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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued)

TABLE VI (Continued)

SURFACE

Cause	Athens	C.S.	Lloyd	Maas	Mather	Neg.	Princeton	Spies	Totals
Falling material	1					2			3
When using tools		1							1
Flying particles or bounding objects							1		1
Falls of persons slipping or stumbling	1								1
Total surface	2	1				2	1		6

OPEN PIT MINES

	Canisteo	Hill-Trumbull	Holman-Cliffs	Tilden	Totals
Falling material	1	2		1	3
Runaway truck	1				1
Slipping or stumbling			1		1
Struck by moving train, tractor, or truck		1	2		3
Other causes	1	1	2		4
Machinery		2			2
Total open pits	2	6	5	1	14

OTHER OPERATIONS

	C. P. & L. Co.	General Sthse.	General Shops	Hospital	Totals
When using machinery		1			1

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b. Non-Fatal Accidents (Continued)

TABLE VII

FREQUENCY RATES*

All Compensable Accidents

Year	Total Man Days Worked	Number of Compensable Accidents Non-fatal	Fatal	Frequency Rate
1935	393,967	35	2	.094
1936	567,891	33	2	.062
1937	765,701	58	1	.077
1938	491,303	46	3	.099
1939	564,542	44	1	.078
1940	714,391	59	5	.089
1941	918,300	79	5	.092
1942	1,024,713	75	2	.075

* Based on number of accidents per 1000 man-days worked.

TABLE VIII

SEVERITY RATES*

All Compensable Accidents

Year	Non-Fatal Days Lost	Rate	Fatal Days Lost	All Accidents Days Lost	Rate
1935	3,225	7.93	3,600	6,825	17.70
1936	3,509	6.16	3,600	7,109	12.67
1937	7,881	10.29	1,800	9,681	12.64
1938	6,290	12.80	5,400	11,690	23.66
1939	3,264	5.79	1,800	5,064	8.97
1940	3,442	4.82	9,000	12,442	17.52
1941	5,403	5.81	9,000	14,403	15.68
1942	4,103	4.00	3,600	7,703	7.52

* Based on days lost by accidents per 1000 days of labor.

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b. Non-Fatal Accidents (Continued)

TABLE VIII-A

COMPENSABLE ACCIDENTS, INCLUDING FATALITIES

BY MINES

Mine or Plant	Frequency*	Severity*
Hill-Trumbull	0.093	30.88
Negaunee	0.144	20.53
Princeton	0.176	9.37
Lloyd	0.063	8.18
Athens	0.101	5.25
Tilden	0.098	3.74
Maas	0.074	3.96
General Shops & Sthse.	0.043	2.55
Holman-Cliffs	0.078	1.89
Canisteo	0.082	1.64
Cliffs Shaft	0.033	1.54
General	0.000	0.00
Miscellaneous	0.000	0.00
C. P. & L. Company	0.000	0.00
Mather	0.000	0.00
Spies-Virgil	0.000	0.00
All Properties	0.075	7.52

* Per thousand days of labor.

TABLE VIII-B

COMPENSABLE ACCIDENTS, INCLUDING FATALITIES

Mine or Plant	Days of Labor	Hours of Labor	Number of Accidents	Days Lost C.C.I. Co.**	Days Lost N.S.C.*	Fatalities	Frequency C.C.I.	Frequency N.S.C.	Severity C.C.I.	Severity N.S.C.
Athens	118,590	948,720	12	623	623	-	0.101	12.64	5.25	0.657
Maas	148,298	1186,384	11	588	588	-	0.074	9.28	3.96	0.496
Negaunee	138,545	1,108,360	19	2,843	8,791	1	0.144	18.05	20.52	7.931
Princeton	39,827	318,616	7	373	373	-	0.176	21.97	9.37	1.171
Lloyd	94,722	757,776	6	775	775	-	0.063	7.92	8.18	1.023
Cliffs Shaft	151,435	1,211,480	5	233	233	-	0.033	4.13	1.54	0.193
Mather	26,930	215,440	0	-	-	-	-	-	-	-
Spies-Virgil	22,976	183,808	0	-	-	-	-	-	-	-
Hill-Trumbull	64,416	515,328	5	1,989	6,189	1	0.093	11.64	30.88	12.017
Holman-Cliffs	63,874	510,992	5	121	121	-	0.078	9.78	1.89	0.237
Canisteo	36,531	292,248	3	60	60	-	0.082	10.27	1.64	0.205
Tilden	10,159	81,272	1	38	38	-	0.098	12.35	3.74	0.467
General Storehouse and Shops	23,481	187,848	1	60	60	-	0.043	5.33	2.55	0.320
C. P. & L. Co.	21,181	169,448	0	-	-	-	-	-	-	-
General and Miscellaneous	62,352	498,816	0	-	-	-	-	-	-	-
Totals	1,024,713	8,197,704	75	7703	17,851	2	0.075	9.39	7.52	2.177

p. Non-Fatal Accidents (Continued)

** Cleveland-Cliffs Iron Company: Frequency Rate - Number of accidents for every 1000 days worked. Fatality 1800 days.
Severity Rate - Number of days lost per 1000 man shifts worked.

* National Safety Council: Frequency Rate - Number of accidents for every 1,000,000 man hours. Fatality 6000 days.
Severity Rate - Number of days lost per 1000 man hours.

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11. ACCIDENTS AND PERSONAL INJURY

b. Non-Fatal Accidents (Continued

TABLE IX

SHOWING GROUP AGES OF INJURED WORKERS
(Compensable Accidents)

Age	Number Injured
18 to 25 years of age	10
25 to 30 years of age	11
30 to 35 years of age	15
35 to 40 years of age	9
40 to 45 years of age	6
45 to 50 years of age	8
50 to 55 years of age	5
55 to 60 years of age	7
60 to 65 years of age	4
	75

TABLE X

SHOWING TIME PERIODS WHEN
COMPENSABLE ACCIDENTS OCCURRED

Time	Number	Working Period
8:00 to 12:00 A.M.	25	First half of day shift
12:00 to 4:00 P.M.	22	Second half of day shift
4:00 to 8:00 P.M.	11	First half of afternoon shift
8:00 to 12:00 P.M.	7	Second half of afternoon shift
12:00 to 4:00 A.M.	5	First half of night shift
4:00 to 8:00 A.M.	5	Second half of night shift
	75	

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b. Non-Fatal Accidents (Continued)

TABLE XI

SHOWING OCCUPATION OF INJURED EMPLOYEES
(Compensable Accidents)

Miner	36	Machinery Operator	2
Timberman	6	U.G. Trammer	1
Surface Laborer	5	Blacksmith	1
Chuteman	4	Blacksmith Helper	1
U.G.Laborer	3	Steelworker	1
Miner's Helper	2	Pitman	1
Oiler	2	Timber Hoister	1
Truck Driver	2	Welder	1
Motorman	2	Power Shovel Operator	1
Carpenter	2	Machinist	1

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection

The Safety Department has cooperated with all the company's supervisors in promoting safety at the various operations. Mr. H. F. Rogers, Safety Inspector, makes a written report of all his inspections and the writer a written report on some and a verbal report on others. Fine cooperation was received from all supervisors. A copy of all reports is sent to the Manager at the end of each month.

Mr. G. R. Whittington, Safety Inspector for the Mesaba Range mines, made written reports on all of his 237 inspection trips during the year. The writer accompanied Mr. Whittington on several of these inspection trips and made several verbal recommendations and suggestions.

Most of the inspection trips on the Marquette Range have been in the soft ore mines because of the continual changing of conditions which involve more hazards than the hard ore mines.

Mining for years has been rated as the most dangerous of all industries and its frequency and severity ratings prove it so, but it is believed by the writer that it can be greatly improved were it possible to supervise all employees more closely and educate all men as to the hazards involved. In safety inspection we are trying to educate employees in safe and unsafe methods and offering constructive criticism.

The following tables give the number of safety recommendations, and suggestions at the various properties.

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c. Safety Inspection (Continued)

TABLE XII

Mine or Plant	Violation of Standards	Safety Suggestions	Recommendations	Total
Athens Mine	41	22	12	75
Cliffs Shaft Mine	19	35	8	62
Lloyd Mine	23	20	19	62
Maas Mine	48	63	19	130
Negaunee Mine	39	47	13	99
Spies-Virgil Mine	5	3	8	16
Princeton Mine	23	33	12	68
Mather Mine	2	7	8	17
Tilden Mine	1	6	5	12
Incline Pit	3			3
Champion Screening Plant			3	3
Gen. Shops & Sthse.	1	3	1	5
C. P. & L. Company	1	1	1	3
Ishpeming Hospital		2	3	5
Negaunee Dispensary		3		3
Central Office			1	1
Miscellaneous		2		2
Totals	206	247	113	566

G. R. Whittington, safety inspector for our mines in Minnesota, submitted the following report of inspections:

TABLE XIII

Mine	Number of Inspections	Violation of Standards	Recommendations
Canisteo	80	3	15
Hill-Trumbull	81	2	13
Holman-Cliffs	76	3	38
Totals	237	8	66

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Fire Patrol Inspections

During idle periods at the mines a fire patrol covers the entire mine. It is the duty of this patrol to make sure that all power circuits are off and they check all working places to make sure there are no fires. These patrols already have put out a few incipient fires. Reports are sent only to the superintendents.

Idle and Abandoned Mines and Explorations

All idle and abandoned properties were inspected by the writer who was accompanied at times by Mr. Carl Brewer, Chief Mining Engineer. Mr. Brewer showed the writer the various properties and property lines which require semi-annual inspection.

A number of repairs had to be made to fences and one old exploration audit had to be covered.

Blasting Inspection Reports

Another educational method used in safety promotion is reporting by shift bosses of blasting practices used by the miners. Each shift boss must, according to rules, inspect blasting practices of his miners at least once every two months. This rule probably is responsible for a year without injury from blasting accidents.

Following is listed the number of blasting inspection reports received from the various mines.

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

TABLE XIV

NUMBER OF BLASTING INSPECTION REPORTS

Mine	Number
Athens	181
Cliffs Shaft	633
Lloyd	105
Maas	131
Negaunee	188
Spies-Virgil	41
Total	1279

The following tables show the kind and number of safety inspection reports made by the mine and plant foremen, which were received and checked by this Department.

TABLE XV

Hoisting Ropes	2279
Skip & Cage Roads	513
Ladder Roads	406
Safety Catches	100
Fire Doors	18
Slack Rope Device	66
Hoist Inspection	155
Fire Equipment	35
Fire Extinguisher	25
Fire Prevention Inspection	146
Total	3743

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c. Safety Inspection (Continued)

TABLE XVI

NUMBER OF FIRE EXTINGUISHERS INSPECTED

	2½ Gal. Soda Acid	3 Gallon Carbon Tetrachloride	1 Quart Carbon Tetrachloride	DuGas 15-30	DuGas 150	2½ Gal. Non-Freezing
Athens Mine	5	4	32	3		
Canisteo Mine	6	12	28	10		
Cliffs Shaft	9	4	52			2
Central Office	7		12			
Gwinn District	2		14			
Hill-Trumbull			30	12		
Holman-Cliffs	5		34	10		
Hibbing District						
Ishpeming Hospital	9		22			
Ishpeming Residences			30			
Lloyd Mine	3	6	26	2		
Maas Mine	6	6	46	2		
Mather Mine	4		36	10		
Negaunee Mine	6	6	30	5		
Negaunee Dispensary	3		4			
North Lake Residences	2 (5 gal.)		16			
Spies-Virgil Mine	3	8	42	2		
Spies Location			34			
Shops and Storehouse	10		56			11
C. P. & L. Company	4	30	26	11	1	2
Tilden Mine	1	2	60	3		4
Princeton Mine	1	4	24	2	—	—
Totals	86	82	654	72	1	19

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Rules and Regulations

The Cliffs Power and Light Company distributed their new "Safety Rules and Manual of Safe Practices" shortly after the first of the year. This manual should help considerably in preventing accidents. Electrical accidents are dangerous from the standpoint of potential fatalities and the manual of safe practices, if studied thoroughly by the men, will no doubt almost eliminate these accidents.

The underground and surface rule books were revised and a number of new rules added. The Central Safety Committee met a number of times to approve of these rules and the new book was sent to the printers in September. Most of these rule books have now been distributed to the men. The rule books now consist of "Underground Safety Rules for Captains, Foremen and Bosses," "Underground Safety Rules for Employees," "Surface Rules for Foremen," and "Surface Rules for Employees."

TABLE XVII

RULE BOOKS DISTRIBUTED AT MICHIGAN MINES

Mine or Plant	Foremen	Haulage	Explosives	Top Slicing	Surface	Total
Princeton	8	7	0	0	0	15
Lloyd	0	33	0	0	0	33
Negaunee	2	18	0	0	0	20
Spies-Virgil	0	11	0	0	0	11
Cliffs Shaft	3	22	0	0	0	25
Athens	4	14	0	0	2	20
Maas	0	6	6	8	0	20
Mather	4	0	0	0	5	9
Totals	21	111	6	8	7	153

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c. Safety Inspection (Continued)

TABLE XVII (Continued)

NEW COMBINED SURFACE RULE BOOKS

Mine or Plant	For Foremen	Surface Employees	Totals
Princeton	6	49	55
Lloyd	6	1	7
Negaunee	9	55	64
Spies-Virgil	4	28	32
Cliffs Shaft	8	120	128
Athens	6	0	6
Maas	7	59	66
Tilden	1	31	32
Mather	7	39	46
General Shops & Storehouse	8	0	8
Miscellaneous	13	0	13
Totals	75	382	457

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11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

Disciplinary Action

Absenteeism caused some concern at some of the mines. The exact cause of all time lost from the job is not known, but in Table XVIII are some of the known causes. There probably was not as much disciplinary action taken as should have been because of the dire need of production.

TABLE XVIII

CAUSES AND NUMBER OF DISCIPLINARY ACTION

Cause	Maas	Negaunee	Athens	Lloyd	Cliffs Shaft	Spies-Virgil	Total
Losing time	27	2	8	8		4	49
Infraction of rules	3	11		1			15
Insubordination				1			1
Reporting to work under the influence of liquor	2	7	1	4	1		15
Negligence of duties	1						1
Disregarding instructions		2					2
Totals	33	22	9	14	1	4	83

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c. Safety Inspection (Continued)

Central Safety Committee

The committee met several times during the year to discuss various accidents and causes, to classify accidents, to discuss revision of the safety rule books, and to discuss recommendations of inspectors of the U. S. Bureau of Mines, Mineral Resources Security Division.

Foremen's Conferences

Only two foremen's conferences were held during the year, at which time all accidents which had occurred were discussed in detail. These meetings are very valuable in accident prevention work as many new ideas are brought out with the discussion of each accident. Smokers were held at the end of each meeting. Minutes of the meetings were recorded and copies sent to the superintendent.

Officials of the Minnesota mines met four times during the year. Mr. W. A. Sterling presided as chairman and Mr. G. R. Whittington as secretary. At these meetings accidents are discussed and classified and all safety recommendations and suggestions made by Mr. Whittington are acted on.

Mining Club

The annual mining club meeting was not held this year because of the difficulty in arranging for a meeting place which would suit the occasion.

Cliffs Power & Light Company's Safety Conference

This safety conference was held for the first time at the Central Office on July 22nd with 33 employees and officials in attendance. As there were no compensable accidents to discuss, the time was taken up mainly with certain hazards of the job, a quite thorough discussion by Mr. J. D. Preston of the new "Safety Rules and Manual of Safe Practices," and a demonstration of Top Pole Resuscitation. A smoker was held at the end of the meeting.

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c. Safety Inspection (Continued)

Lake Superior Section, National Safety Council

This meeting was held in Duluth, Minnesota June 18 and 19. Our Marquette Range was represented by C. J. Stakel, L. C. Moore, Theodore Anderson, Walter Gries, W. R. Atkins, and myself. Our Minnesota mines were represented by George Beasley, H. C. Bolthouse, John J. Foucalt, M. E. Gaffney, W. A. Sterling, George E. Tucker, James A. Wivell, J. K. Young, Myron J. Youngberg and G. R. Whittington. Two of our employees took part in the program. Mr. Gries read a paper entitled "Value of Physical Examinations." The writer read a paper on discussion of a paper entitled "Fatigue vs. Accidents" and was chairman of the Nominating and Resolutions Committee and was a member of the Exhibit Committee.

National Safety Council

The annual meeting was held in Chicago, Illinois October 27th to 29th. The company was represented by Mr. C. W. Allen, Superintendent of the Mather Mine, and the writer. Mr. Whittington, Safety Inspector on the Mesaba Range, was unable to attend because of illness in his family. Membership has been retained in this organization. We receive 11 National Safety News magazines and 1300 poster units, plus many other safety services.

Safety Flags

The National Safety Flag was flown under the Stars and Stripes at all the properties. The banner flags were flown at the Spies-Virgil, Hill-Trumbull, and General Shops. The banner flag is flown at the mine or plant having the best safety record. For the year 1943 these flags will be flown by underground property, Mather Mine; open pit, Canisteo; and general, Cliffs Power & Light Company.

Miners' Safety Bulletin

Only two issues of the Miners' Bulletin were published during the year due to the rush of other urgent work, including control of gases at the Spies-Virgil Mine. The "More Ore to Win the War" slogan was

11. ACCIDENTS AND PERSONAL INJURY

c. Safety Inspection (Continued)

started in the March issue and prizes were offered for best suggestions submitted under this slogan. Many suggestions were received and prizes given with the July issue. The March issue was sent by mail to every employee.

Foremen's Bonus

The Foremen's Bonus continues to be an incentive in the promotion of safety among foremen and shift bosses. Table XIX shows distribution of these bonuses.

