atkins.
International Harvester Company	Agnew, Hawkins and Sargent.
Teal Lake Iron Mining Company	Cambria.

Similar loose-leaf books for company officials were prepared as follows:

Name	Mine
W. A. Sterling, Manager	Agnew, Atkins, Canisteo, Hawkins, Hill-Trumbull, Holman-Cliffs, Sally, Sargent and Wanless-Woodbridge.
J. J. Foucault, Superintendent,	Agnew, Sargent.
E. L. Bemis, Superintendent,	Canisteo.
P. P. Swanson, Superintendent,	Hawkins.
H. J. Leach, Superintendent,	Hill-Trumbull.
W. A. Pakkala, Superintendent,	Holman-Cliffs.
R. M. Belliveau, Superintendent,	Atkins, Wanless-Woodbridge.
J. Trosvig, Superintendent,	Athens.
W. R. Atkins, Superintendent,	Cambria-Jackson.
S. W. Sundeen, Superintendent,	Cliffs-Shaft.
O. Marjama, Superintendent,	Lloyd, Spies-Virgil.
H. O. Moulton, Superintendent,	Maas, Tilden.
F. J. Haller, Superintendent,	Mather "A" and "B" Shafts.

B. MAP REPORTS

Each month two sets of prints of working maps of each operating soft ore mine were prepared, showing in red, the work done on the various levels and sub-levels during the month. Similar sets of the Cliffs-Shaft Mine were made four times a year. These sets were made for the Manager of Michigan Mines and the Mine Superintendent. Every Mine Captain, foreman and shift boss received prints of the maps of the levels and sub-levels in the territory under his jurisdiction. These maps were trimmed and folded to fit the pocket and can be taken underground.

Other map reports prepared during the year were as follows:

ATHENS MINE

Two sets of prints of the working maps, scale 1" = 50', were sent out monthly, except December, to officers of the Pickands Mather & Company, one in Duluth and the other in Ironwood. Semi-annually, a set of maps showing the work done on the Corbit Lease for each half year were forwarded to the Detroit Trust Company, Detroit, for the fee-owners of the Corbit Lease. Throughout the year, two sets of maps were prepared monthly showing the work done on the Corbit Lease adjacent to the Lucky Star boundary line for the Ishpeming office of the Jones & Laughlin Ore Company. These maps were prepared in connection with the block caving on the Eastern side of the leased premises.

CLIFFS-SHAFT MINE

One set of geological maps of the Bancroft and Section 10 Leases, scale 1" = 50', were forwarded to the Duluth office of the Oliver Iron Mining Company after each quarterly survey. These maps showed in color the work done in the mine during each quarter. The set for the last quarter of the year showed all the mining done for the year and the areas used in making tbe estimate of ore reserves of the Michigan State Tax Commission.

MATHER MINE

A complete set of prints of the working maps of the Mather Mine, "A" and "B" Shafts, were forwarded to Dr. Donald M. Fraser, Chief Geologist of the Bethlehem Steel Company, each month beginning with March, 1949. These maps were colored, in red, showing the work done during the month, the same as our regular monthly report maps and were prepared at the request of the Bethlehem Steel Company.

MICHIGAN STATE TAX COMMISSION

The Michigan State Legislature, Public Acts 285, 287 and 288, moved ahead three months the tax assessment calendar for 1949 and subsequent years. This necessitated a change in the time of preparation of the ore reserve estimates from December forward to September. On August 30th, Mr. F. G. Pardee, Mine Appraiser, held a meeting, in Crystal Falls, with representatives of the Engineering Departments of all of the Mining Companies of the Lake Superior District, relative to the proposed changes of dates on which reports would have to be made. This conference set August 30th as the date for making the estimates of ore reserves. These estimates were to be revised as of October 1st and forwarded to the Mine Appraiser at Lansing to be in his hands by October 20th. Annual statements of production, shipments and ore in stock as of December 31st were to be forwarded as soon after the first of the year as possible.

In prior years, the maps forwarded to the Mine Appraiser showing the areas used in the preparation of the estimate of ore reserves, were the annual prints, scale 1" = 200'. This year it was necessary to forward prints of our regular mine maps, 1" = 50', instead of the smaller size. As these maps are too large and bulky for filing purposes, two sets of annual report prints were prepared at the end of the year showing the areas used in the estimates. One set was filed in the Engineering Department with the calculation sheets and one set was forwarded to the Cleveland office.

C. REMARKS ON MISCELLANEOUS DOCUMENTS AND ABSTRACTS

All documents affecting the Company's lands and rights passed through the Mining Department for approval. These were all referred to Mr. Brewer and, where mineral rights were involved, to Mr. Derby. These documents were entered on the Engineering Department records and were initialed. Most of these documents originated in other departments but all had to receive the approval of the Mining Department before execution.

The following table shows the number and classification of documents that passed through the Department during the year:

Classification	Number Received	Last File Number
Mining Leases	4	88
Miscellaneous Documents	81	1815
Easements	4	466
Rights of Way	0	224
Surface Leases	74	6284
Sales	60	4193
Tax Histories	20	724

The following summary covers the various classifications of documents as shown above:

MINING LEASES

The following mining leases were executed during the year. In most cases negotiations had been carried on for sometime prior to 1949:

Lease No. 85 - Portland Mine.

The N½ of NW¼ of Section 26, 48-31 was leased from the Maas Land Company. This is in the South Michigamme District and lies immediately West of the Webster Mine.

Lease No. 86 - Samson Mine.

The SE¼ of SW¼ and the SW¼ of SE¼ of Section 2, 47-29 was leased from Mr. and Mrs. Harry B. Weber. These lands are adjoining and form a part of the Humboldt District.

Lease No. 87 - Steward Mine.

This is a part of the so-called Steward Mine and is the S½ of SW¼ of Section 23, 48-31 and was leased from the Conservation Department of the State of Michigan, State Lease No. 33. This property is immediately North of the Portland Mine in the South Michigamme District.

Lease No. 88 - Hill-Top Exploration.

A - The NW¼ of Section 26, 43-35.
B - The NE¼ of Section 27, 43-35.
C - State Mining Lease No. 16.
D - State Mining Lease No. 16A.

These four leases comprise the Hill-Top Exploration in Iron River, Iron County, Michigan. The ownership of these two quarter sections is very complicated and the State owns considerable acreage due to acquisition through delinquent taxes. It was necessary to secure approval of proportionate ownerships for the proper distribution of royalties and minimums before the documents could be executed.

MISCELLANEOUS DOCUMENTS

All documents affecting land titles and rights relating to operating mines or mineral lands are included in this classification. There were 34 documents covering the granting or acquisition of rights and lands in connection with the Minnesota operations. Only a few copies of these documents are in the Engineering Department files. There were 17 documents in connection with the purchases of lands in the Humboldt District. There were 18 miscellaneous documents regarding property in Negaunee and vicinity; 4 rights of way and 8 other documents covering miscellaneous rights.

EASEMENTS

The four documents filed were for transmission line rights of way for the Cliffs Power & Light Company covering extensions and changes of their lines.

RIGHTS OF WAY

This file covers railroad rights of way and is used mostly for copies of documents for reference purposes.

SURFACE LEASES

These leases originate in the Land Department and cover use of Company lands for residences, camps, gardens, farms, etc.

SALES

These sales are conveyances of Company lands off the mineral formation for rights of way, camp sites, etc. Seven of them, however, were transfers of houses in Negaunee from The Cleveland-Cliffs Iron Company to the Negaunee Mine Company.

TAX HISTORIES

All the tax histories placed on file had to do with lands acquired in the Republic District.

ABSTRACTS OF TITLE

All Abstracts of Title were forwarded to the Cleveland office for filing. These abstracts are brought up to date before sending to Cleveland and title opinions are prepared by Bell & Davidson. The title of all property purchased is, of course, checked before the final purchase is completed.

D. THE FORCE

The personnel of the Engineering Department remained the same throughout the year and there was very little shifting of men from one property to another. During the strike period, from October 1st to November 14th, when the mines were closed and no survey work permitted therein, the surveyors and helpers assisted the Geological Department and Metallurgical Department in their field surveys and sampling work. During this time the engineers kept their same assignments and assisted the Superintendents at the various properties.