TABLE XIX

SAFETY BONUSES PAID TO FOREMEN

Mine or Plant	Amount	Men Participating
Athens Mine	$ 1,118.17	14
Cliffs Shaft Mine	1,284.13	17
Lloyd Mine	842.97	12
Maas Mine	1,340.09	14
Mather Mine	32.62	1
Negaunee Mine	1,279.95	13
Spies-Virgil Mine	221.14	5
General Storehouse	183.61	5
C. P. & L. Company	122.23	4
Totals	$ 6,424.91	85

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c. Safety Inspection (Continued)

TABLE XX

OCCUPATIONS OF MEN PARTICIPATING IN BONUS

Title	Athens	Cliffs Shaft	Lloyd	Maas	Mather	Neg.	Spies-Virgil	Gen. Sthse.	C.P.&L.	Total
Shift Boss	10	11	8	9	-	10	3	-	-	51
Mech. Foreman	1	2	1	1	1	1	1	-	-	8
Elect. Foreman	1	1	1	1	-	-	-	2	4	10
Surface Foreman	1	1	1	1	-	1	1	-	-	6
Timber Foreman	1	1	1	1	-	1	-	-	-	5
Blacksmith Foreman		-	-	-	-	-	-	1	-	1
Garage Foreman	-	-	-	-	-	-	-	1	-	1
Scraper Foreman	-	1	-	-	-	-	-	-	-	1
Track Foreman	-	-	-	-	-	-	-	-	-	0
Machy. Foreman	-	-	-	1	-	-	-	1	-	2
District Foreman	-	-	-	-	-	-	-	-	-	0
Mech. Engineer	-	-	-	-	-	-	-	-	-	0
Totals	14	17	12	14	1	13	5	5	4	85

11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation

Ventilation can be summarized as follows:

1. Measuring the volumes of air passing through the mines and its distribution to the mining contracts.

2. Collecting air samples to analyze for dust particles and gases.

3. Testing the efficiency of ventilation equipment.

4. Submitting reports with recommendations to the superintendents.

During the year Mr. Thomas Hill and the writer cooperated with the Engineering Department in measuring the volumes of air in each mine. These surveys are made twice a year and are used in making up the ventilation maps for the mines.

With the assistance of Mr. Edward Urban, Field Engineer, Saranac Laboratory, the writer made ventilation surveys of all the underground mines, checking distribution of air to all contracts and checking the efficiency of the main mine fans. Reports of these surveys were made to all superintendents, along with recommendations to improve the ventilation system.

Good ventilation is very essential in underground mining. It has universal application in control of dust; it is the only way to remove and dilute dangerous gases from a blast; it allows miners to enter working contracts sooner after the blast, which is a definite economy; it is a decided asset in prevention of certain mine fires; it is a godsend when there is a fire; it is imperative where heat and humidity are major factors; it minimizes timber decay; it improves visibility; and it provides atmospheres which are conducive to health and safety. Most of our mines are equipped with main mine fans, powerful enough to keep ventilation under positive control. It will be some time in the future before good ventilation can be had in every working place because ventilation raises and drifts in rock were not provided in the early days of mining. Much of this work is being done at the present time and will simplify ventilation in the future. At the present time our mines compare favorably with any in the Lake Superior District and our average is considerably better. All new auxiliary fans are of the high speed type and have greatly improved conditions in new headings and dead ends. Mr. Hill and the writer check the efficiency of the auxiliary fans on our routine trips through the mines.

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d. Ventilation (Continued)

Briefly, the volumes of air at each of the underground mines is:

Negaunee-Maas Mines:

Main Fan	Total volume	-	106,000 c.f.m.	Negaunee Mine
			66,000 c.f.m.	Maas Mine
Emergency Fan	" "	-	96,000 c.f.m.	

Athens Mine:

Main Fan	Total volume	-	86,000 c.f.m.
Emergency Fan	" "	-	40,000 c.f.m.

Lloyd Mine — Total volume - 25,000 c.f.m. (this was increased from 18,000 c.f.m. through driving of ventilation raises from 6th to 5th levels and probably can be increased to 30,000 c.f.m. if obstructions are removed between 5th and 4th levels to the main fan at number 6 shaft.)

Princeton Mine — Natural ventilation 3,500 c.f.m. made by smoke test measurement June, 1942.
Bids for a main mine fan have been asked for.

Cliffs Shaft Mine — Natural ventilation 35,000 c.f.m.

Spies-Virgil Mine — Main fan total volume 14,000 c.f.m.
The above fan is rated at 40,000 c.f.m., but small cross section of old mine workings prevents greater volume.

Air samples taken for dust analyses were very favorable during the year. Only a few were in excess of the permissible limit and these conditions were corrected immediately. It has been found that by diluting air at the source of the dust is most beneficial. At all rock headings an attempt is made to deliver air at the rate of 3,000 c.f.m. This is not possible at all times but with wetting down, water sprays, water blasts and wet drilling, dust can be kept to a minimum. Dust respirators also are used by the men and, if conditions warrant, air-line respirators or clean-air-blowers are used to provide men with a self-contained supply of air free of any nuisance dusts. Any employee who will follow the company's rules and wear protective respiratory equipment furnished by the company need not fear any respiratory disease. Our greatest

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d. Ventilation (Continued)

problem is to make these employees conscious of health hazards.

The following tables give locations and various occupations where dust samples were taken. Copies of all dust analyses are sent to the Saranac Laboratory, the superintendent of the mine or plant, and to the Manager. The number of samples taken this year is less than last year because Mr. Hill assisted at mine fires.

TABLE XXI

DUST SAMPLES COLLECTED IN ROCK WORK

Mine	Total-1942	Total 1936-1942
Athens	37	348
Cliffs Shaft	69	1110
Lloyd	32	359
Maas	65	354
Mather	37	98
Negaunee	63	584
Spies-Virgil	-	34
Tilden	-	21
Miscellaneous	2	96
Totals	305	3,004

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d. Ventilation (Continued)

TABLE XXII

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

	Athens	Cliffs Shaft	Lloyd	Maas	Mather	Negaunee	Champion Crusher	Totals
Drilling	12	60	13	24	21	30		160
Scraping	12		2	2		4		20
Blasting	1		4	4		2		11
Timbering			2			11		13
Hand shoveling	1	2	7	12	16			38
Barring back						3		3
Blowing cars	6		2	3		4		15
Blowing pocket	5			2		2		9
Crushing ore		7					2	9
Using compressed air loader to fill cars			2	8		7		17
General mine air				10				10
Totals	37	69	32	65	37	63	2	305

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e. Mine Rescue and First Aid Work and Training

Through the oxidation of sulphur in the black slates of the Spies-Virgil Mine sulphur dioxide fumes are thrown off. This action has given considerable trouble at the mine during the year. On the sixth level a sulphur fire flared up in one of the old stopes which had caved. Fumes from this fire backed against the air current to the main air raise between the 6th and 8th levels. Men wearing self-contained oxygen apparatus were used to run a line-brattice from this raise to the main air raise from the 6th to the 4th level where a concrete bulkhead was built. Under these very trying conditions the mine rescue men did an excellent job. Temperatures ranged up to 120° Fahrenheit most of the time with fumes and smoke so thick that water goggles had to be used continuously. The erection of the concrete bulkhead cleared the mine of gases almost entirely.

A number of other jobs had to be done at the Spies-Virgil Mine when using oxygen apparatus.

A crew of six oxygen apparatus men made a trip into the Inland Steel Company's Sherwood Mine to close a brattice door between the Sherwood Mine and Virgil Mine when smoke and fumes from the Virgil backed into the Sherwood.

On February 26th two men were slightly burned by the ignition of methane gas on the fifth level of the Princeton Mine at the time the mine was being dewatered. Although these men had been warned of the possible discharge of methane and other gases they entered the drift on the fifth level as soon as the water had been pumped out of the station. The pocket of methane was small so there was little damage done. Thomas Hill of the Safety Department and the writer and two employees of the Princeton Mine investigated the mine soon after the ignition. Oxygen apparatus was used but the mine soon cleared of gases and work was continued in a short time.

During the year the Safety Department trained 72 men in the use of mine rescue equipment. The total number of men available for this work was 108. Some of these men have been trained only to recharge and repair the equipment. Those taking the full mine rescue course must be in excellent physical condition because of the extreme physical exertion needed in this type of work. It also calls for a man of at least normal intelligence and he must be cool and collected, otherwise a little mistake may cause panic and disaster. Picking our mine rescue men is a difficult job but we have been very successful, mainly because

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Rescue and First Aid Work and Training (Continued)

of the number of men employed by the company. Because of the number of men going into the service, those who have become over age, and those who cannot pass the physical examination, new men will be trained at regular intervals.

New mine rescue equipment includes five sets of 2-hour McCaa oxygen apparatus, a motorized hi-pressure oxygen pump, smoke tubes and aspirating bulbs, five all-service gas masks and a Lamb Air Mover. All of this equipment has been used since purchased.

The mine rescue station located at the Negaunee Mine has been remodeled, painted and work benches with storage space for oxygen apparatus built in. All equipment is now kept in this building instead of having part of it at the Cliffs Shaft. This means less confusion when equipment is needed, training can be conducted without hauling equipment from one place to another and recharging and repairing is easily done. All the equipment is tested at least once a month and kept in first class condition. A report on the condition of all equipment is kept at the station, at the Safety Department's office, and one copy is sent to the Manager.

The writer conducted first aid classes for all supervisors during January and February. 82 out of 94 men who started the course completed it and received U.S. Bureau of Mines Certificates of First Aid Training. Frank Cash, District Supervisor, U.S. Bureau of Mines, conducted the examinations.

First aid materials were delivered weekly to first aid kits at the various properties. 31,418 first aid items were distributed. Of these items 27,590 were merthiolate pads used for slight wounds such as scratches. The cost of this material is negligible compared to the value received.

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Rescue and First Aid Work and Training (Continued)

TABLE XXII-A

MEN TRAINED FOR MINE RESCUE DURING 1942

Athens Mine	13
Negaunee Mine	13
Lloyd Mine	12
Mather Mine	9
Cliffs Shaft	15
Maas Mine	10
Total	72

MINE RESCUE MEN AVAILABLE AT EACH MINE

Spies-Virgil Mine	2
Mather Mine	11
Engineering Department	4
Athens Mine	17
Lloyd Mine	15
Negaunee Mine	16
Cliffs Shaft	18
Maas Mine	14
Princeton Mine	2
Total	99

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

e. Mine Rescue and First Aid Work and Training (Continued)

TABLE XXIII

FIRST AID SUPPLIES DISTRIBUTED

Material	Number Distributed
Merthiolate Pads	27,590
Ounces of Merthiolate	269
1" Roller Bandage	540
2" Roller Bandage	74
3" Roller Bandage	345
Rolls of Adhesive Tape	56
Picric Gauze	199
Plain Gauze	583
Leather Finger Cots	284
Merthiolate Applicators	1,368
Ounces of Aromatic Spirits of Ammonia	14
Tubes of Unguentine	20
Ounces of Absorbent Cotton	27
Triangular Bandages	40
Pairs of Scissors	9
Total items	31,418

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11. ACCIDENTS AND PERSONAL INJURY

Summary

This report would hardly be complete unless we had some means of comparing our accident records with those of other properties, and for that reason I include a table showing our frequency and severity rates compared with that of all mining in the nation, which was compiled by the National Safety Council. The frequency rate in this case is based on the number of disabling injuries per 1,000,000 man-hours of exposure. The severity rate is the number of days lost per 1,000 man-hours of exposure, including charges for permanent disabilities and deaths.

TABLE XXIV

INJURY RATES AND SEVERITY OF INJURIES

	Frequency	Severity
*All Mining, National Rate	38.90	9.42
**The Cleveland-Cliffs Iron Company	10.01	2.32

* 1941, latest available
** 1942

Following is the frequency and severity rates for Marquette County mines as taken from the county mine inspector's reports for the fiscal year ending September,30, 1942.

	Frequency	Severity
Cleveland-Cliffs Iron Company	9.16	1.66
Other Marquette County Mines	16.35	7.20

Safety Department

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11. ACCIDENTS AND PERSONAL INJURY

f. Department Expenses

TABLE XXV

Salaries	$ 9,198.00
Auto Expense	207.91
Furniture and Fixtures	21.85
Insurance	6.21
Postage	76.09
Repairs	25.81
Stationery and Printing	294.50
Traveling and Entertainment	402.48
Telephone and Telegraph	22.85
Unemployment Insurance Tax	152.97
General - Unclassified	803.50
Old Age Benefit Tax	91.60
Depreciation	199.84
Personal Injury Expense	1.00
Total	$11,504.61

Respectfully submitted,

A. J. Stromquist
Director of Safety

ANNUAL REPORT OF THE MINING ENGINEERING DEPARTMENT FOR THE YEAR ENDING DECEMBER 31, 1942

The regular books of photographic maps, scale 1" = 200', showing the areas mined on the various sub-levels and levels in the operating mines during 1942, accompany this report. These books also contain views of some of the properties and cross-sections of the Mesaba open pit mines. The maps show in red the areas mined and the development work done since last year's report. The sections show in color the geological structure adjacent to the open pits. Books have been prepared for the different companies interested in the various mines. The following list shows the companies for which books have been prepared and the mines included therein:

Company	Mines
The Cleveland-Cliffs Iron Company	Athens, Canisteo, Cliffs-Shaft, Hill-Trumbull, Holman-Cliffs, Jackson-Lease, Cambria, Lloyd, Maas, Mather, Morris, Negaunee, Princeton, Spies-Virgil and Tilden.
Bethlehem Steel Company	Mather and Negaunee
Pickands Mather and Company	Athens
Canisteo Mining Company	Canisteo
Hanna Ore Mining Company	Hill-Trumbull and Holman-Cliffs
Inland Steel Company	Hill-Trumbull and Holman-Cliffs
Jones & Laughlin Steel Corporation	Hill-Trumbull and Holman-Cliffs
Pittsburgh Steel Corporation	Hill-Trumbull and Holman-Cliffs
Republic Steel Corporation	Hill-Trumbull and Holman-Cliffs
Wheeling Steel Corporation	Hill-Trumbull and Holman-Cliffs

There were two bound volumes made for the Cleveland-Cliffs Iron Company, one for the Cleveland office and one for the Ishpeming office, Engineering Department. One bound volume and two loose-leaf books were prepared of the Canisteo Mine for the Canisteo Mining Company. One loose-leaf book was prepared for each of the partners of the Mesaba-Cliffs Mining Company except the Republic Steel Corporation for whom two books were prepared. One loose-leaf copy of the other books were made.

There were similar books prepared for the fee owners and superintendents, those for the Mesaba Range being bound. The following is the list of the books prepared and the mines included:

Person	Mines
Arthur Iron Mining Company	Hill-Trumbull and North Star Bingham Lease of Holman-Cliffs
W. A. Sterling, District Supt.	Canisteo, Hill-Trumbull and Holman-Cliffs
H.C.Bolthouse, Superintendent	Hill-Trumbull and Holman-Cliffs
G. E. Tucker, Superintendent	Canisteo
W. W. Graff, Superintendent	Athens and Negaunee
H.O.Moulton, Superintendent	Maas
F. J. Haller, Superintendent	Lloyd and Spies-Virgil
C. W. Allen, Superintendent	Mather
S. W. Sundeen, Superintendent	Cliffs-Shaft

B. MAP REPORTS

Two sets of blueprints of mine maps for the Michigan Mines, scale 1" = 50', were prepared at the end of each month during the year, showing in red the areas mined during that month. One of the sets was for the General Superintendent and the other for the Mine Superintendent. The sets for the General Superintendent are preserved for future reference. Maps of the Cliffs-Shaft mine are made quarterly.

Besides the above regular map reports, other sets of maps of Michigan Mines were prepared as follows:

ATHENS MINE

Two sets of monthly blueprints of the Athens Mine, showing in red the work done during that month, were sent to the Cleveland office for Pickands, Mather and Company.

CLIFFS-SHAFT MINE

Three sets of blueprints of the gological maps of the Bancroft Lease, scale 1" = 50', were prepared after the first three quarterly surveys, one set each were sent to the Ishpeming and Duluth offices of the Oliver Iron Mining Company and the other set for our Cleveland office. These maps showed, in red, the work done since the previous report. At the end of the year, two sets of these geological maps were prepared showing the work done for the entire year and were sent to the same offices as above. Also two copies of the estimate of ore reserves in the Bancroft Lease as of December 31, 1942, as prepared for the Michigan State Tax Commission were sent, one to the Ishpeming office and the other to the Duluth office of the Oliver Iron Mining Company. The geological maps sent at the end of the year, showed in color the areas of ore reserves.

MAAS MINE

Blueprints of those portions of the Maas Mine workings, scale 1" = 50', in the Roman Catholic Cemetery Lease were sent monthly to Mr. R. S. Archibald, Negaunee, Michigan, showing in red the areas mined during the month.

A set of blueprints, scale 1" = 50', of the Maas Mine have been sent monthly to Mr. R. C. Miller of Negaunee, Michigan, showing in red the workings in the Maas Mine Lease during that month. Mr. Miller is the fee-owners' engineer for this property.

NEGAUNEE MINE

A set of blueprints of the Negaunee Mine maps, showing in red, the areas mined during the month were sent monthly to Mr. R. C. Miller, Negaunee, Michigan. Mr. Miller is engineer for some of the fee-owners of the Negaunee Mine Lease.

At the end of the year annual report maps of the 4th, 6½, 9th, 10th, 11th, 12th, 13th, and 14th levels of the Negaunee Mine were forwarded to the eleven fee-owners of this property.

A set of blueprints of the North-South cross-sections, scale 1" = 50', of the Negaunee Mine was sent to Mr. W. L. Cumings, Geologist for Bethlehem Steel Company, Bethlehem, Pennsylvania. Only those sections that were affected by mining in 1942 were sent.

SPIES-VIRGIL MINE

Five sets of blueprints of the Virgil Mine workings, scale 1" = 50', was sent quarterly to the fee-owners of the Virgil property, showing in red the areas mined during the previous three months.

MICHIGAN STATE TAX COMMISSION

Estimates of ore reserves in the Athens, Cliffs-Shaft, Lloyd, Maas, Negaunee, Princeton and Spies-Virgil Mines were made as of December 31, 1942. These estimates were accompanied by a set of annual report maps of each of the mines showing the areas included in compiling these estimates and the general geological structure adjacent to the areas mined in 1942. There were two sets of these estimates and maps prepared, one being sent to the Michigan State Tax Commission through the Cleveland office in January, 1943 and the other remaining on file in the Engineering Department at Ishpeming.

C. REMARKS ON MISCELLANEOUS DOCUMENTS AND ABSTRACTS

All documents affecting lands and rights held by the Company or its subsidiaries passed through the Engineering Department for recording and approval irrespective of where these documents originated. Documents affecting the disposal of Company lands were approved by the Geological Department and initialed by Mr. Derby. All documents were initialed by Mr. Brewer who made a special report if necessary. Copies of those documents which affect the mineral lands are kept on file in the Engineering Department. Cafeful consideration of all documents were given from the standpoint of the Mining Department.

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

Classification	Number Received	Last File Number
Mining Lease	0	72
Miscellaneous Documents	36	1447
Easements	3	419
Rights of Way	0	224
Water Rights	0	66
Surface Leases	81	5502
Application for Sale	1	180
Sales	75	2905
Tax Histories	1	703
Legal Opinions	0	195

The following comments cover the above classification of the documents that were entered on the records of the Engineering Department during 1942:

MINING LEASES

There were no mining leases received on cancelled during the year.

The surrender of the Mackinaw Mine lease comprising the $S\frac{1}{2}$-$SW\frac{1}{4}$, $N\frac{1}{2}$ of $SE\frac{1}{4}$ and $SW\frac{1}{4}$ of $SE\frac{1}{4}$ of Section 35, 45-25 became effective in February, 1942, sixty days after the mailing of the notice of surrender.

MISCELLANEOUS DOCUMENTS

This classification covers all documents involving the transfer of rights on mineral lands. Of the thirty-six documents under this classification received during the year, thirteen affected the purchase of lands by the Cliffs Power and Light Company in the Deer Lake Basin and thirteen covered rights of various kinds at the Minnesota properties and the balance were miscellaneous documents received for filing.

EASEMENTS

This classification covers rights acquired by the Cliffs Power & Light Company.

RIGHTS OF WAY

This file covers railway and highway rights of way.

WATER RIGHTS

These are permits regarding the discharge of mine water across lands adjacent to the mines.

SURFACE LEASES

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

APPLICATION FOR SALE

These also originate in the Land Department and are preliminary reports covering lands to be sold on areas lying off the mineral formation.

SALES

This file covers the transfer of rights of all kinds, most of which originate in the Land Department. The seventy-five documents in the classification covered eighteen farms, twenty-nine lots for residences or other purposes, thirteen easements for rights of way and seven sales to the State, the balance were miscellaneous permits.

TAX HISTORIES

The tax history of the Spies Mine purchase were added to the Engineering Department files during the year. There were no legal opinions added during the year.

ABSTRACTS

There was no work done on abstracts during 1942.

D. THE FORCE

There was no change in the personnel of the Department as far as engineers were concerned during the year but there was considerable change of helpers because of being drafted for military service. The following table shows the personnel of the Department during the year, their position and period employed during 1942:

Name	Position	Entered	Left	1942 Employment
Carl Brewer	Chief Mining Engineer			12 months
John Trosvig	Engineer			12 "
W. R. Atkins	"			12 "
C. R. Sundeen	"			12 "
J. S. Westwater	"			12 "
G. T. Hollett	"			12 "
W. H. Stannard	Draftsman			12 "
F. A. Koski	Helper		Feb. 14	1½ "
J. M. Hill	"		Dec. 21	11½ "
C. A. Koski	"		May 5	4 "
D. W. Carlson	Stenographer		Sept. 16	8½ "
D. A. Krook	"	Jan. 2	Mar. 7	2 "
J. Simons	Helper	Mar. 4	Apr. 16	1 "
V. Johnson	"	May 8		7½ "
H. A. Reichenbach, Jr.	"	May 18	Aug. 29	3 "
H. H. Korpinen	Surveyor	Sept. 22		3 "
E. L. Carlson	Stenographer	Sept. 16		3½ "
O. R. Sandell	Helper	Oct. 5		3 "

The next table shows the length of service in the Engineering Dept. of the present personnel:

Name	Date Entered	Length of Service
C. Brewer	August, 1906	24 years, 3 months
J. Trosvig	June, 1911	25 years, 10 months (1)
W. R. Atkins	November, 1936	6 years, 1½ months
C. R. Sundeen	February, 1940	2 years, 10½ months
J. S. Westwater	May, 1940	2 years, 7½ months
G. T. Hollett	August, 1940	2 years, 4½ months
W. H. Stannard	November, 1940	2 years, 2 months
V. Johnson	May, 1942	8 months
H. H. Korpinen	September, 1942	3½ months
E. L. Carlson	October, 1942	3 months
O. R. Sandell	October, 1942	3 months

(1) Not employed by Company from October 15, 1914 to December 1, 1915, also from June 1, 1932 to November 9, 1936.

The above "length of service" covers only the period that the men were employed in the Engineering Department and does not necessarily cover the entire length of service with the Company. Several of the men have been in other Departments either before or at intervals since first entering this Department.

The following table shows the days worked, days sick, and days absent for the year covering all persons who have been in the Department during the year:

Name	Days Worked	Days Sick	Days Absent
C. Brewer	270	11	2
J. Trosvig	270½	8	11
W. R. Atkins	278		6
C. R. Sundeen	278½	4	6
J. S. Westwater	273		12
G. T. Hollett	284½		3½
W. H. Stannard	274½		8½
F. A. Koski	37		
J. M. Hill	257½		18½
C. A. Koski	97		
D. W. Carlson	195½		6½
D. A. Krook	51		
J. Simons	35½		
V. Johnson	173	2½	
H. A. Reichenback, Jr.	82		
H. H. Korpinen	77		
E. L. Carlson	78	1½	
O. R. Sandell	65½	1	

The distribution of the time spent underground, in the field and in the office during 1942 is shown in the following table, together with the percentage of time:

Name	Underground	Field	Office	Total
C. Brewer	7½	52	210½	270
J. Trosvig	46½	48	176	270½
W. R. Atkins	115½	36	126½	278
C. R. Sundeen	126	9	143½	278½
J. S. Westwater	93	52½	127½	273
G. T. Hollett	78	98½	108	284½
W. H. Stannard	7	20½	247	274½
F. A. Koski	7½	½	29	37
J. M. Hill	60	65½	132	257½
C. A. Koski	32½	21	43½	97
J. Simons	8½	4½	22½	35½
V. Johnson	37	61	75	173
H. A. Reichenbach, Jr.	12	33	37	82
H. H. Korpinen	27½	18	31½	77
O. R. Sandell	12	18	35½	65½
TOTAL	670½	538	1,545	2,753½
%	24.4	19.5	56.1	100.0

The following is a resume of the work done by the various men in the Department during the year:

CARL BREWER, Chief Mining Engineer, having charge of the engineering exercised general supervision over all of the work. All documents passing through the Department were handled by him and entered on the records. He initialed them and made such reports as were necessary. He compiled the annual report books, estimate of ore reserves and maps for the Michigan State Tax Commission, Stock-pile estimates, etc. He checked the Mining Department and Cliffs Power & Light Company lands with the delinquent tax lists in the different counties and made the 1942 tax list for both the above Departments. He checked the title of the Spies land purchase from abstracts received with the purchase. He assisted in the triangulation surveys and in the office calculations. He made memorandums of the Princeton Mine surface surveys and assisted in the Spies Mine surface surveys along the East line for the diamond drilling campaign. With Mr. S. W. Sundeen, he visited the M. A. Hanna Company properties in Iron River in connection with possible stope filling operations for the Cliffs-Shaft Mine. Toward the end of the year he made a study and prepared maps for possible mining operations on the Athens-Lucky Star boundary line.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
General Engineering		21	194	215	79.8
Athens		3	9.5	12.5	5
Cliffs-Power & Light Co.		3.5		3.5	1
Commonwealth Mine, (Wis.)		1		1	.3
Maas	2		0.5	2.5	1
Mather	0.5	0.5		1	.3
Negaunee		1		1	.3
Princeton	5	13.5	6.5	25	9
Spies		7.5		7.5	3
Tilden		1		1	.3
TOTAL	7.5	52	210.5	270	
%	3.0	19.0	78.0		100.0

JOHN TROSVIG, Engineer, had charge of the engineering work at the Cliffs-Shaft Mine and Jackson Lease-Cambria Mine throughout the year. He made the quarterly surveys of the Cliffs-Shaft property and prepared monthly maps of the Jackson Lease. He prepared the estimate of ore reserves and maps for the Cliffs-Shaft Mine for the Tax Commission. He made the triangulation surveys and assisted in the office calculations. During May he made the estimate of ore in stock at the Otis Steel Company plant at Cleveland and estimated the Cliffs-Shaft ore in stock in October at the mine. In October he made the estimate of ore in stock at the old Commonwealth Mine at Florence, Wisconsin. He supervised the installation of scraper in the inclined pit in connection with its operations. For the Geological Department he surveyed drill holes in Sections 3, 9 and 11, 47-27.

The following table shows the distribution of his time for the year:

Property

Property	Underground	Field	Office	Total	%
General Engineering		26	8.5	34.5	13
Cliffs-Shaft	36.5	9	124.5	170	63
Commonwealth Mine, (Wis.)		1	1	2	.7
Incline Pit		0.5		0.5	.1
Jackson Lease	10	0.5	42	52.5	19
Otis Steel Company		9.5		9.5	4
Geological Department		1.5		1.5	.2
TOTAL	46.5	48	176	270.5	
%	17.0	18.0	65.0		100.0

WILLIAM R. ATKINS, Engineer, had charge of the engineering work at the Maas and Princeton Mines throughout the year. At the Maas he supervised the sinking of the winze and development of the 6th Level plat together with the installation of hoisting equipment, as well as the sinking of the main shaft below the 6th Level. He gave lines for the development drifts on the 3rd, 4th and 5th Levels as necessary. At the Princeton Mine he ran new surveys underground and did all the necessary engineering work on surface in connection with the grading and stockpiles, erection of trestles and the new drainage ditch at No. 1 shaft.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
Archibald		1	0.5	1.5	.55
Mackinaw			1.5	1.5	.55
Maas	89	3.5	86	178.5	64.2
Princeton	26.5	31.5	38.5	96.5	34.7
TOTAL	115.5	36	126.5	278	
%	41.5	13.0	45.5		100.0

CURTIS B. SUNDEEN, Engineer, took care of the engineering work at the Negaunee and Spies-Virgil Mines throughout the year. He made the estimate of ore reserves, prepared the maps for the Tax Commission of both these properties and also the estimate of ore in stock. He gave lines for the Negaunee Mine for development on the 13th and 14th levels. At the Spies-Virgil properties he assisted the safety inspector in handling the underground fire. He made a ventilation study with the Inland Steel Company for connection with the Sherwood properties. He made the surface survey of the Spies-Virgil Mine on the East line for locating surface drilling.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
Athens	0.5			.5	.4
Maas	2		0.5	2.5	1
Negaunee	80	4	100.5	184.5	66
Spies	43.5	5	42.5	91	32.6
TOTAL	126.	9	143.5	278.5	
%	45.3	3.2	51.5		100.0

JAMES S. WESTWATER, Engineer, had charge of the engineering work at the Lloyd and Tilden Mines throughout the year. After September 1st he took over the Athens Mine in addition to his other work. He made the estimate of ore reserves at the Lloyd Mine and prepared the maps for the Tax Commission and made the Stockpile estimates at the Properties. He planned the 8th Level with the superintendent. He gave such lines as were necessary for underground development work. At the Tilden he laid out drilling for blasting and supervised all the blasts at the property. He laid out and estimated the stripping plans and supervised the work. At the Athens Mine he made the monthly surveys toward the end of the year.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
Athens	19.5	2.5	12.5	34.5	12.6
Cliffs Power & Light Co.		2.5		2.5	1.0
Cliffs-Shaft	0.5			0.5	.2
Lloyd	72.5	5.5	73	151	55.3
Maas	0.5			0.5	.2
Princeton		1.5		1.5	.5
Tilden		35.5	40.5	76	27.8
Geological Dept.		5	1.5	6.5	2.4
TOTAL	93	52.5	127.5	273	
%	34.0	10.0	47.0		100.0

GRANT T. HOLLETT, Engineer, had charge of the engineering work at both the Athens and Mather Mines until September 1st, after which time he spent all of his time at the latter property. He made the ore estimate of the Athens Mine and prepared the maps for the Michigan State Tax Commission and made the estimate of ore in stock at this property. He ran elevations for ground settlement along the South side of the property at various times throughout the year. At the Mather Mine he gave grades and lines for the erection of the stocking trestles and the grading for road and landscaping around the buildings. He also gave lines and grades for the construction of the discharge pipe into the Carp River toward the West of the property and supervised the excavation and construction of the timber tunnel. In the shaft he lined in bearer sets as they were placed and did other work in connection with the sinking of the shaft.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
Athens	60	12	74	146	51.3
Cliffs-Power & Light Co.		1		1	.3
Cliffs-Shaft	0.5			0.5	.2
Maas	0.5			0.5	.2
Mather	16	84.5	34	134.5	47.2
Negaunee	1	0.5		1.5	.6
Geological Dept.		0.5		0.5	.2
TOTAL	78	98.5	108	284.5	
%	27	35	38		100.0

W. HARLOW STANNARD, Draftsman, spent most of his time in the office making maps for the various mines as needed. These consisted of working maps and Annual Report maps. Each month he spent several days posting the cross-sections of the diamond drilling for the diamond drill records of the Geological Department. He spent some time in the field and underground, helping on various surveys.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
General Engineering		7	49.75	56.75	20.7
Archibald		1		1	.7
Athens			10.75	10.75	3.9
Canisteo			0.5	0.5	.3
C. P. & L. Co.			4	4	1.4
Cliffs-Shaft		5	8.5	13.5	4.8
Commonwealth Mine (Wis.)			0.5	0.5	.3
Hill-Trumbull Mine			0.5	0.5	.3
Holman-Cliffs Mine			0.5	0.5	.3
Jackson Lease			11.5	11.5	4
Lloyd Mine	3		17.5	20.5	7
Maas Mine	3	1	28.5	32.5	11.8
Mather Mine	0.5		3.5	4	1.4
Morris Mine			8.75	8.75	3
Negaunee Mine	0.5		10	10.5	3.8
Princeton Mine		5	35	40	14.6
Spies Mine		1		1	.7
Tilden Mine		0.5	7	7.5	2.7
Geological Department			50.25	50.25	18.3
TOTAL	7	20.5	247	274.50	
%	2.5	7.5	90.0		100.0

F. ALFRED KOSKI, Helper, assisted in the underground and surface surveys during the time he was in the Department. He also made blueprints while in the office as well as assisting in survey calculations and other work. He left the Department on February 14 to return to Military Service.

The following table shows the distribution of his time while he was in the Department:

Property	Underground	Field	Office	Total	%
General Engineering			22	22	59.5
Cliffs-Shaft	3.5		.5	4	11
Canisteo Mine			1.5	1.5	4
Hill-Trumbull			2	2	5.3
Holman-Cliffs			1	1	2.7
Jackson Lease	1			1	2.7
Maas Mine	2		.5	2.5	6.8
Mather Mine	1	.5		1.5	4
Negaunee Mine			1.5	1.5	4
TOTAL	7.5	.5	29	37	
%	20.3	1.3	78.4		100.0

JOHN M. HILL, Helper, assisted in the surface and underground surveys, office calculations, blue-printing and other work. He assisted also in the stockpile ore estimate at the Otis Steel Company plant in Cleveland. He left the Department on November 2nd to enter the Navy.

The following table shows the distribution of his time while he was in the Department:

Property	Underground	Field	Office	Total	%
General Engineering		9.5	86.5	96	37.
Archibald Mine		1	0.5	1.5	0.6
Athens Mine	3.5	6.5	3	13	5
C. P. & L. Co.		0.5		0.5	0.2
Cliffs-Shaft	31	7.5	22	60.5	23
Lloyd Mine	7	2.5	2	11.5	4.4
Maas Mine	3.5		13	16.5	6.4
Mather Mine	4	8		12	4.6
Negaunee Mine	6.5		3	9.5	3.7
Otis Steel Company		8.5		8.5	3.3
Princeton Mine	4.5	6		10.5	4
Spies Mine		4	0.5	4.5	2.7
Tilden Mine		9	1.5	10.5	4
Geological Dept.		2.5		2.5	1.1
TOTAL	60	65.5	132	257.5	
%	23.3	25.5	51.2		100.0

C. ARTHUR KOSKI, Helper, also assisted in the various underground and surface surveys and making blueprints, etc, in the office. He left the Department on May 5th to enter the Military Service.

The following table shows the distribution of his time while he was in the Department:

Property	Underground	Field	Office	Total	%
General Engineering			38	38	39.5
Athens Mine	7.5	1.5	1.5	10.5	10.8
Cliffs-Shaft Mine	1			1	1
Lloyd Mine	12	1.5	1.5	15	15.5
Maas Mine	3.5			3.5	3.6
Mather Mine	2	4.5		6.5	6.7
Negaunee Mine	5	.5		5.5	5.6
Princeton Mine	.5	8.5	2	11	11.3
Spies Mine	1			1	1
Tilden Mine		2	.5	2.5	2.5
Geological Dept.		2.5		2.5	2.5
TOTAL	32.5	21	43.5	97	
%	33.8	21.6	44.6		100.0

DONALD W. CARLSON, Stenographer, worked for both the Engineering and Geological Departments for the time he was in the office. He spent two days in the field on surface surveys. He left the Department on September 16th to enter Military Service.

DONALD A. KROOK, Stenographer, was employed during the early part of the year typing the estimate of ore reserves for the Tax Commission and Annual Reports. He left the Department on March 7th.

JOHN SIMONS, Helper, entered the Department on March 4th as helper, and assisted in surface and underground surveys and blueprinting. He was unable to get his physical exam until a month after entering the Department when it was found that he was unfit for underground work and was forced to resign on April 16th.

The following table shows the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
General Engineering			16.5	16.5	47
Cliffs-Shaft Mine	6		6	12	33.8
Lloyd Mine	.5	1		1.5	4
Maas Mine	1.5			1.5	4
Negaunee Mine	.5			.5	1.4
Princeton Mine		2		2	5.6
Spies Mine		.5		.5	1.4
Tilden Mine		1		1	2.8
Total	8.5	4.5	22.5	35.5	
%	24	13		63	100.0

VERNE JOHNSON, Helper, entered the Department on May 5th. He has assisted in underground and surface surveys, looked after the automobiles and made blueprints, etc., as necessary.

The following shows the distribution of his time for the year:

Prpperty	Underground	Field	Office	Total	%
General Engineering		9	75	84	48.5
Athens Mine	2	4.5		6.5	3.7
C. P & L. Company		1.5		1.5	.9
Cliffs-Shaft Mine	3.5	2.5		6	3.4
Lloyd Mine	6	1		7	4.7
Maas Mine	10.5	2.5		13	7.5
Mather Mine	1	11		12	6.9
Negaunee Mine	6.5	2		8.5	4.9
Princeton Mine	7.5	13		20.5	11.8
Spies Mine		1		1	.3
Tilden Mine		9.5		9.5	5.4
Geological Dept.		3.5		3.5	2.0
TOTAL	37	61	75	173	
%	21.0	35.0	44.0		100.0

HARRY A. REICHENBACH, Jr., Helper, was in the Department between May 18th and August 29th. He assisted in underground and surface surveys, calculations, blueprinting, etc. His work with the Company gave him certain credits in the under-graduate course at Lehigh University to which he returned when leaving the Department.