The following table shows the personnel of the Department, their position at the end of the year and the period of employment:

Name	Position	Entered	Left	1949 Employment
Carl Brewer	Recorder			12 Months
Robert M. DeGabriele	Engineer			12 "
John M. Haivala	"			12 "
Grant T. Hollett	"			12 "
Maxwell H. Madsen	"			12 "
H. Walter Rembold	"			12 "
W. Harlow Stannard	Draftsman			12 "
Anselm Mantyla	"			12 "
George B. Manzoline	"			12 "
Donald W. Carlson	Clerk			12 "
Clifford H. Amel	Surveyor			12 "
Edgar G. Curtis	"			12 "
P. Daniel Isaacson	"			12 "
C. Arthur Koski	"			12 "
F. Alfred Koski	"			12 "
Ernest A. Oja	"			12 "
Ralph K. Oja	"			12 "
John R. Sleeman	"			12 "

Name	Position	Entered	Left	1949 Employment
Robert E. Anderson	Helper			12 Months
Clarence P. Ayotte	"			12 "
Herbert S. Kelly	"			12 "
Louis R. Miller	"			12 "
Alfred B. Nault	"			12 "
Raymond E. Oja	"			12 "
Russell J. Paull	"			12 "
Martin D. Tasson	"			12 "
Raymond S. Windsand	"			12 "
Edward J. Fassbender	Surveyor	June 13th	Sept. 23rd	3½ "

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

Name	Date Entered	Length of Service
Carl Brewer	August, 1906	31 years, 3 months
Robert M. DeGabriele	December, 1945	4 " 1 "
John M. Haivala	March, 1943	6 " 10 "
Grant T. Hollett	August, 1940	9 " 4½ "
Maxwell H. Madsen	September, 1943	6 " 4 "
H. Walter Rembold	March, 1948	1 " 10 "
W. Harlow Stannard	November, 1940	9 " 2 "
Anselm Mantyla	July, 1948	1 " 5½ "
George B. Manzoline	December, 1947	2 " ½ "
Donald W. Carlson	August, 1936	10 " 1 "
Clifford H. Amel	May, 1944	5 " 7½ "
Edgar G. Curtis	February, 1944	5 " 11 "
P. Daniel Isaacson	November, 1940	4 " 4½ "
C. Arthur Koski	June, 1941	5 " 1 "
F. Alfred Koski	January, 1936	8 " 9 "
Ernest A. Oja	March, 1943	6 " 10 "
Ralph K. Oja	February, 1947	2 " 10½ "
John R. Sleeman	February, 1947	2 " 10½ "
Robert E. Anderson	July, 1948	1 " 6 "
Clarence P. Ayotte	April, 1948	1 " 8½ "
Herbert S. Kelly	May, 1948	1 " 7 "
Louis R. Miller	August, 1945	4 " 3½ "
Alfred B. Nault	September, 1946	3 " 3½ "
Raymond E. Oja	October, 1946	3 " 4 "
Russell J. Paull	March, 1947	2 " 9 "
Raymond S. Windsand	December, 1947	2 " ½ "
Martin D. Tasson	August, 1948	1 " 5 "

In the above table, the "Length of Service" covers only that period the men were employed in the Engineering Department. Some of them have been in other Departments at one time or another. Time spent in the Armed Services is not included in this table.

The following table shows the number of days worked, sick or absent during the year, of all those who were in the Department.

Name	Days Worked	Days Sick	Days Absent
Carl Brewer	244½	-	25
Robert M. DeGabriele	257	-	9
John M. Haivala	263½	-	8
Grant T. Hollett	245½	13	14
Maxwell H. Madsen	262	1	8½
H. Walter Rembold	258½	-	11½
W. Harlow Stannard	256	1	12½
Anselm Mantyla	259	-	10½
George B. Manzoline	263	-	6½
Donald W. Carlson	233½	29	7
Clifford H. Amel	251	-	14
Edgar G. Curtis	249½	1½	16
P. Daniel Isaacson	267	2	5
C. Arthur Koski	257	-	10
F. Alfred Koski	256	-	9
Ernest A. Oja	253	1	11
Ralph K. Oja	261	-	9
John R. Sleeman	257½	4	5
Robert E. Anderson	256½	4	5
Clarence P. Ayotte	265	-	7
Herbert S. Kelly	255½	6	5
Louis R. Miller	249½	10	10
Alfred B. Nault	253½	3	10
Raymond E. Oja	255	-	11
Russell J. Paull	250½	-	15½
Raymond S. Windsand	251½	4½	11
Martin D. Tasson	257	-	9
Edward J. Fassbender	73	-	-