The following is the distribution of his time while in the Department:

Property	Underground	Field	Office	Total	%
General Engineering		10	20.5	30.5	37
Athens Mine	1	1		2	2
Cliffs-Shaft Mine	5.5	.5	8	14	17.1
Lloyd Mine	1			1	1.5
Maas Mine	1	.5		1.5	1.8
Mather Mine	.5	2.5		3	3.6
Negaunee Mine	1	1.5		2.5	3
Princeton Mine	2	8	6	16	19.5
Spies Mine		4		4	5
Tilden Mine		4		4	5
Geological Department		1	2.5	3.5	4.5
TOTAL	12	33	37	82	
%	14.0	40.9	45.1		100.0

HUGO H. KORPINEN, Surveyor, entered the Department on September 22nd. He has made such surveys, gave lines for development drifts, raises, etc., at the various properties for the engineers. In the office he assisted with the survey calculations, made tracings, etc.

The following table is the distribution of his time since entering the Department:

Property	Underground	Field	Office	Total	%
General Engineering			7	7	9
Athens Mine	4.5	2.5	3.5	10.5	13.6
Cliffs-Shaft Mine	3	3.5	4	10.5	13.6
Commonwealth Mine (Wis.)		1		1	.1
Lloyd Mine	7	2.5	7	16.5	21.6
Maas Mine	4	1	3.5	8.5	11
Negaunee Mine	3.5	2	4.5	10	13
Princeton Mine	4	1	1	6	7.8
Spies Mine	1.5	3		4.5	6.8
Tilden Mine		1.5	1	2.5	3.5
TOTAL	27.5	18	31.5	77	
%	35.7	23.3	41		100.0

ELSIE L. CARLSON, Stenographer, entered the Department on September 28th and worked for both the Engineering and Geological Departments.

OSCAR R. SANDELL, Helper, entered the Department on October 5th. He assisted in surface and underground surveys, blueprinting, survey calculations, etc. Toward the end of the year he took charge of the printing for the Annual Report.

The following is the distribution of his time for the year:

Property	Underground	Field	Office	Total	%
General Engineering			35	35	53.4
Athens Mine	1.5		1.5	1.5	2.7
Cliffs-Shaft Mine	2	3	0.5	5.5	8.0
Commonwealth Mine (Wis.)		1		1	1.0
Jackson Lease		0.5		0.5	.6
Lloyd Mine	1.5	2		3.5	5.4
Maas Mine	2	1		3	4.8
Mather Mine		1.5		1.5	2.7
Negaunee Mine	2	1		3	4.8
Princeton Mine	3	1		4	6.0
Spies Mine		4		4	6.0
Tilden Mine		2.5		2.5	4.0
Geological Dept.		.5		0.5	.6
TOTAL	12	18	35.5	65.5	
%	18.0	27.0	55.0		100.0

E. DISTRIBUTION OF TIME

There was comparatively little work for the Department except that directly connected with the operating mines. All the time has been charged against the various properties where possible. Blueprinting, miscellaneous drafting, reports, etc. not directly chargeable to any mine have been classified under general engineering, and for payroll purposes have been distributed proportionately to the different properties.

The following table shows the distribution of the time, except stenographic work, divided between underground, field and office for the different mines and other properties:

Property	Underground	Field	Office	Total	%
General Engineering		83½	552½	636	23.1
Archibald Mine		3	1	4	0.2
Athens Mine	100	33½	114¾	248¼	9.0
Canisteo Mine			2	2	0.1
C. P. & L. Co.		12½	8	20½	.7
Cliffs- Shaft Mine	90	27½	170	287½	10.5
Commonwealth Mine		4	1½	5½	.2
Hill-Trumbull Mine			2½	2½	.1
Holman-Cliffs Mine			1½	1½	.0
Incline Mine		½		½	.0
Jackson Lease	11	1	53½	65½	2.4
Lloyd Mine	110½	16	101	227½	8.3
Maas Mine	124½	9½	132½	266½	9.7
Mackinaw Mine			1½	1½	.0
Mather Mine	25½	111½	37½	174½	6.4
Morris Mine			8¾	8¾	.3
Negaunee Mine	106½	12½	118	237	8.6
Otis Steel Co.		18		18	.7
Princeton Mine	53	92	89	234	8.5
Spies-Virgil Mine	46	30	43	119	4.3

Tilden Mine			66½	50½	117	4.3
Geological Dept.			17	54¼	71¼	2.6
	TOTAL	667	538½	1543¼	2748¾	
	%	24.3	19.6	56.1		100.0

F. COSTS

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

	1940	1941	1942
Salaries	$20,252.36	$19,486.36	$21,913.49
Auto Expense	934.43	1,143.41	1,325.26
Furniture and Fixtures	-	236.81	193.90
Heat, Light and Power	571.06	569.41	625.49
Insurance	112.22	81.50	33.78
Janitor and Cleaning			18.17
Postage	30.18	34.29	29.90
Repairs	189.18	118.50	885.08
Stationery and Printing	57.42	116.35	252.55
Supplies	1,831.61	1,801.68	2,497.84
Taxes	45.27	46.40	45.49
Travel and Entertainment	68.10	153.23	166.60
Personal Injury Expense	410.97	53.25	5.25
Telephone and Telegraph	130.68	106.02	120.38
Papers and Periodicals	17.00	-	10.25
Unemployment Insurance Tax	660.47	645.10	361.58
General - Unclassified	32.69	110.09	65.24
Old Age Benefit Tax	204.47	195.50	225.96
Depreciation	84.96	84.96	84.96
TOTAL	$25,633.07	$24,982.86	$28,861.17

H. AUTOMOBILES

The Ford Station-Wagon and the Ford four-door sedan furnished by the Four Wheels, Inc., were operated by the Department during the entire year. The Station-Wagon was in a collision while returning from the Spies Mine on December 19th. The following table shows the mileage covered in 1942, the total mileage and the date received:

Car	Miles 1942	Total	Date Received
Ford Station Wagon	6,648	13,968	January 24, 1941
Ford Sedan	10,346	20,021	January 30, 1941

I. MINES

The following summary covers the special work done by the Department during the year:

GENERAL

The weekly inspections of soft ore mines were continued throughout the year unless prevented temporarily by other work. During these inspections the engineer accompanied the mining captain or shift boss and visited nearly all of the working places each week. The general geology was noted and posted on the maps and special trips were made with members of the Geological Department for special areas.

The engineer assisted the superintendents with their monthly and annual reports.

ATHENS MINE

During the year the ground settlement extended further to the East and the new cracks were surveyed from time to time. Elevations were run at intervals with iron pins along the South boundary line and adjacent to the houses in that locality. There was very little southerly extension of the ground settlement but it did extend further to the East and near the houses on the South side of the Athens property.

Seven test holes were put down into ledge in the area Southeast of the cave to determine the amount and location of underground water entering the mine. Well No. 1 was installed in November and pumped between forty or fifty gallons during the latter part of the month. Owing to the fact that the ledge was more or less broken we have been unable to get any satisfactory ground water levels in the holes. In September two weirs were placed in Partridge Creek, one West and one East of the mine property in an endeavor to ascertain whether or not there was any seepage of the creek water under the mine. A heavy rainstorm washed out these weirs before satisfactory readings could be taken. The weirs were replaced in November but extreme cold weather prevented readings at that time.

Underground development above the 4th Level continued to require considerable attention. Cross-cuts were also driven on the 6th and 7th Levels and the 10th Level fan station cut-out all required lines at various times.

CLIFFS-SHAFT MINE

Grades and lines were given for the foundations of the new steel permanent trestle at the crushing plant. A study was made of the possible extension of the stockpile ground to the Southwest and a possible railroad track lay-out designed.

Underground quarterly surveys were made in March, June, September and November. Lines were given for raises and for drilling as required.

LLOYD MINE

Underground drill holes were located and lines given for 7th Level development. The shaft sinking was supervised and bearers lined in as needed. Plans for the 8th Level were made and the cutting out of the plat and pocket at this elevation was carefully watched.

MAAS MINE

The principal underground development during the year was sinking of the winze below the 5th Level and the installation of the equipment, cutting the plat, etc., on the 6th Level. All this work was planned and construction supervised. Also plans were made and the work supervised in connection with the sinking of the main shaft below the 6th Level. Bearer sets were lined in. The winze was plumbed and the survey lines carried down to the 6th when sufficient openings had been made. Lines were given for the development of cross-cuts on the 3rd and 4th Levels. A drilling campaign was planned Northwest above the 5th Level.

MATHER MINE

During the summer, roads and sidewalks were made and landscaping done around the buildings. Grades and lines were given for this work as needed. The excavation for and construction of the timber tunnel was supervised. Grades and lines were given for the foundation of the permanent trestle to the stocking ground.

Shaft sinking continued throughout the year. Eight bearer sets were lined in during the year. Plans were drawn for the proposed plats, pockets, pump houses, etc., so they would be ready when shaft sinking was finished shortly after the end of the year.

NEGAUNEE MINE

The only development work done was on and above the 14th Level during the year. Lines were given as needed and drill holes located. Mining operations, however, were so extensive that careful and frequent mapping was necessary.

PRINCETON MINE

Early in the spring lines and elevations were given at No. 2 Shaft for the foundation piers for the Gardner Mine headframe which was moved to this property. Plans were made for the grading of the old rock pile to provide new stockpile grounds Southeast of the shaft and grades were given as needed while the work progressed. This work was done by scrapers and approximately 34,000 yards removed. Plans for the permanent and stocking trestles were prepared and the construction supervised during the summer. Several churn drill holes were put down South of the No. 2 shaft over a stope and blasted in an attempt to fill underground workings. This was only partially successful.

At No. 3 shaft elevations and grades were given for levelling the ground adjacent to the collar for additional timber yard area.

The study of the underground workings adjacent to old No. 1 shaft seemed to indicate that mining in that vicinity might cause a ground settlement. The Northwestern Railroad was notified and tentatively advised that a relocation of their tracks might be needed. The profile was run for the relocation of the creek near No. 1 shaft after the test with weirs and dye showed a considerable amount of seepage into the underground workings. A new ditch and launder were constructed to divert this water from flowing over the mine workings.

On the surface survey stations at the Princeton Mine in the vicinity of the No. 1, 2 and 3 shafts could not be found and it was, therefore, necessary to re-establish surveys on surface. The old surface maps had been plotted on Austin coordinates (origin W¼ corner of Section 20, 45-25) while the underground workings had been mapped on Princeton coordinates (origin NW corner of Section 20, 45-25). Fifteen concreted iron pins were set between the central office and the Princeton location near No. 1 shaft and a new complete surface survey was made of the location and the vicinity of the three shafts. When the 6th Level had been sufficiently cleaned out so that underground surveys could be run, a careful search was made for old underground survey stations. Fortunately, two of these points were found that could be positively identified, one was near No. 1 shaft and one near No. 2 shaft. A new survey was run between these two points on the 6th Level and the calculated distance between them checked so closely the calculations on the old surveys that it was decided to use the coordinates of these

two points as the base line for all new surface and underground surveys. The surface surveys were tied into this 6th Level by two wires, one being in No. 1 Shaft and the other in No. 3 shaft. The 6th Level survey was later extended to No. 1 shaft. The 6th Level was completely re-surveyed and extensions were run up to the sub-levels as they were opened up.

SPIES-VIRGIL MINE

The drilling campaign along the East line of Section 24, 43-35 necessitated a long survey from the West line of the Section because none of the former survey stations could be found. Two concreted iron pins were set along the East line. Elevations were run from the Bates Mine bench mark to these stations.

The engineer assisted in the construction of brattices on account of the fire on the 6th Level. He also made frequent ventilation studies for local conditions due to the fire situation. Plans were prepared for the Sherwood connection.

TILDEN MINE

The drilling and blasting of the cuts in the East and West pits were planned and supervised by the engineer. The drill holes were carefully located with respect to the face of ore to be blasted. Plans and estimates were made for stripping at both the East and West pits and this work was supervised. Lines and grades were given for a new inclined roadway to the Upper Bench in the East Pit but this was not completed before stripping operations stopped for the winter.

J. MISCELLANEOUS

SHAFT GAUGING

The following table shows the dates when the skip and cage runners in the shafts at the operating mines were gauged:

Mine		Date	
Athens		May 3rd.	December 13th.
Cliffs-Shaft		April 19th.	November 7th.
Lloyd Mine		April 12th.	November 22nd.
Maas		April 8th.	November 1st.
Mather	— Temporary cage to 226th set.		June 9th.
"	N. skip to 99th set		August 13th.
	S. skip to 320th set		December 28th.
Negaunee		May 10th	November 8th.
Princeton #3		March 25th.	
Spies-Virgil			November 14th.

STOCKPILES

The ore in stock at the various mines was estimated and recorded as of November 1st. The following table is a comparison of the ore in stock of different Michigan Mines as of November 1st, 1941 and 1942:

Mine	November 1, 1941	November 1, 1942	Difference
Athens	23,264	1,658	-21,606
Cliffs-Shaft	53,548	90,298	+36,750
Lloyd	195,018	168,907	-26,111
Maas	88,657	14,026	-74,631
Negaunee	22,979	12,496	-10,483
Princeton	120,799	42,669	-78,130
Stephenson	7,597	---	- 7,597
Spies-Virgil	87,916	66,988	-20,928
TOTAL	599,778	397,042	-202,736

In October the ore in stock at the Commonwealth Mine, Florence, Wisconsin, was estimated for the Cleveland office. There were about 22,000 tons of ore in stock. Samples were taken but the grade was found to be below expectations.

During May, Messrs. Trosvig and Hill estimated the ore in stock at the Otis Steel Company plant in Cleveland. This report was made direct to the Cleveland office.

TAXES

The delinquent tax lists for the annual sale in May were checked and recommendations made for protection of Company property. The tax list for 1942 covering the Mining Department and Cliffs Power and Light Company lands was prepared in the fall.

TRIANGULATION

The triangulation surveys were completed to Negaunee and to connect with the Oliver Iron Mining Company's triangulation surveys on Section 16, 47-27. Final calculations for this work will be finished early next year.

EXPLORATIONS

The surface exploration on Company lands required the placing of holes decided upon by the Geological Department. The following drill holes were located and surveyed:

Holes 33 and 34 in Section 3, 47-27
Holes 10 to 17, inclusive, in Section 5, 47-27
Holes 56 and 57 in Section 9, 47-27
Holes 7, 8 and 9 in Section 11, 47-27
Holes 61, 61A, 61D, and 62 in Section 24, 43-35

ISHPEMING QUARRY

A churn drill hole from the Tilden Mine was taken to the Ishpeming Quarry and several holes were drilled and blasted. Mr. Westwater supervised the drilling and blast.

UNDERGROUND WATER

The elevation of the water at the various test holes in the Maas-Negaunee Mines were measured monthly during the year. The following table shows the water elevation beginning at the end of the year and the difference:

Test Hole	Elevation of Water Jan. 1, 1942	Jan. 1, 1943	Difference
W1	1239.8	1242.6	+2.8
W2	1235.6	1237.0	+1.4
W5	1242.7	1246.0	+3.3
W9	1267.1	1266.6	-0.5
W13	1321.2	1313.3	-7.9
W14	1296.6	1295.3	-1.3
W15	1310.1	1308.1	-2.0
W16	1275.6	1278.6	+3.0
W18	1242.4	1242.9	-0.5
W20	1249.8	1251.1	+1.3
W21	1229.0	1231.6	+2.6
CA	1177.2	1177.9	+0.7
7	1183.0	1183.8	+0.8

Maas Well No. 2 pumped 350 gallons steady throughout the year. No. 2 well operated until December 24th pumping about 550 gallons. Maas No. 3 Well pumped about 50 gallons a month to April 11th when the pump was removed and not replaced. No. 4 Well pumped during the year except during April 18th and June 28th pumping between 125 and 150 gallons.

There was not as much variation in the water levels in 1942 as in preceding years but it is interesting to note that test hole W13 which is the farthest West and furthest away from any well, dropped nearly eight feet. This can be compared to a drop of 11.2 feet in 1941 and 10.6 feet in 1940. This shows a total drop of 29.7 feet in three years. Negaunee No. 1 Well pumped an average of 250 gallons throughout the year. The following tables show the average monthly gallons per minute flowing to the pump on the various levels of the Maas-Negaunee Mines, in December 1941 as compared with 1942:

Maas Mine	December 1941	December 1942	Difference
1st Level	55	98	+43
2nd Level	13	13	--
3rd Level	310	264	-46
4th Level	296	346	+50
5th Level	192	247	+55
TOTAL	866	968	+102
Negaunee Mine			
9th Level	324	353	+29
10th Level	113	120	+ 7
11th Level	17	20	+ 3
12th Level	79	40	- 39
13th Level	13	13	--
14th Level	--	--	--
	546	546	0

The water in the Negaunee Mine has remained very constant but seems to have increased in the Maas Mine in spite of surface pumping.

The test holes for the ground water at the Athens Mine have been previously mentioned under comments on the Athens Mine.

OFFICE HOURS

The office hours during the year were from 8:30 to 12:00 A.M. and 1:15 to 5:00 P.M., except Saturday when the office closed at 12 noon.

HOLIDAYS

The following holidays were granted during the year:

January 1st	New Years Day
July 4th	Independence Day (½ day)
November 29th	Thanksgiving Day
December 24th	Christmas Eve (½ day)
December 25th	Christmas Day
December 26th	(½day)
December 31st	New Years Eve (½ day)

Carl Brewer

Chief Mining Engineer

CB:ELC

2-8-43

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1942

CLIFFS SHAFT MINE:

Gusset plates connecting the "B" shaft trestle to the crusher building failed on January 24th. Repairs were made and a temporary wood bent erected in the center of the first span to carry the load. Structural steel reinforcing for "A" and "B" shaft trestles was purchased on Contract 1709 in accordance with Worden-Allen Company design drawings Est. 219-42, sheets S-1 and S-2. The legs are built of 3½x3½x5/16" angles with Queen trusses between the bents attached to and under the old truss members. Erection of this steel was started on August 4th and completed in October.

On March 29th a rebabbitted eccentric was installed in the No. 8 McCully crusher. The old eccentric has been rebabbitted and will be kept as a spare. A new mantle was installed in this crusher on August 9th to replace one that was loose and completely worn out.

A new brake shaft bearing was installed on the "A" shaft hoist on March 22nd to replace one that was broken.

New pans were installed on the picking belt on April 28th which had been rebuilt at the General Shops. On December 2nd this belt was completely rebuilt and new pans with attachments, rollers, links, sprockets and drive shaft were replaced.