The following table shows the distribution of time spent underground, in the field, and in the office:

Name	Underground	Field	Office	Total
Carl Brewer	-	17	227½	244½
Robert M. DeGabriele	81	104	72	257
John M. Haivala	122	14	127½	263½
Grant T. Hollett	64½	39	142	245½
Maxwell H. Madsen	97	13½	151½	262
H. Walter Rembold	146	14	98½	258½
W. Harlow Stannard	-	4½	251½	256
Anselm Mantyla	-	-	259	259
George B. Manzoline	-	-	263	263
Donald W. Carlson	-	-	233½	233½
Clifford H. Amel	-	153	98	251
Edgar G. Curtis	66½	92	91	249½
P. Daniel Isaacson	137	31½	98½	267
C. Arthur Koski	115	32½	109½	257
F. Alfred Koski	50	181	25	256
Ernest A. Oja	-	147	106	253
Ralph K. Oja	112½	41½	107	261
John R. Sleeman	95½	55½	106½	257½
Robert E. Anderson	124	49	83½	256½
Clarence P. Ayotte	142	47	76	265
Herbert S. Kelly	122	36½	97	255½

Name	Underground	Field	Office	Total
Louis R. Miller	-	-	249½	249½
Alfred B. Nault	130	24½	99	253½
Raymond E. Oja	-	190	65	255
Russell J. Paull	81	97	72½	250½
Raymond S. Windsand	137½	40	74	251½
Martin D. Tasson	1	208	48	257
Edward J. Fassbender	-	69	4	73
TOTALS	1824½	1701	3436	6961½
%	26.2	24.4	49.4	100.0

The increased adoption of the block caving system required more planning and survey work than even the sub-level caving method, at least during the preliminary development. This development, involving the driving of the transfer and grizzly subs and the raises involved, required precise installation of the timbering and the proper location of them all. Each year there is more and more importance being placed on the proper grades and location of all development work so that there are more calls for planning by the engineers and more surveying by the crews.

The following summary covers the work done by the various men in the Department and shows the mines to which they were assigned. The more special jobs at the various properties are reviewed under the heading Mines and Miscellaneous.

CARL BREWER, Recorder, supervised the work of the Department, but most of his time throughout the year was in connection with acquisition of lands, preparation of mining leases, deeds and other documents. With Mr. Choquette he spent some time on matters in connection with the revaluation of Marquette County by the Michigan State Tax Commission and prepared the tax list of the Mining Department, both Michigan and Minnesota, and for the Cliffs Power & Light Company. The question of land titles for the property purchased or leased required a great deal of attention and many contacts with the Legal Department.

ROBERT M. DEGABRIELE, Mining Engineer, had charge of all the engineering work at the Athens Mine throughout the year. He supervised very closely the drawing of ore from the different block caving areas and spent much time planning development in the new ore deposit. During the summer he supervised the moving of all of the houses from the Boyer Avenue area and the preparation of the MacKenzie Field for some of these houses.

JOHN M. HAIVALA, Mining Engineer, did the engineering work at both the Lloyd and Spies-Virgil Mines throughout the year. At the Lloyd Mine, the stope development above the 9th Level required a good deal of attention. At the Spies Mine, he spent a great deal of time in connection with the radial drilling in the stopes of the East Deposit.

GRANT T. HOLLETT, Mining Engineer, was the engineer at the Mather Mine "A" Shaft all the year. He had a great deal to do in planning the changes to the permanent steel trestle and the erection of the third stocking trestle, and planning the grading therefore. Other changes on surface required considerable attention while planning for the underground work was an ever-present duty.

MAXWELL H. MADSEN, Mining Engineer, was in charge of the engineering work at the Cliffs-Shaft Mine during the entire year. He made time studies for the Superintendent as to various operations underground and assisted in planning development, especially on the Section 10 Lease. He supervised the sinking of the winze below the 7th Level, Cambria-Jackson Mine, and the installation of the pockets, etc. and planned, with Mr. Kelly Campbell, the installation of the conveyor system.

H. WALTER REMBOLD, Mining Engineer, was in charge of the engineering work at the Cambria-Jackson, Maas and Negaunee Mines during the year. There was very little work needed at the Negaunee Mine up to the time it was closed down in April, most of his time being spent at the other properties. He supervised the installation of the hoist equipment at the winze on the 6th Level, Maas Mine.

W. HARLOW STANNARD, Draftsman, assumed more and more charge throughout the year of the drafting work and maps in the office. He visited other mine offices to see glass models and designed and completed a similar model of the Mather "A" Mine workings. He made numerous special drawings throughout the year and did all of the planning for the Annual Report and getting the maps ready for the estimates of ore reserves.

ANSELM MANTYLA, Draftsman, was engaged throughout the year mostly in making new tracings and hard maps, both for replacement and new development. He also made many special drawings and maps. He posted the drill records for the Geological Department throughout the year.

GEORGE B. MANZOLINE, Draftsman, spent much of his time in making additional ownership maps and bringing the former ones up to date. He also made a great many special maps and did considerable work in connection with the regular mine maps and especially for the Annual Report.

DONALD W. CARLSON, Clerk, did the stenographic work for both the Engineering and Geological Departments for the entire year. He requisitioned supplies, did the filing, recorded documents and took care of the general office work for both Departments.

CLIFFORD H. AMEL, Surveyor, did a great deal of surface surveying throughout the year. He was in charge of the survey work at the South Michigamme and the Tilden Districts and assisted in surveys at the Humboldt, North Michigamme and other areas. He also did the surveying in connection with the drilling in the Hill-Top Exploration in Iron River.

EDGAR G. CURTIS, Surveyor, did the survey work at the Athens Mine all the year, both surface and underground. The surface work consisted of laying out the lots in MacKenzie Field and establishing bench marks and running levels for the subsidence record near the mine buildings.

P. DANIEL ISAACSON, Surveyor, ran surveys at the Mather "A" Mine throughout the year. He assisted in preparing the monthly map reports in the office.

C. ARTHUR KOSKI, Surveyor, was in charge of the survey work at the Cliffs-Shaft, Lloyd and Spies-Virgil Mines.

F. ALFRED KOSKI, Surveyor, was at the Mather "B" Shaft throughout the year. During shaft sinking, he checked the lining in of the sets and on surface gave grades and lines for such construction work and grading that was done by the Company.

ERNEST A. OJA, Surveyor, was in charge of the surface surveys at the Humboldt District and the opening of the Lake Mine-East End deposit. He also ran some of the coordinates in the North Michigamme Area and assisted in other field work at the various properties.

RALPH K. OJA, Surveyor, was at the Mather "A" Mine throughout the year. At various times during the year he ran surveys at other properties to fill in where necessary.

JOHN R. SLEEMAN, Surveyor, did the surveying at the Cambria-Jackson and Maas Mines throughout the year. He too assisted at other properties as the occasion required.

ROBERT E. ANDERSON, Helper, assisted in the surveys in the Negaunee District, mostly with Mr. Sleeman at the Cambria-Jackson and Maas Mines, and assisted at other properties as needed.

CLARENCE P. AYOTTE, Helper, assisted in the surveys at the Mather "A" Mine throughout the year.

HERBERT S. KELLY, Helper, assisted in the surveys at the Cliffs-Shaft, Lloyd and Spies-Virgil Mines.

LOUIS R. MILLER, owing to illness, was prevented from doing field survey work and was therefore in the office all of the year doing the blueprinting and other office work as required.

ALFRED B. NAULT, Helper, was on the survey crew of the Cliffs-Shaft, Lloyd and Spies-Virgil Mines throughout the year.

RAYMOND E. OJA, Helper, assisted in the various surface surveys, working with either Messrs. Clifford Amel or Ernest Oja as the occasion arose.

RUSSELL J. PAULL, Helper, assisted in the surveys in the Negaunee District but was mostly working with Mr. Curtis on the Athens Mine surveys.

MARTIN D. TASSON, Helper, assisted in all of the surface surveys and took care of the automobiles in the Department, seeing that they were properly serviced.