In April a new 8 ft. head sheave was installed in "B" shaft headframe for the counterweight rope. The steel liners in this sheave were loose and liner bolts could not be kept tight. The old sheave was taken to the Lake Shore Engineering Company shops at Marquette, refitted for heavier liners and the hub bored for a larger shaft. The shaft in the 12 ft. skip sheave at "B" shaft became loose in the hub. A new shaft was fitted and installed on May 3rd.

The intercooler and front head gasket on the high pressure cylinder of the #2 compressor were in poor condition. A new gasket and rebuilt intercooler were installed on April 7th.

A new automatic condensation pump was installed in the change house heating plant to return the water from the heating system in the change house, engine house and "B" shaft house direct to the boiler.

A new electric driven fuel oil pump was installed to unload tank cars and pump oil up to the drill bit shop. It replaces a Cameron air pump which was in poor condition.

The revolving screen was blanked off on May 10th to let the full product through without screening.

The wood framework supporting the deflecting sheave on "B" shaft skip rope was replaced with a new wood structure on July 12th.

The 600 GPM 1000' head Prescott centrifugal pump ont the 15th level was in such poor condition it had to be scrapped. An order has been placed for new pump with the Crane Engineering Sales for 1 Figure 3360 4" 4-stage 3550 RPM heavy pattern ball bearing multistage centrifugal pump with a capacity of 600 GPM and 1000' head. Delivery is promised about February 9, 1943.

The structural steel for the stocking trestle was received in July, erection was started at once and completed in September. Several changes were made to the chute and chute operating equipment and a lot of wood framework was replaced with steel.

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CLIFFS SHAFT MINE: (Cont'd.)

A motor bearing on the #1 Prescott pump on the 15th. level burned out on November 28th, caused by broken oil rings. A spare bearing was installed and the pump was put into operation with no delay to mine operations.

A new double deck cage was installed in "A" shaft on December 13th. to replace the cage that was put in service in November 1934.

MATHER MINE:

The cage hoist installation was completed in January. The electrical engineers completed the installation and adjustment of the electrical equipment and control and the hoist was placed in operation on February 16th. to continue the shaft sinking.

In March a brake arm rod broke on the cage hoist. Inspection showed that this rod was welded. All brake rods on the skip and cage hoists were replaced with new solid end rods. After the installation of new rods the brakes were tested and found in good condition.

The installation of the skip hoist was started in January and completed in August. Mr. Stromberg of the Nordberg Mfg. Co. and Mr. Schill of the Farrell-Birmingham Co. made a joint inspection of gears on both cage and skip hoists in May. They would not approve installation until new babbitt shells were placed in pinion shaft bearings. New shells were later placed in the bearings by the Nordberg Company.

Some trouble was experienced with the Amplidyne control on the cage hoist in May. The factory expert found it was due to a coil in the Lilly hoist controller. This was corrected and no further trouble is anticipated.

The four 12 foot angle sheaves were completed in the fall and are now ready for operation.

The #1 2750 cubic foot Ingersoll-Rand air compressor was given a trial run on February 13th. and put in continuous operation on February 18th. The motor is 500 H.P. at 180 R.P.M.

The skip hoist flywheel set was received in March, installation was started at once and completed in April. Water and oil piping was completed about June 1st.

The #2 2750 cubic foot Ingersoll-Rand air compressor was received on April 11th. Installation was started in May and the machine was put in operation on August 31st.

The cage rope was changed to the top of the new steel headframe on May 24th. and the temporary wood headframe was dismantled.

A new Model 10-B Bucyrus-Erie gasoline crane was received on June 26th. This machine is used for unloading material from cars, excavating for timber tunnel and general crane service.

In the headframe the skip dumps, air cylinders for operating chutes and grizzleys are about completed.

The Otis elevator was put in operation in August. On account of a ventilating fan pipe obstructing the elevator shaft it was used only from the landing to the top of headframe until September 13th, when changes were made so that it can be operated from all stations. In December the electrical equipment for this elevator gave some trouble due to excessive moisture in shaft house. The switchboard is being enclosed and equipped with space heaters to keep the contacts dry.

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MATHER MINE: (Cont'd.)

The double deck aluminum cage is almost completed at the General Shops.

Two new Jumbo drill trucks were completed to be used for drifting. Each truck is arranged to mount four rock drills and equipment.

Two deflecting chutes were completed at the General Shops for the landing.

On November 18th. 10 - 90 cubic foot Granby type mine cars and two car dumpers were received from the C. S. Card Iron Works.

An 8" jointer for carpenter shop equipment was received from the W.P. & R. S. Mars Co.

The three 200 cubic foot skips were received at the mine on December 21st. They were made by the National Iron Works of Duluth. No large roller bearings could be secured for shaft on which the skip box swings so they were replaced with brass bushings for the duration of the war.

TILDEN MINE:

On March 28th. loading was started from the stockpile. Loading direct from pits commenced in May and continued to October 30th.

The two 15-yard supercharged engine Euclid trucks were received at the mine, one on May 1st. and the second on May 15th. They were put in operation on May 19th. hauling from the lower bench in the west pit. The operation of these trucks has been very satisfactory.

The eccentric on the east 10" McCully crusher burned out on June 16th and was replaced with a spare. It has been rebabbitted and will be kept as a spare. On July 11th the concaves in the west 10" crusher were turned. On July 12th new concaves were installed in the east crusher. In November in making the usual winter inspection two cracks were discovered in the main frame of the east 10" crusher. As this has only been in operation for two years a complaint was entered with the Allis-Chalmers Mfg. Co. and an order placed for a new cast steel frame.

The new 120-B Bucyrus-Erie electric shovel was received at the mine on January 6th without dipper or sticks. The shovel was unloaded and set on the caterpillars. On July 17th the dipper and sticks were received and this shovel was put in operation on the lower bench in the west pit on July 27th. Its operation has been very good and far superior to the 80-B, with more power and a longer and higher reach. This shovel and the Euclid trucks were used to do some stripping this fall in the west pit, replacing the 12-yard side dump cars mounted on flat cars, and L. S. & I. R.R. Co. locomotive. The yardage per day increased from 500 to 1000 after this change.

ATHENS MINE:

A bearing on the skip hoist indicator became so badly worn it was necessary to rebore and bush it in January.

A skip sheave axle broke on the headframe on April 24th. It was replaced with a new sheave taken from stock. All old sheave hubs will be bored for 6-7/8" shafting to replace the 6" shafting formerly used in these sheaves.

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ATHENS MINE: (Cont'd.)

On May 25th. an axle broke on the battery locomotive used on surface for timber haulage. A new axle was made at the General Shops and the locomotive put in operation on May 26th.

The end spiders in the drum on the skip hoist were found to be loose on the shaft. Welding the spiders to the shaft was tried but did not hold. In July two new spiders were ordered with split hubs. The new spiders were received on November 4th. Installation was started on December 31st and completed January 3rd.

The motor on the Ilgner set operating the ore hoist burned out on account of age and deterioration during its 25 years of service. This was removed and sent to the service shop of the General Electric Co. in Milwaukee. Repairs were completed and the apparatus returned to service with one week's delay.

The air receiver was tested on August 30th at 145 pounds, operation being at 90 pounds. A few tubes were leaking slightly, repair were made and the receiver is now in good condition.

Two bilge pumps for all change house water with a capacity of 75 GPM against a 50 ft. head were installed on December 15th in a concrete sump already built to receive them. This diverts the flow from the south to the east and was necessary due to caving ground.

A new semi-steel water body for Prescott pump #139 has been ordered to replace a cylinder that is in poor condition.

MAAS MINE:

The foundation under the high pressure cylinder of the #2 Ingersoll-Rand air compressor was in very poor condition caused by oil in the concrete. The poor concrete was cut out and the cylinder reset on July 4th.

The intercooler tube assembly on the #1 compressor was changed on November 15th on account of leaking tubes. It was replaced with a spare kept on hand for all of this type compressors at the several mines.

On March 23rd the north skip rope broke causing considerable damage in the shaft and delay to mining operations. This accident was covered by a report from the Superintendent.

Considerable repairs were made to the pan conveyor at the crushing plant. The pans were straightened and repaired and a complete set of new links and pins were installed.

The pinion on the #7½ McCully crusher was loose on the shaft. The shaft was built up by electric welding and refitted to pinion on August 13th.

New steel liners were placed in the south skip head sheave in April.

The 200 H.P. Wellman-Seaver-Morgan hoist formerly used at the Mackinaw Mine was moved to the Maas Mine 5th level and used as a transfer hoist for a new level.

The bearings in the 5th level Aldrich pump were rebabbitted on July 14th.

A new flexible coupling was installed on the 5th level Prescott pump to replace the old coupling that was in very poor condition.

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MAAS MINE: (Cont'd.)

On July 15th a bad crack was discovered in the main frame crankshaft bearing on the 3rd level Prescott pump. Temporary repairs were made. On July 23rd a main frame from pump formerly used at the Stephenson Mine was used to replace the cracked frame. Repairs were completed on July 26th.

The air receiver at this mine was tested at 145 pounds and it was in good condition. Operating pressure is at 90 pounds.

The heating boiler was cleaned on September 20th and put in good condition. A new set of flue blowers was installed.

NEGAUNEE MINE:

At the #2 air shaft a stoker was installed in the heating boiler in January. The ventilating fan, unit heaters and boiler were given a trial run on February 28th. After making some minor adjustments the plant was put in operation on March 4th. A bearing on this fan burned out on August 22nd, destroying the fan blades. The fan was shipped to the factory for repairs. Bearing thermostats were ordered and placed on the fan which will stop the motor if they become overheated. This fan was again placed in operation in October. In December three of the unit heaters froze and broke and two of them were repaired. The breaker on the stoker circuit kicked out but the fans on the heaters continued to operate, forcing cold air through the heaters and freezing them. This was corrected by installing a low pressure breaker to stop the heater fan when the steam pressure gets too low.

On March 7th a brake lever on the cage hoist cracked. Temporary repairs were made and a new lever installed on March 15th. The motor pinion on the cage hoist became loose on the shaft and was repaired by electric welding to the shaft on May 17th.

Aldrich pump #3807, 200 GPM, 1000 ft. head, inventory #C-2-138-125, which was formerly used at the Mackinaw Mine, was rebuilt and changed to 7"x12", 400 GPM, 500 ft. head. It was installed on the 14th level and put in operation on July 4th.

In July an 8' sheave axle broke. A spare sheave taken from the General Storehouse was used to replace it. The present sheaves are all fitted with 6" axles. They are being changed to 6-7/8" in hub and 6" in the bearings to eliminate further breakage.

The air receiver was tested on August 28th at 145 pounds. A slight leak in one of the seams was caulked. The operating pressure is 90 pounds.

A short delay occured on the skip hoist in October. A shim in the keyway on the drum spider became loose and cut a groove through the oil well on the drum shaft bearing. By operating with the oil level a little lower in the well the trouble was corrected.

LLOYD MINE:

A repair shed was added to the blacksmith shop in September to weld broken auger steel.

A Westinghouse Type HPF high power factor A.C., 220/440 volt, single phase, 60 cycle, 300 ampere electric welder was ordered November 23rd. This machine was received at the mine on January 4th.

New bearings were installed in the skip hoist motor in October to replace bearings that were badly worn.

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PRINCETON MINE:

The foundation for the hoist at #3 shaft was completed in February. The old Stephenson Mine skip hoist was installed in the Central Power Plant to be used in #3 shaft for handling men and timber.

A stoker was installed in the heating boiler in the change house in January. Sufficient second hand steel lockers were secured from the Yale Mine at Bessemer to equip the change house. This change house was formerly used as a boiler room for the Princeton Central Power Plant.

A new stoker was installed in the General Office on February 5th.

The compressor foundation was completed in February and the Nordberg compressor formerly used at the Mackinaw was installed and put in operation on April 22nd.

A steel headframe was dismantled at the Gardner shaft, moved and erected at #2 shaft. Steel sheeting was taken from the Mackinaw headframe and used to enclose this headframe at Princeton #2.

Pumping was completed at #3 shaft in March.

The Aldrich pump on the 7th level was removed and sold for scrap as it was in very poor condition. Aldrich pump #3808, 8"x16", 1000 GPM, 1000' head, formerly used at the Mackinaw Mine and stored in the Hard Ore yard, was erected on the 7th level at #2 shaft to replace the pump that was scrapped. The motor on the 5th level centrifugal pump burned out on May 15th. A pump was moved from the Tilden Mine and put in operation on May 16th. The north skip was placed in the shaft on May 31st.

A new connecting rod for the Nordberg compressor was ordered in June and received on November 5th. The remaining water was pumped out of the drift to #1 shaft on July 6th.

The tram plant at #2 shaft was moved to a new location. A plant formerly used at the Mackinaw Mine was installed for the second car. The old plant was put in operation on October 26th and the other plant about November 1st.

A heating boiler for #2 was installed in the old change house with a second hand stoker. This plant was put in operation in November. The boiler was taken from the Mather Mine temporary buildings.

SPIES-VIRGIL MINE:

In January the intake and discharge valve of the Ingersoll-Rand compressor were taken out and the carbon removed. Some trouble was experienced with this compressor overheating in July. The water jackets in cylinders and cylinder heads were cleaned and the governor repaired. No further trouble is expected.

The heating plant boiler was cleaned in January. In May the old heating boiler was in very poor condition, it was scrapped and a boiler from the Mesaba Range was installed. The stoker formerly used on the old boiler was installed in June.

The Larry car on landing was overhauled in January.

The steam shovel was moved close to the shaft in February and used to thaw ice in the shaft. Some repairs were made to the #30 and #15 shovels in March to prepare them for summer operation.

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SPIES-VIRGIL MINE: (Cont'd.)

The compressor water circulating pump was overhauled in March. The haulage generator burned out in May,it was shipped to Milwaukee for repair and put back in operation in September.

In December considerable trouble was experienced underground due to a sulphur fire. A rush job was made of securing a 42" diameter Aerodyne fan from the Jeffrey Mfg. Co. and installing it at the Virgil shaft. This fan has a capacity of 35,000 CFM against 2½" water gauge and is driven by a 25 HP motor. It will be used later at the Lloyd Mine.

GENERAL SHOPS:

Steam shovels #6, 10, 11, 26 and 27 are at the shops, #7 at Negaunee, #42 at Athens and #44 at Cliffs Shaft for regular repairs. Information was secured on cost of loading stockpile ore with steam shovels and tabulates as follows.

C.C.I.CO. SHOVEL NO.	SHOVEL TYPE	REPAIRS TO SHOVELS 1940	1941	TONS LOADED-1942 STOCKPILE
6	70	$ 224.47	$ 75.57	98,240
7	70	1273.52	731.23	196 246
10	70-C	638.20	1243.58	154 659
11	60	1129.21	375.20	52 584
15	70-C	1222.77		64 728
16	70-C	319.90	720.04	138 742
42	85-C	2223.89	967.32	219 122
43	70-C	931.09	2952.50	152 477
44	95	546.33	764.07	163 543
45	88-C	1453.17	2810.68	243 218
27	88-C		4888.43	71 114
Princeton				
3	60			29 009
8	70-C			76 223
Spies-Virgil				
15	70-C			
30	60			67 270

Tons loaded per shift average 70 cars @ 50 ton - 3,500 tons

Labor: Runner 8.72, Craner 7.04, Fireman 6.24, 5 Pitmen 28.00 Total $50.00 per shift.

Coal - 2 ton @ $10.00 20.00

Repairs - Average per season $ 1,000

Maximum days operated by any shovel 60

Cost per year for repairs and operation 1,000 plus 4,200 - $ 5,200.00

Cost of 85-B electric shovel $50,000

Depreciation at 5% and interest at 5% per year or 10% - $5,000, which shows no saving by substituting electric for steam machines for this work.

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GENERAL SHOPS:

The addition to the electrical shop, to be used for cleaning equipment that comes in for repairs, will be completed in a short time. The concrete floor will be added next spring.

Due to a break in the 84" diameter steel pipe near the McClure power plant on December 20th most of the welding and blacksmith crew were out of the shops for two weeks. The repair was completed January 6th and the plant put on full load.

Rental on the compressor and hoist which had been loaned to the Rope's Gold Mine was stopped on November 1st. This was necessitated by the Federal governments regulation prohibiting all gold mine operation. This equipment will be removed next spring, at which time the hoist will be stored at the Lake Mine and the compressor transferred to the Princeton Mine.

HILL-TRUMBULL MINE:

At the Washing Plant the two Akins classifiers operated in 1941 gave such good results that the structural steel was changed and two more duplicate machines were installed before the plant started operating April 13th. The plant stopped washing on November 6th after shutting down one interval of four days due to freezing weather. Concentrate production for the year was 1,129,967 tons.

The 42" x 40" jaw crusher and the 5' pan conveyor were moved from the washing plant to the pit but the 8' pan conveyor was left to feed the 36" belt from the railroad receiving pocket. This 8' pan conveyor will be shortened this winter from 60' to 21' centers and the 36" belt conveyor extended under pan conveyor to reduce maintenance in the future.

The 5' x 14' double deck Robbins vibrating screen that has given trouble in the past due to breakage of cross springs was revamped. With the new improvement on spring suspension this should give no further trouble as it was tried out at the Holman Mine last season and found very satisfactory.