RAYMOND S. WINDSAND, Helper, assisted in the surveys at the Mather "A" Mine throughout the year and sometimes assisted in surveys at other properties.

EDWARD J. FASSBENDER, Surveyor, was employed from June 13th to September 23rd. He gave lines for brushing out three miles of lines at the North Michigamme District for surveys by both the Engineering and Geological Departments. At the Tilden area, he gave lines for brushing about two miles of lines for the same departments.

F. COSTS

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

	1947	1948	1949
Salaries	$ 57,754.59	$ 79,449.63	$ 91,052.07
Auto Expense	3,333.94	3,335.67	3,070.69
Furniture and Fixtures	361.11	34.47	-
Heat, Light and Power	1,026.51	721.25	634.29
Insurance	145.48	149.69	216.47
Postage	27.82	53.90	75.52
Repairs	80.00	41.90	-
Stationery and Printing	234.72	809.88	259.62
Supplies	5,053.10	7,152.02	8,000.02
Taxes	46.55	51.65	48.49
Traveling and Entertainment	508.32	1,020.09	1,868.71
Telephone and Telegraph	101.34	132.89	203.54
Papers and Periodicals	16.33	2.50	18.00
Unemployment Insurance Tax	849.90	887.37	1,048.00
General - Unclassified	653.78	1,059.60	2,316.14
Old Age Benefit Tax	587.93	682.66	822.80
Depreciation	104.08	95.37	60.00
Group Annuity Premiums	201.18	-	3,233.49
Equipment	1,358.17	-	453.50
TOTALS	$ 72,444.85	$ 95,680.54	$ 113,381.35

H. AUTOMOBILES

The Ford Tudor sedan furnished by Four Wheels, Inc., was operated throughout the year. The Chevrolet Station-Wagon was also operated throughout the year. The Ford Station-Wagon was sold on June 13th and was replaced by a Chevrolet Surburban Carry-All. The Station-Wagon had outlived its usefulness and could not be used for long trips.

The following table shows the mileage covered in 1949, the total mileage to the end of the year, and the date the cars were received in the Engineering Department:

	Miles		
Car	1949	Total	Date Received
Ford Sedan	17,281	19,577	November 19, 1948
Ford Station-Wagon	2,272	53,890	January 24, 1941
Chevrolet Station-Wagon	7,372	65,486	July 29, 1943
Chevrolet Carry-All	6,458	6,572	June 13, 1949

I. MINES

The following summary covers special work done at the various properties during the year:

GENERAL

The mines operated on a six day schedule until June 27th when they went on a five day week. On September 6th the Spies-Virgil Mine dropped to four days per week. All mines were idle during the strike period, from October 1st to November 14th.

ATHENS MINE

The surveys for subsidence were continued throughout the year and were extended. As the subsidence affected many of the houses on Boyer Avenue, these were purchased during the year and moved. Three of the houses were moved over to Healy Avenue and the other four were taken to prepared lots on MacKenzie Field, East of the Sterling Addition. One house was moved from Ann Street adjacent to the Athens Mine office to give added access to the shaft. The staking out of Mackenzie Field lots required the re-running of the North line of the Bunker Hill property. At this time it was found that the iron pin, supposedly being the Northeast corner of the Lucky Star property, was not in the correct location. Plans were made with the Jones & Laughlin Ore Company to re-set this corner, but it was not done during 1949.

Underground, the development of the block caving in the Corbit Lease was planned and supervised and the extraction of ore very carefully watched.

CAMBRIA-JACKSON MINE

The sinking of the incline winze below the 7th Level was planned and lines and grades given as required. The chutes and pockets above the level were carefully planned and installed.

CLIFFS-SHAFT MINE

During the latter part of the year a connection was made with the old Moro Mine workings which had been previously drained. Studies of the various types of drill bits were made during the year by Mr. Madsen. He also spent some time trying to work out a more equitable method for estimating the work done by the contract miners.

LLOYD MINE

The underground mining was confined between the 8th and 9th Levels where development for stopes required lines and grades.

MAAS MINE

The sinking of the winze below the 6th Level was the principal development at this property during the year.

MATHER MINE "A" SHAFT

Several check surveys and elevations were run on the 6th Level in the drift headed for "B" Shaft. Grades were carefully watched. One of the check surveys consisted of an angle survey using lights for survey points. This enabled longer sights to be obtained and the result checked within 10 secondsof the regular surveys. Inasmuch as the Mather "A" and "B" drifts will meet head-on, course and grade is all important. The sinking of the winze below the 6th Level and the raising of the shaft for a new 7th Level required many surveys and constant watching. The final shaft was completed in July.

On surface, lines and grades were given for the foundations for the third stocking trestle and additions to the permanent steel trestle. Grades were also given for the grading of the stockpile grounds.

MATHER MINE "B" SHAFT

The extension of the concrete tunnels and the final grading and completion of work around the headframe required constant attention. After the shaft was finished, the installation of shaft runners and equipment was supervised.

NEGAUNEE MINE

Very little engineering work was required at the Negaunee Mine, which was closed down on April 27th after exhaustion of the ore body.

SPIES-VIRGIL MINE

The development by raises and dog drifts above the 6th Level required careful watching and frequent surveys.

TILDEN MINE

There was very little work needed at the Tilden Mine during the year.

J. MISCELLANEOUS

ORE ESTIMATES

The change of time for preparing ore estimates has been previously detailed under the heading of Michigan State Tax Commission. The new schedule is much easier for the Engineering Department as it does not come at the same time as the preparation of the Annual Report. A comparison of the estimates of ore reserves as prepared for the Michigan State Tax Commission is shown below:

	As of 12/31/48	As of 9/30/49
	Tons	
Athens Mine	2,610,597	2,595,038
Cambria-Jackson Mine	1,732,110	1,320,563
Cliffs-Shaft Mine	1,798,890	1,899,317
Lloyd Mine	533,848	370,461
Maas Mine	5,616,883	5,242,625
Mather Mine "A" Shaft	12,153,767	12,359,239
Negaunee Mine	198,170	-
Spies - East Deposit	665,595	468,868
TOTALS	25,309,860	24,256,111

STOCKPILES

During October, when the mines were idle, estimates of ore in stock were made at the Cliffs-Shaft, Lloyd and Maas Mines and reported as of November 1st. The piles at the other mines had been cleaned up and there was only a small tonnage of wet ore in stock for which book figures were reported.

The following table shows the comparison of ore in stock on November 1st, 1948 and 1949:

	Tons	
	November 1, 1948	November 1, 1949
Athens Mine	0	1,087
Cambria-Jackson Mine	0	6,705
Cliffs-Shaft Mine	24,374	29,241
Lloyd Mine	49,324	62,528
Maas Mine	4,214	61,206
Mather Mine "A" Shaft	3,733	33,365
Spies Mine	11,522	72,548
TOTALS	93,167	266,680

SHAFT GAUGING

The runners in the various operating shafts were gauged on the dates as shown below:

Athens	November 9th
Cambria-Jackson	" 8th
Cliffs-Shaft	" 10th
Lloyd	" 19th
Maas	" 8th
Mather "A"	" 10th
Spies	" 11th

HUMBOLDT DISTRICT

There was some field work done in the Humboldt District for mapping some of the open pits. Several surveys were run for the drill holes put down in search of water supply in the territory North of the proposed open pit. Only such work as was actually necessary was done in this area during the year.

In December, approval was given for the purchase of the remaining lands under option and notices were sent to the respective land owners. The purchase of these properties were not completed at the end of the year due to the lack of time necessary for preparing the documents.

SOUTH MICHIGAMME DISTRICT

This area comprises the Webster, Portland, Steward, Ohio and Norwood properties. Such surveys were run as were needed for the exploratory work done on the Webster property: drilling, trenching and geological surveys. Survey lines were extended onto the Ohio and Norwood properties and drill holes located. The surveys were tied into the lines run by the Inland Steel Company so that the surveys could be on the same basis.

NORTH MICHIGAMME DISTRICT

This District includes the Michigamme Mine in Section 19, 48-30 and adjacent lands to the West in Section 24, 48-31. The Inland Steel Company had run a survey along the latter section, tying in the various corners. We accepted their survey along the East line of Section 24 and with them ran a joint survey along the East line of the SE¼ of this Section 24, this being the West boundary of the Michigamme