To the south east from the washing plant just across the railroad track a 150 TPH retreatment plant was erected. This plant is of structural steel supplied by the Worden-Allen Co. and operates on the sink and float principal using ferro-silicon as medium to build up the gravity. It contains the following machines:

1. 1 – 24" Inclined belt conveyor on 200' centers driven by a 20 HP motor
2. 1 Concrete pocket and feeder for crude ore to above 24" belt driven by 5 HP motor
3. 1 Magnetic head pulley on above 24" belt
4. 1 Riffleflo 5'x14' scalping and sizing screen driven by 10 HP motor
5. 1 6"x6" Cone and auxiliaries driven by 5 HP motor through V-belts
6. 2 – 3'x8' Flat deck Allis-Chalmers screens, each driven by 5 HP motor through V-belts
7. 2 – 3'x16' Flat deck " " " " " " 7½ " " through V-belts
8. 1 – 6" Wilfley "C" pump driven by 50 HP motor through V-belt
9. 1 – 4" " " " " " 15 " " " "
10. 1 – Set magnetizing blocks
11. 1 – 16' Diameter primary thickener tank driven by 3 HP motor through V-belt
12. 1 – 2" Wilfley pump driven by 10 HP motor through V-belt
13. 1 – Primary magnetic separator (36" Crockett Type K) with 5 HP motor
14. 1 – Secondary " " (12" ") " 2 " "

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HILL-TRUMBULL MINE:

15. 1 - Solenoid launder control
16. 1 - 2" Wilfley pump driven by 10 HP motor through V-belt
17. 1 - Medium densifier (30" Akins classifier) driven by 5 HP motor through V-belt
18. 1 - Demagnetizing coil
19. 1 - 30' Secondary thickener driven by 10 HP gear motor and chain drive
20. 1 - 2" Wilfley pump driven by 10 HP motor through V-belt
21. 1 - 4" Centrifugal pump driven by 15 HP motor
22. 1 - 4" Wilfley pump driven by 5 HP motor through V-belt
23. 1 - Primary classifier (66" Akins) driven by 15 HP motor through V-belt
24. 1 - Tailings disposal line (400' - 8" diameter line)
25. 1 - Secondary classifier (48" Akins) driven by 10 HP motor through V-belt
26. 2 - 4'x8' Hummer screens, Type 400
27. 1 - 6" Wilfley pump driven by 25 HP motor through V-belt
28. 1 - 2" " " " " 10 " " " "
29. 3 - Weightometers (Fairbanks Morse Co.)
30. 1 - Tailings conveyor, 24" wide on 100' centers, driven by 10 HP motor
31. 1 - " bin arranged for truck haul disposal
32. 1 - Concentrate conveyor, 24" wide on 130' centers, driven by 10 HP motor
33. 1 - " bin over railroad track
34. 1 - Compressor, 150 CFM, driven by 30 HP motor
35. 2 - Air receivers, 1 - 4' dia. x 10' long, 1 - 6' dia. x 20' long
36. 1 - Water supply pump, 2000 GPM on 200' head, driven by 125 HP motor

Sufficient room was left to add later if necessary:
1 - Symons 3' short head crusher
1 - 5'x6' Ball mill
1 - Elevator for crusher material

Due to slow delivery of material and equipment the plant was not ready to test until October 9th. It was operated off and on until October 23rd, treating 5,135 tons. Several changes were found necessary which will be completed before next ore season.

In the pit the belt conveyor tunnel was driven from both ends through the south bank and holed through during the month of March. The foundations for belt conveyor as well as crushing and screening plant and receiving bin were completed by May 9th, and erection of steel and machinery was completed as rapidly as received. Delivery of material was so slow the conveyor equipment could not be completed until July 15th. Even then it was necessary to shorten the horizontal belt about 45 feet to miss some rock that had to be excavated to allow room for crushing and screening plant. The whole system needed very little adjustment to get operating on regular schedule. The list of equipment is as follows.

In the crushing and screening plant:
1. Steel work supplied by Worden-Allen Co.
2. 2 Ross feeders, Size No. 8, each driven through gears by 15 HP motor
3. 1 - 5'x12' Style C single deck scalping screen driven by 20 HP motor
4. 1 - 5' pan conveyor secured from washing plant driven by 10 HP motor
5. 1 - 42"x40" jaw crusher " " " " " 100 " "
6. 1 - 36" belt conveyor on 34' centers driven by 10 HP motor
7. 1 - 4' wide x 10' long Link-Belt pan feeder driven by 10 HP motor

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HILL-TRUMBULL MINE:

The 36" belt conveyor system consisted of three sections. No. 1 section was almost horizontal and 568'-8" between centers, driven by a 40 HP motor. Section No. 2 inclines about 13° from the horizontal and is 415'-9" between centers. Section No. 3 also inclines at 13° and is 414'-6" between centers. The last two sections are each driven by a 100 HP motor. The original layout called for a horizontal belt 45 feet longer between centers but due to more rock to be moved than expected at the crushing and screening plant the plant was shifted 45 feet further south and the rock left in place. This change made a long ramp on trestle timbers necessary for the 15 ton trucks to back to receiving pocket and slows up operations.

The Worden-Allen Co. supplied the structural steel for conveyor belt equipment as well as receiving pocket. Due to scarcity of steel workers a contract was let to a Duluth company to erect the conveyor belt and receiving pocket steel.

At the shops repairs were completed on Locomotives #104, 105 and 106 and these machines were returned to the Holman-Cliffs Mine in April.

In January due to short stripping program five Euclid trucks were sent to the Holman-Cliffs Mine to help out there. During this month repairs started on shovels #35 and 47. By March these were completed and No. 47 shovel moved to washing plant to load out stockpile there. In April the ore season started on 3 shifts per day and 5 days per week, using the two 4 yard shovels No. 34 and 35.

During the fall when the stripping program started it was necessary to move the transmission line at the pit entrance, as well as the coal dock and deep well pump. A contract was made with the Layne Northwest Co. to drill a new hole south of the present stripping area, repair the old deep well pump and reerect it in the new hole ready for operation. This should be completed before next year's shipping season starts.

The old locomotives No. 2, 17, 19 and 128 were sold to Hyman-Michaels Co. and are being moved as fast as they can be sufficiently repaired and equipped so the main railroad lines will accept them for shipment.

A second hand 3/4 yard gas driven shovel was purchased in June as it was impossible to buy a truck mounted crane. This machine was needed for various jobs around the pit and washing plant.

Three new Model FD 10 yard rear dump Euclid Trak-Trucks, powered with 150 HP, Model 6HB, Cummins diesel engines were purchased and delivered during the fall. This raises the total to 10 in operation at this mine.

HOLMAN-CLIFFS MINE:

In the pit the 7000 GPM pump was removed and after checking its condition and that of a duplicate pump they were rented to the Oliver Iron Mining Co. to pump out the Mountain Iron pit. They were used by the O.I.M.Co. from May 27th for the remainder of the year at $350.00 per month.

The heavy stripping program, with two shovels and 12 trucks, continued through January, February and to March 21st, when equipment repairing started. It was necessary to repair three 8-hour shifts per day to complete all machines ready to start ore operations by April 14th. To improve a wet condition in the pit bottom a new sump was dug during the summer and equipped with a barrel raft supporting a 2000 GPM, 200 ft. head pump.

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HOLMAN-CLIFFS MINE:

At the washing plant some changes were made in crusher and screening building. As drilling proved there were no large ore chunks to be crushed the 5-foot pan conveyor and 42"x40" jaw crusher were peplaced with a rock pocket. The old stationary grizzly was replaced with a 5'x12' Type C scalping vibrating screen driven by a 20 HP motor. This change eliminated two men formerly needed to keep clear the old grizzly bars and the price of the new screen will be saved in two years operation. Ore washing started April 14th and was completed November 6th, totaling 1,103,432 tons concentrates. Due to freezing weather it was necessary to shut down four days during the fall but on the return of mild weather the plant was started again.

By revamping the Robbins 5'x14' double deck screen which kept breaking cross springs and delaying plant operation the machine gave satisfaction for the season and no further trouble is anticipated.

Five new Model FD 10 yard rear dump Euclid Trak-Trucks, powered with 150 HP Cummins diesel engine Model 6 HB, were purchased and delivered during the year. This raises the total to 13 at this mine.

Only minor delays were encountered due to equipment breakdowns. In January the Marion shovel No. 51 broke a set of dipper sticks that were rebuilt. In September the dipper on the same shovel broke, causing a 3 hour delay for repairs. In September a short circuit in one of the short transmission cables caused a 2½ hour delay.

At the shops after shipping season Locomotives No. 104 and 6 needed new flue sheets due to the heavy grades from pit to washing plant. Due to government restrictions these sheets are hard to get. Plans are under way to purchase an electric haulage system for the Hill-Trumbull Mine, transfer Locomotives 101, 2 and 3, which are in good condition, to the Holman-Cliffs Mine and sell Locomotives 104, 5 and 6.

CANISTEO MINE:

Due to a heavy stripping program the two 85-B shovels and nine trucks were busy during January and February on the south bank of pit. On March 1st repairs started on this equipment, working three 8-hour shifts per day and were completed by the latter part of April. The washing plant started May 4th and completed the seasons operation on September 15th, producing 800,576 tons of concentrates. Stripping started again September 16th and continued for the rest of the year. The shovels gave some trouble: An exciter armature burned out on one in July and a caterpillar tread main frame broke and had to be welded in December. In August a tumbler shaft broke on shovel #49 and in November a boom intermediate shaft let go and had to be replaced, causing a 12-hour delay.

At the washing plant some improvements were made. The four 66" Akins classifiers were set directly below the 25 ft. logs by changing some structural steel. This shortened the chute system and allowed the classifiers to discharge directly into shipping bin. Some coils burned out on one 40 HP motor driving 25 ft. log in August but caused only a short delay. An accident to the top flight 36" conveyor belt, due to a 5 ft. crow bar catching in vibrating screen and ripping a section out of top cover rubber, made it necessary to return the belt to the factory for repairs. By adding a shelf at discharge point on one conveyor similar accidents can be eliminated in the future.

In November the tailings pond was built up with paint rock hauled from pit with the Euclid trucks. It should last several seasons before additional rock is needed.

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CANISTEO MINE:

At the crushing and screening plant in pit the 42"x40" jaw crusher and 5 ft. pan conveyor were replaced with a rock pocket and a 5'x12' single deck Type C Allis-Chalmers scalping screen, driven by 20 HP motor, was installed to replace the old stationary grizzly bars. This screen eliminates the services of two men and will pay for itself in two years.

A new tailings pump house was built in the spring and in it were installed one old 12" Hydroseal pump, one new one and both driven by V-belts and motors of 200 HP and 325 HP. The tank feeding the pump suctions was enlarged and a concrete floor added, making the installation as neat and efficient as the rest of the plant.

Due to enlargement of tailings basin it was necessary to shift the high tension line, of the Minnesota Power & Light Co. This was completed in March.

Three new Model FD 10 yard rear dump Euclid Trak-Trucks, power with 150 HP Cummins diesel engines Model 6HB were purchased and received in the fall. This raises the total to 10 machines at this mine. From experience it was found that due to the easy grades in pit it was more economical to purchase Trac-Trucks without super-chargers. The 150 H.P. plain engine has ample power and the transmission and tires require less maintenance than with the 200 HP supercharged engines. The three trucks rented from Holman Mine were returned in March.

A new Kerrick Kleaner was installed in the shops in April. This unit cleans the dirt and grease from truck engines and transmissions and pays for itself in one seasons operation.

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COMPARATIVE TABLES

YEAR	TONS ORE AND ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED	G.P.M.
CLIFFS SHAFT MINE:					
1933	61,623	160,033,500	2,596	362,896,379	
1934	235 639	394 168 500	1 672	348 670 324	
1935	288 053	516 140 000	1 791	366 504 523	692
1936	484 310	907 194 600	1 873	389 395 743	739
1937	579 759	1,102,635,000	1 901	370 765 799	705
1938	352 983	735 452 000	2 083	362 700 824	689
1939	415 682	790 875 000	1 902	363 540 036	693
1940	573 487	1 053 990 000	1 837	362 590 686	686
1941	677 249	1 218 780 000	1 799	343 850 964	655
1942	733 970	1 223 325 000	1 666	339 185 356	643
ATHENS MINE:					
1933	49,506	152,235,000	3,075	194,073,179	
1934	166 412	334 485 000	2 009	179 244 454	
1935	205 683	527 355 000	2 561	154 911 562	292
1936	318 604	698 985 700	2 193	134 999 491	255
1937	455 512	884 565 000	1 941	134 521 343	257
1938	276 800	643 005 000	2 322	165 316 266	313
1939	416 225	819 405 000	1 968	173 774 003	331
1940	526 456	1,196,505,000	2 272	185 418 833	351
1941	638 178	1 350 945 000	2 116	185 835 174	354
1942	699 590	1 351 440 000	1 931	204 553 558	387
MAAS MINE:					
1933	143,845	367,560,000	2,555	554,157,402	
1934	294 372	601 920 000	2 044	550 020 020	
1935	370 399	686 520 000	1 853	597 349 626	1,129
1936	549 615	897 919 800	1 634	674 397 310	1 279
1937	784 328	1,251,710,000	1 595	686 467 622	1 307
1938	438 359	742 635 000	1 694	752 268 448	1 429
1939	528 389	1 005 165 000	1 902	726 916 014	1 386
1940	709 755	1 288 665 000	1 815	710 849 782	1 346
1941	849 963	1 646 145 000	1 936	595 239 587	1 135
1942	894 045	1 703 655 000	1 905	553 194 582	1 049
NEGAUNEE MINE:					
1933	65,661	166,050,000	2,528	448,928,213	
1934	240 808	437 985 000	1 818	435 724 897	
1935	311 446	481 680 000	1 546	485 600 207	918
1936	530 844	737 716 000	1 389	483 287 423	916
1937	839 283	1,096,200,000	1 306	562 290 718	976
1938	439 588	771 210 000	1 754	534 118 975	1,015
1939	577 510	1 026 945 000	1 778	532 642 228	1 015
1940	890 598	1 296 675 000	1 455	377 169 929	714
1941	1,077,854	1 500 165 000	1 391	338 385 511	644
1942	1 128 737	1 432 260 000	1 268	345 945 101	656

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1942

COMPARATIVE TABLES

YEAR	TONS ORE AND ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED	G.P.M.
LLOYD MINE:					
1933	4,554				
1934	136 951	145,926,000	1,065		
1935	248 410	289 426 500	1 165		
1936	377 572	383 994 000	1 017		
1937	545 274	559 512 000	999		
1938	286 864	293 247 000	1 022		
1939	323 639	273 042 000	843		
1940	487 287	398 308 500	839		
1941	572 778	534 456 000	933	40,031,200 (10 Mo.)	91
1942	588 749	588 451 000	999	39 486 100	74
TILDEN MINE:					
1933	94,194				
1934	167 688				
1935	190 511				
1936	291 341				
1937	305 418				
1938	85 889				
1939	170 276				
1940	205 612				
1941	302 943				
1942	235 207				
PRINCETON MINE:					
1942	83,918	(This mine re-opened and first hoisting in June)			

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
YEAR 1942

During the year 1942 the continued increase in iron ore production on the Marquette Range, together with increased production of other war plants in the area and general prosperity of the territory served by our company, resulted in increased energy sales and revenues for The Cliffs Power & Light Company. During this year energy sales amounted to 96,046,944 K.W.H., with a total gross revenue of $1,320,499.76. This is an increase of approximately 6.8% in both energy sales and revenue over the previous records for the company established during the year 1941. Transmission and distribution losses required that we purchase and generate 106,065,000 K.W.H. to supply the energy sales. Of this amount 97,782,000 K.W.H. were generated by our own power plants and 8,283,000 K.W.H. purchased from our purchase energy sources. Energy generated by our own plants was approximately 16% greater than the previous record established in 1941.

The rainfall for the year, although not abnormally high, came in such a manner that we were able to take full advantage of it during the year which, coupled with the fact that we had a load of sufficient capacity to absorb the output of the small plants, made it possible to utilize them to their maximum advantage. Very light snowfall during the winter of 1941-1942 did not place enough water in the reservoirs to fill them during the spring run-off. However, subsequent rains kept the flows of the various streams up during the summer and fall to the points that the plants were able to produce the energy required without resorting to extensive power purchases in more than three months. The high output of the system can be attributed to some extent also to the fact that the Escanaba and Republic plants were operated automatically during periods when water was available, which considerably increased the amount of energy which could be obtained from these smaller plants.

The beginning of the year found the new dam on the Carp River at Deer Lake completed with the exception of the application of the waterproof paint on the upstream face of the dam, the blasting of the old rock masonry dam and the plugging of the hole through which the leakage from the old dam had been by-passed through the new one. This work required considerable heating of the dam structure and because of the extremely cold weather was both difficult and expensive to complete. The dam was in condition to receive the water from Deer Lake during March and the old dam was blasted in that month, thus placing the burden of retaining the water upon the new structure. All work on the dam was completed during the month of May and the contracts covering construction were settled during the month of June. Due to the light snowfall of the winter this dam only filled to elevation 1385.9, which is 4.1 feet from the spillway. The extra water which the new structure enabled us to retain in the storage dam was the equivalent of approximately 3,600,000 K.W.H. , which amount is almost equivalent to that which could have been stored in the old dam.

Both hydraulic turbine units at the Carp Plant were completely overhauled during January, February and March of the year. The #1 unit was closed down on January 27th and again placed in operation on February 3rd, at which time the #2 unit was closed down and this was again placed in operation on April 1st. This was the first complete overhaul these units had had in a number of years and we feel that the repairs made will place them in condition for efficient service for several years in the future.

As stated previously the Escanaba Plant was equipped for full automatic operation by the installation of new synchronizing equipment during the month of February. This permitted us to continue 24 hour operation at this plant with only one operator on duty for 40 hours weekly. The effect of this increased operating cycle is responsible to a great extent for the increased output of this plant which this year exceed any previous output by approximately 16-2/3% and added 1,000,000 K.W.H. to our total plant production.

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
YEAR 1942

During February our plant guard was increased by the addition of four full time watchmen placed on duty at the Hoist Plant to guard the dam and sand levee. This addition enabled us to maintain 24 hour guard service at this point, which we considered the most vulnerable spot in our entire system for sabotage operations.

The engineering staff of the company was badly crippled in early spring by the loss of Anthony Barney and Arthur Kleven, electrical engineers, being called to active duty from the Army Reserve Corps in which they held commissions and by the resignation of Roy Hosking, civil engineer, who accepted a Chief Petty Officer's rating in the Navy. This shortage was made more acute during May by the death of R. K. Durland, who for some 25 years had been employed by our company in charge of relaying, testing and metering, who died while on a vacation in Chicago. Under existing manpower conditions it has been extremely difficult to replace these men but it is anticipated that additional engineering help will be obtained in the early part of 1943.

The company has continued the practice of concreting the outside of the wood stave pipe lines forming part of the penstocks of both the McClure and Carp dams. Due to an early break-up in the spring an abnormally long construction period was available this year and the work has now progressed to the point where it is hoped to be able to successfully finish both of these lines during 1943. Such completion will materially strengthen the reliability of service which can be expected from these plants.

On the 20th of December there was a bad failure in the steel pipe line feeding the McClure Plant some 1200 feet up that line from the power house. The exact cause of the rupture can not be determined but it is felt that the failure was due to natural causes rather than to sabotage action. This opinion was given by the Michigan State Police after a thorough investigation of the facts surrounding the breaks in the pipe. The accident caused a shut down of the McClure Plant for the remainder of the month and operation of that plant was not resumed until January 5th, after which time several further interruptions of this plant were necessary in order to stop various leaks which occured in the unconcreted wood stave pipe line as a result of the failure which had been experienced in the steel line.

In July a severe lightning storm burned out one coil of the #1 unit at the McClure Plant. Although it was possible to place this unit back in service by cutting out this coil on Sunday, a complete winding should be installed whenever the machine is shut down for mechanical overhaul.

Minor bearing trouble occured during October which resulted in considerable oil leakage from the thrust bearing in the new #3 unit at the Hoist Plant. This machine was removed from service on November 24th and the bearing was overhauled. The machine was returned to active service on December 8th and no further difficulties have been experienced.

As an assistance to the war effort the two obsolete steam turbines which have remained installed in the Mass Mine at Negaunee and at the Central Power Plant at Princeton were disposed of as junk during December, yielding a total of 162,240 lbs. of scrap metal. These machines were obsolete in design and in such poor condition of repair that they could never have been used satisfactorily as generating equipment for our company again and were much more valuable as scrap than as installed inactive machinery.

THE CLIFFS POWER & LIGHT COMPANY

STATISTICAL DATA - 1942

	KILOWATT HOURS GENERATED & PURCHASED								STATION USE	DELIVERED TO LINES	KWH SOLD	TRANSMISSION LOSSES	
	McCLURE	CARP	HOIST	AUTRAIN	REPUBLIC	ESCANABA	PURCHASED	TOTAL				KWH	%
Jan.	3,768,000	1,906,000	1,291,000	491,000	136,000	417,000	57,000	8,066,000	18,600	8,047,400	7,099,746	947,654	11.77
Feb.	4 376 000	1 054 000	1 602 000	436 000	116 000	277 000	3 000	7 864 000	17 750	7 846 250	6 980 274	865 976	11.03
Mar.	4 562 000	1 229 000	1 596 000	477 000	90 000	246 000	0	8 200 000	19 200	8 180 800	7 479 131	701 669	8.57
Apr.	3 410 000	1 764 000	1 227 000	701 000	229 000	875 000	0	8 206 000	17 350	8 188 650	7 534 275	654 375	7.99
May	4 100 000	909 000	1 500 000	693 000	325 000	1,020,000	754,000	9 301 000	18 900	9 282 100	8 557 952	724 148	7.80
June	4 709 000	1 101 000	1 724 000	507 000	324 000	754 000	0	9 119 000	31 450	9 087 550	8 287 990	799 560	8.79
July	4 821 000	1 339 000	1 765 000	452 000	181 000	424 000	197 000	9 179 000	8 550	9 170 450	8 213 152	957 298	10.43
Aug.	3 837 000	1 072 000	1 393 000	310 000	149 000	399 000	2 287 000	9 447 000	19 450	9 427 550	8 408 914	1 018 636	10.80
Sept.	2 873 000	1 165 000	1 048 000	213 000	178 000	510 000	2 947 000	8 934 000	20 358	8 913 642	8 387 767	525 875	5.89
Oct.	3 231 000	1 796 000	1 206 000	358 000	358 000	849 000	1 465 000	9 263 000	21 499	9 241 501	8 456 852	784 649	8.49
Nov.	4 099 000	2 158 000	1 480 000	498 000	285 000	788 000	29 000	9 337 000	21 400	9 315 600	8 523 349	792 251	8.50
Dec.	3 694 000	2 098 000	1 526 000	518 000	262 000	507 000	544 000	9 149 000	24 450	9 124 550	8 117 542	1 007 008	11.03
	47,480,000	17,591,000	17,358,000	5,654,000	2,633,000	7,066,000	8,283,000	106,065,000	238,957	105,826,043	96,046,944	9,779,099	9.24

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
YEAR 1942

STATISTICAL DATA - 1942

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Precipitation-	0.72	0.78	2.90	1.60	4.28	3.02	4.29	3.76	5.55	2.65	2.78	1.93

Total Precipitation at Ishpeming during 1942 - 34.26" (2.855 ft.)
Average " " Marquette - 32.80 (46 year record)

CARP RIVER PLANT:

Drainage area above Intake Dam		66.66 sq. miles
Cubic feet precipitation in 1942	5,305,658,181	
Kilowatt hours generated in 1942	17 591 000	
Cubic feet water utilized (90 cu.ft. - 1 Kwh)	1 583 190 000	
" " " in Carp Storage Basin Jan. 1, 1942	325 100 800	
" " " " " " " Dec.31, 1942	423 806 000	
" " " stored in 1942	98 705 200	
" " " wasted over Intake Dam	96 228 000	
Total run-off for year 1942 (Cubic feet)	1 788 123 200	
Run-off per sq. mile of drainage area	26 674 515	
Second-feet of run-off		0.84

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923
Total Precipitation	30.11	26.53	38.40	36.83	25.46	31.05	29.50	27.40	30.38	33.67	21.90
Sec.ft. per sq.mile run-off	1.03	0.67	0.93	1.29	0.70	0.79	0.83	0.73	0.68	1.06	0.59

	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Total Precipitation	22.95	20.71	35.69	29.86	36.06	32.28	23.14	36.70	31.20	32.72	32.87
Sec.ft. per sq.mile run-off	0.50	0.25	0.85	0.98	1.11	0.67	1.10	0.83	1.13	1.14	1.00

	1935	1936	1937	1938	1939	1940	1941	1942
Total Precipitation	27.10	30.23	30.10	35.32	33.58	30.34	32.20	34.26
Sec.ft. per sq.mile run-off	0.79	0.89	0.86	1.33	1.47	1.05	0.83	0.84

McCLURE PLANT:

Drainage area above Intake Dam		140.52 sq. miles
Cubic feet precipitation in 1942 (Hoist Plant 40.20")	13,123,533,773	
Kilowatt hours generated at McClure Plant in 1942	47 480 000	
Cubic feet water utilized (125 cu.ft. - 1 Kwh)	5 935 000 000	
" " " wasted over Intake Dam	74 304 000	
" " " in Hoist Storage Basin Jan. 1, 1942	2 071 141 000	
" " " " " " " Dec. 31, 1942	1 293 032 000	
" " " taken from Hoist Storage Basin in 1942	778 109 000	
" " " in Silver Lake Jan. 1, 1942	446 433 000	
" " " " " " Dec. 31, 1942	320 950 000	
" " " taken from Silver Lake in 1942	125 483 000	
Total run-off for year 1942 (Cubic feet)	5 105 712 000	
Run-off per sq.mile of drainage area	36 334 415	
Second-feet of run-off		1.15

	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Total Precipitation	* 27.40	35.10	42.03	26.60	30.49	24.06	43.95	35.51	43.80	38.75	30.81
Sec.ft. per sq.mile run-off	1.22	1.02	1.54	0.85	0.92	0.52	1.52	1.80	2.22	1.36	1.45

	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941
Total Precipitation	37.02	32.54	35.07	35.02	29.96	32.16	38.18	40.93	41.22	36.59	38.15
Sec.ft. per sq.mile run-off	1.10	1.23	1.30	1.16	0.90	1.05	1.19	1.75	1.69	1.47	1.28

	1942
Total Precipitation	40.20
Sec.ft. per sq.mile run-off	1.15

* - 1920 Precipitation figure is total precipitation at Ishpeming.

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
YEAR 1942

SUBSTATION TRANSFORMERS:

Substation transformers installed as of December 31, 1942.

	Phase	No.	K.V.A.	Total K.V.A.	
66,000/2300 Volts					
Munising Substation	1	3	667	2,001	
Seney "	1	1	25	25	
Inland #1 "	1	3	500	1 500	
" #2 "	1	3	500	1 500	
					5,026 K.V.A.
2300/66,000 Volts					
AuTrain Substation	1	3	333-1/3	1 000	
					1 000
33,000/66,000 Volts					
Gwinn Substation	1	3	1,250	3 750	
					3 750
33,000/12,000 Volts					
Clarksburg Substation	1	3	37-1/2	112½	
" "	1	2	150	300	
					412½
33,000/2300 Volts					
Gwinn Substation	1	3	75	225	
Cliffs Shaft-Holmes Substation	1	6	500	3 000	
Morris-Lloyd "	1	3	590	1 770	
Hartford "	1	3	400	1 200	
Maas "	1	6	590	3 540	
Brownstone "	1	3	625	1 875	
Palmer "	1	2	625	1 250	
Greenwood "	1	2	400	800	
Princeton "	1	3	150	450	
Tilden "	3	1	1 250	1 250	
Palmer Rural "	1	4	15	60	
Negaunee-Athens "	1	3	1 000	3 000	
Mather Mine "	1	3	2 000	6 000	
					24 420
2300/33,000 Volts					
Republic "	1	3	250	750	
Hoist Plant "	3	1	2 500	2 500	
Escanaba Plant "	1	3	590	1 770	
McClure " "	3	2	5 000	10 000	
Carp " "	1	3	1 900	5 700	
Hoist " "	1	3	667	2 000	
" " "	1	3	200	600	
					23 320
12,000/440-220 Volts					
Piqua-Marquette Substation	1	3	100	300	
					300
12,000/220-110 Volts					
D.S.S.&A.Ry. at Clarksburg	1	1	2-1/2	2½	
					2½
12,000/2300 Volts					
McClure Plant (Furnace Lines)	3	2	1 250	2 500	
AuTrain Substation	1	3	185	555	
Chatham "	1	3	25	75	
Eben "	1	1	25	25	
Rumely "	1	2	15	30	
Inland #1 (Wis.Mich. Line)	1	3	50	150	
Rumely Sawmill	1	3	185	555	
					3 890

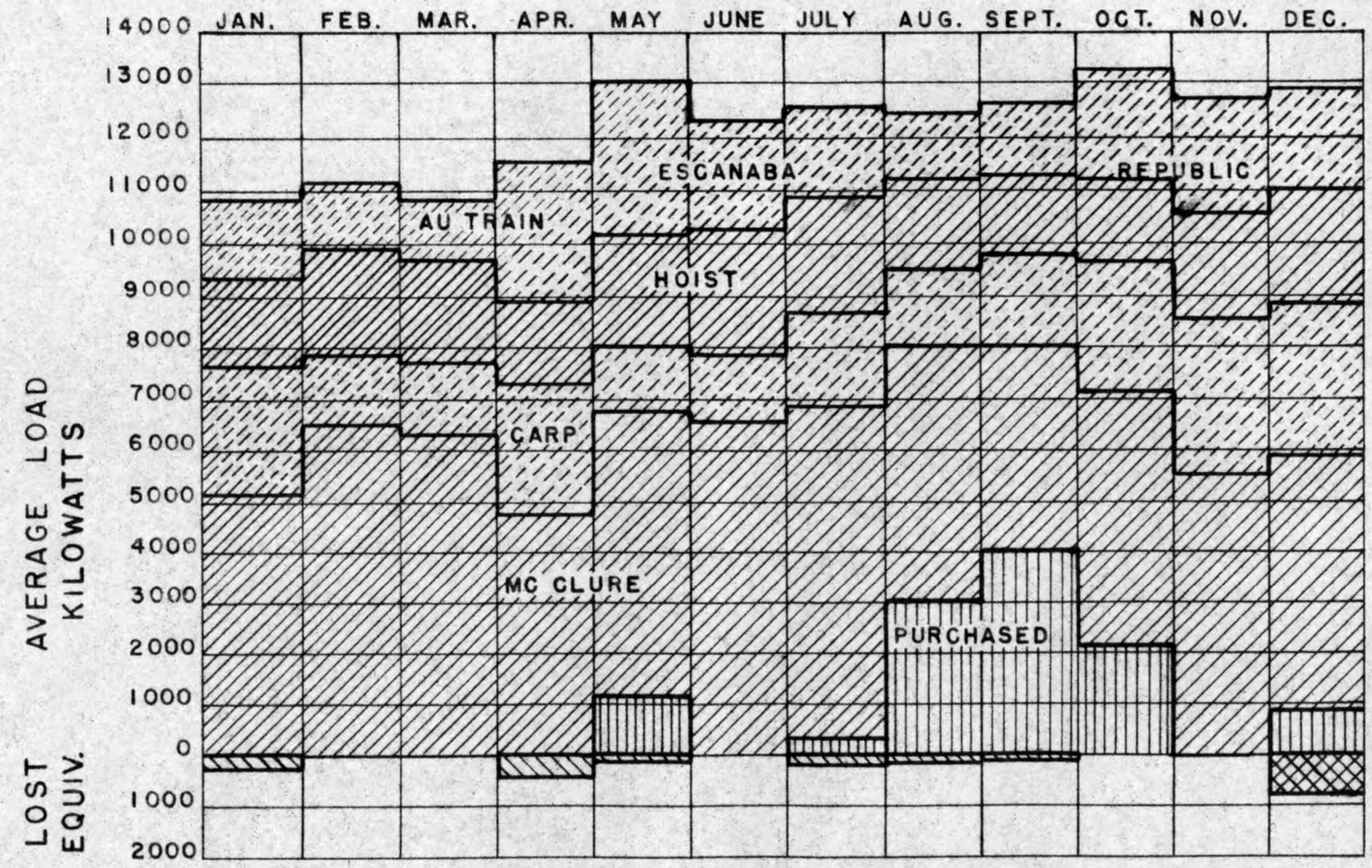
SUBSTATION TRANSFORMERS: (CONT'D.)

	Phase	No.	K.V.A.	Total K.V.A.	
				Brought Fwd.	62,121 KVA
6,600/2300 Volts					
Inland #1 Substation	1	3	25	75	
Blaney Park "	1	2	25	50	
" " "	1	1	15	15	
AuTrain Lake "	1	1	25	25	
					165
6,600/115-230 Volts					
Furnace Substation Lighting	1	1	1-1/2	1-1/2	
					1½
				GRAND TOTAL.....	62,287½

DISTRIBUTION TRANSFORMERS:

	Number	Capacity	
Total at first of year	364	2,109	
" purchased during year	20	243	
" sold during year	12	130-1/2	
" retired during year	1	5	
" at close of year	371	2,216-1/2	K.V.A.
In stock at close of year	8	112-1/2	
" service at " " "	327	1,800	
C.P.&L.Co. plants & auxiliaries	36	304	
	371	2,216-1/2	K.V.A.

1942



CURRENT MADE BY WATER POWER

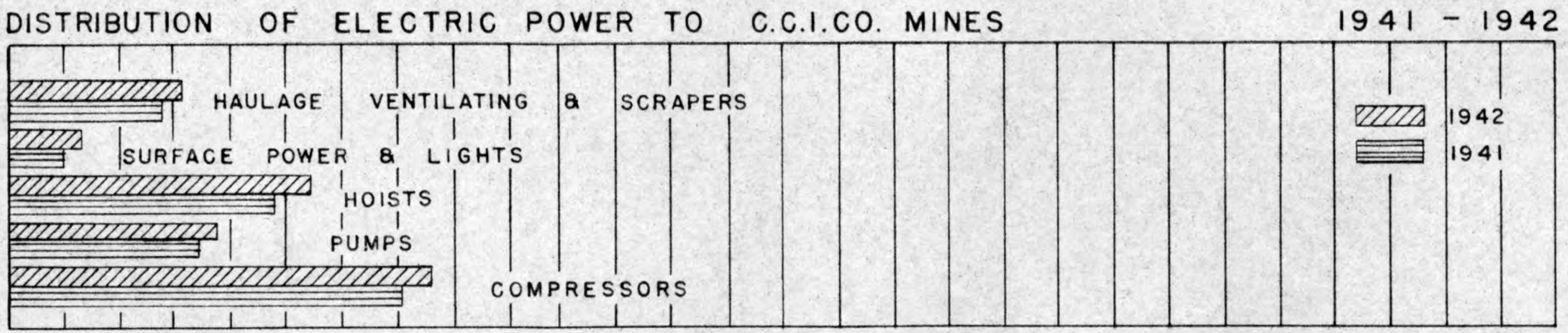
POWER PURCHASED

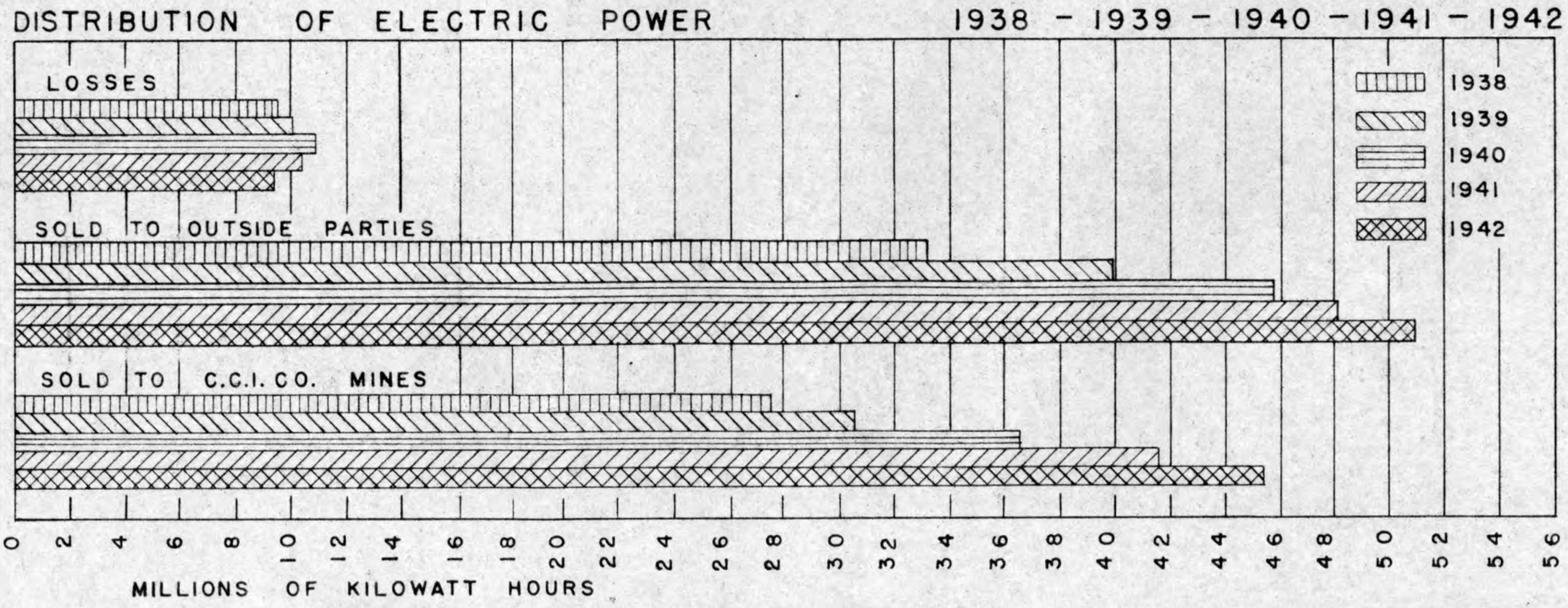
KILOWATT EQUIVALENT WATER LOST AT CARP

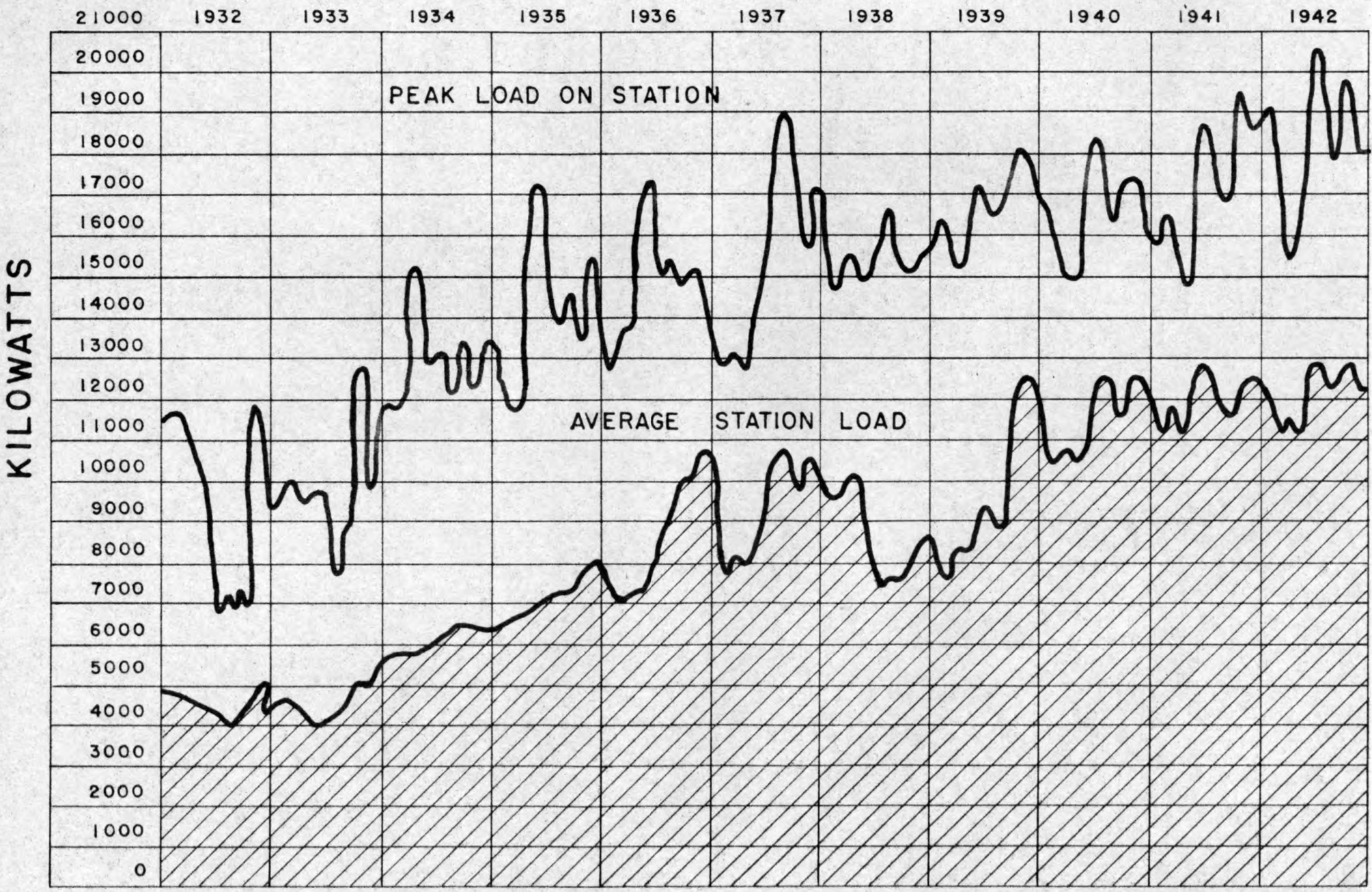
" " " MC CLURE

MC CLURE	44.7 %
CARP	16.6
HOIST	16.4
AU TRAIN	5.3
ESCANABA	6.7
REPUBLIC	2.5
PURCHASED	7.8

C.P.& L.CO.


DISTRIBUTION OF ELECTRIC POWER TO C.C.I.CO. MINES
1941 - 1942
HAULAGE
VENTILATING & SCRAPERS
SURFACE POWER & LIGHTS
HOISTS
PUMPS
COMPRESSORS
1942
1941


DISTRIBUTION OF ELECTRIC POWER
1938 - 1939 - 1940 - 1941 - 1942
LOSSES
SOLD TO OUTSIDE PARTIES
SOLD TO C.C.I. CO. MINES
1938
1939
1940
1941
1942
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56
MILLIONS OF KILOWATT HOURS


KILOWATTS
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
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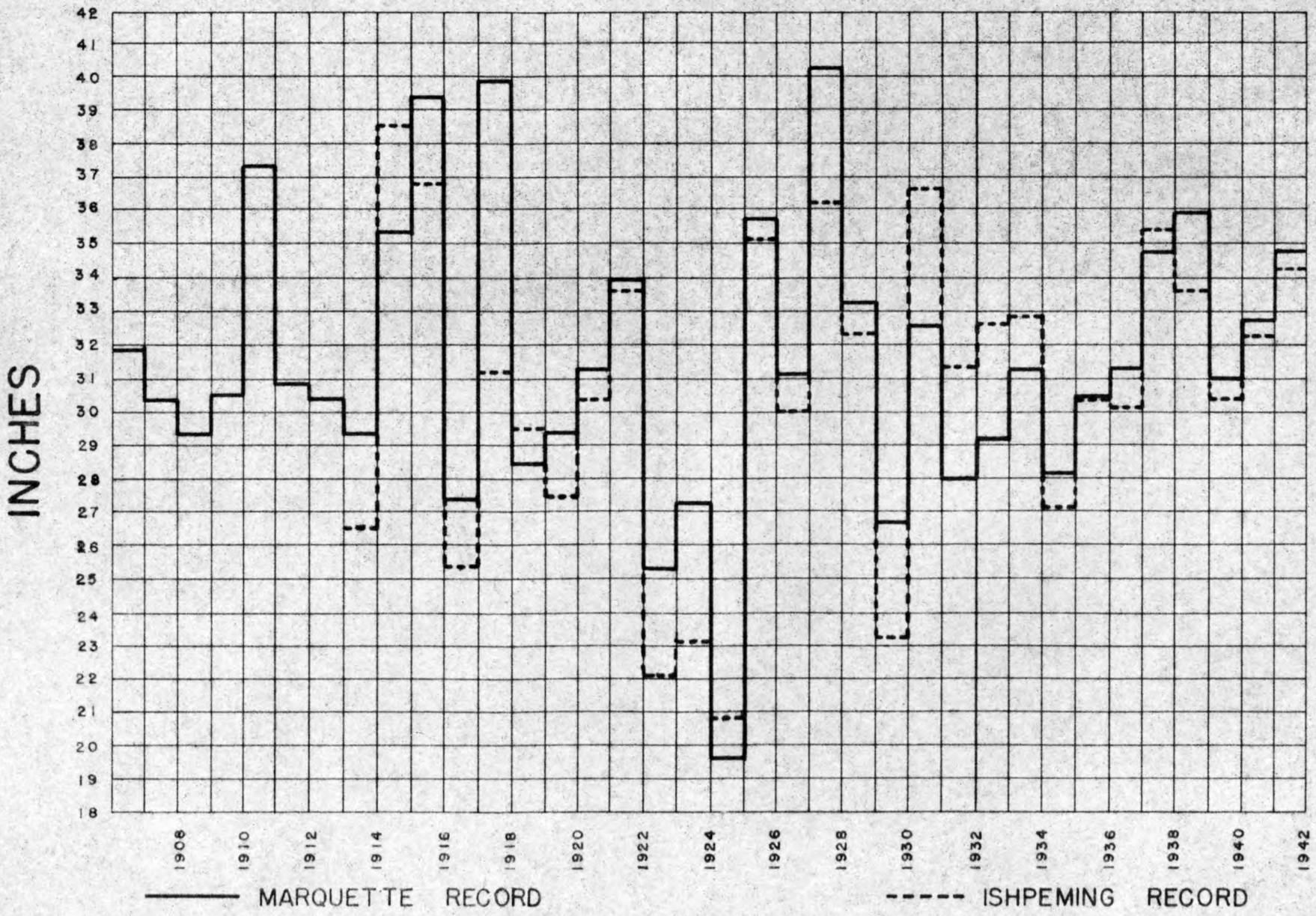
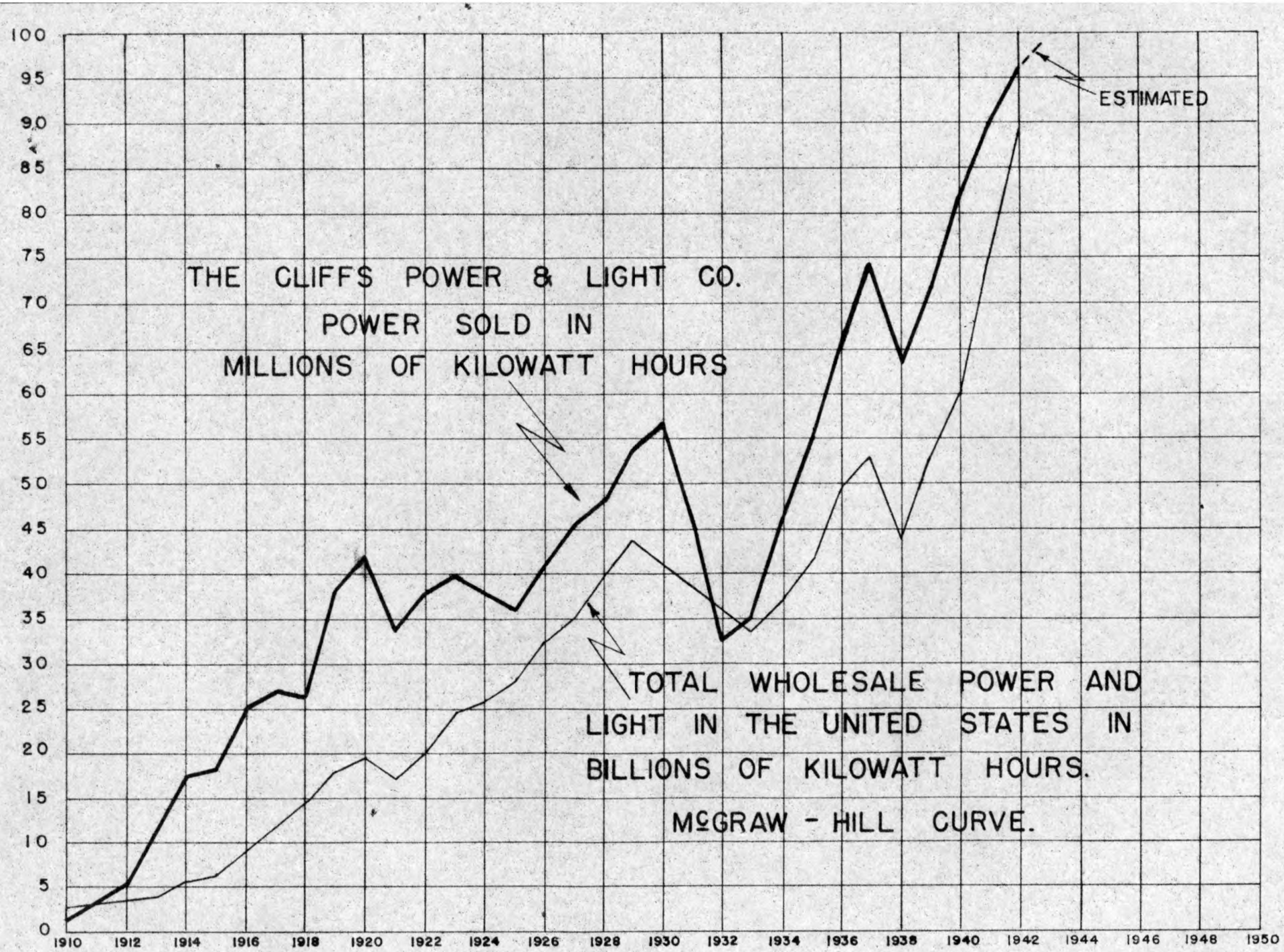
7000
6000
5000
4000
3000
2000
1000
0
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
PEAK LOAD ON STATION
AVERAGE STATION LOAD

PRECIPITATION BY YEARS




100
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1914
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1918
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1932
1934
1936
1938
1940
1942
1944
1946
1948
1950
ESTIMATED
THE CLIFFS POWER & LIGHT CO.
POWER SOLD IN
MILLIONS OF KILOWATT HOURS
TOTAL WHOLESALE POWER AND
LIGHT IN THE UNITED STATES IN
BILLIONS OF KILOWATT HOURS.
McGRAW - HILL CURVE.

WELFARE DEPT. ANNUAL REPORT YEAR 1942

The usual functions of this department were carried on during 1942. Many new problems required attention during 1942, which naturally came with the increase of the number of employees during the year and with the problems that arise during periods of war. Many of our employees entered the services during the year and in connection with their leaving our employ many welfare problems had to be given attention.

The Welfare Department has supervision of all matters dealing with and pertaining to the general welfare, the health, and the concern of the Company's employees. Briefly, this department is charged with various activities, such as the following: Workmen's compensation, group insurance, the Company's pension system, established many years ago, retirement allowances, Social Security, group insurance problems, special relief cases, donations to employees who have long and faithful records and who are no longer capable of working but are not eligible for Social Security, matters dealing with civilian problems and public health, problems dealing with safety, public relations activities, personnel direction and all special problems dealing with the general welfare of the Company's employees which naturally fall within the scope of the Welfare Department.

For the purpose of keeping the record intact and continuous, it is here recorded that this department was previously known as the Pension Department and for many years Mr. W. H. Moulton, who retired on July 1, 1938, headed the department with the title of Secretary. In July of 1938 the name of the department was changed from the Pension Department to the Welfare Department and Walter F. Gries became the head of the department with the title of Superintendent. It is a pleasure to record that throughout 1942 we have had the privilege and benefit of regular meetings and conferences with Mr. Moulton on many questions in which we needed his counsel and advice. It is desired to enter into this record the fact that this service, cooperatively given by Mr. Moulton, has been helpful and greatly appreciated. We also wish to record that the fine cooperation of the Safety Department, under Mr. A. J. Stromquist, Director, and Captain H. F. Rogers, Assistant Director, has been greatly appreciated and, we believe, very helpful.

Throughout this past year there have been many new details requiring the establishment of new procedures and new policies. It is also desired to record here that the splendid attention given to the requests of this department by Mr. S. R. Elliott, Manager, and Mr. C. J. Stakel, Assistant Manager, was very helpful and is very deeply appreciated.

The Police Department, which is a bureau of the Welfare Department and under the direction of Chief of Police R. J. Veale, is now a well-organized and a well-operating department. Mr. Veale is called in for regular conferences and we feel that his cooperation and the supervision of this particular bureau has been very well carried out. We wish to express our appreciation for the manner in which our police work has been supervised and carried out.

WELFARE DEPARTMENT

WELFARE DEPT. ANNUAL REPORT YEAR 1942

The actual detail and program with respect to workmen's compensation and group insurance are the immediate responsibility of Mr. Walter E. Johnson, who has been in the department for a good many years. This portion of the work of the Welfare Department has been a very efficient-working and well-administered part of the department's work. Mr. Johnson is thoroughly familiar with all the details of his particular assignment and his work is well organized and extremely well taken care of.

It is also desired to record here that the personnel of this department is made up of six people. Mr. Johnson assumes responsibility directly for workmen's compensation and group insurance and such other matters as have to do with injuries of employees and hospitalization following injuries. The secretary in this department is Mrs. Hilda Holmgren, the wife of Lowell Holmgren, who formerly was secretary in the department for several years and is now in the military service. Miss Mary Ryan, who has been in the department for a good many years, acts as office receptionist and has charge of files and departmental payrolls. Miss Emily Nicholas is secretary to the Superintendent of the department and acts also in this capacity for Mr. Stromquist, Safety Director. Miss Nicholas also has charge of all other details and special assignments which arise from time to time.

11.

a. WORKMEN'S COMPENSATION

The direct work of the Compensation Department has been taken care of by Mr. Walter E. Johnson, as has been the plan since 1926.

Following are the cases of those men who required some special attention during the year.

NESTOR AHLSTROM - Maas Mine - Acc. Rept. No. 577A

Ahlstrom injured his left knee at the Stephenson Mine in 1924 and in recent years has been suffering from rheumatism which was severe enough to necessitate changing his occupation. He was employed at the Gardner-Mackinaw and upon the closing of that property was transferred to the Maas where he worked underground as a timber hoister. During the time that he was employed at the Maas he lost a good deal of time due to his illness, and on September 6th, 1941 he suffered a severe attack and was disabled for several months. Later he consulted an attorney and a claim was filed in which it was alleged that Ahlstrom had sustained an accident on September 6th, 1941 when he was hoisting timber or poles, the load being hoisted having swung around, striking him on his left knee. The matter was set for hearing on February 27th, 1942, and at that hearing Ahlstrom's petition was withdrawn and it was agreed that he would be employed at the Princeton Mine which had recently been reopened.

JOSEPH DENOFRE - Negaunee Mine - Acc. Rept. No. 700

Denofre was employed at the timber yard at the Negaunee Mine, and claims that he strained his back while lifting some poles on March 26th, 1942. Fellow employees were questioned and they had no knowledge of the alleged injury. On April 18, 1942 Denofre filed a notice of claim and his case was set for hearing on June 16. On May 21, 1942 he advised us that he intended to withdraw his claim and requested that he be paid group insurance during the time he had lost. However, he refused to arrange for a medical report from his attending physician so no claim was filed against the insurance company. He had instructed his attorney to withdraw the compensation claim which Mr. Nebel had, but later the Department of Labor and Industry asked that a notice of withdrawal signed by Denofre be filed. Denofre did no appear at the scheduled hearing so the Deputy Commissioner dismissed his claim. In the meantime it was learned that plaintiff had gone to Detroit and was employed by some air-craft corporation in that city.

FRANK R. JOHNSON - Lloyd Mine

Frank R. Johnson was employed as a watchman at the Lloyd Mine. His vision was poor due to two accidents which he sustained while employed by the Republic Steel Corporation at the Republic Mine before that property was taken over by our company. He also was suffering from chronic rheumatism. Following the outbreak of war his physical condition was such that Dr. Waldie of the Industrial Hygiene Department recommended that he be removed from the policeman job because of extremely faulty

vision. He last worked as a watchman on January 11, 1942 and was advised by Mr. Haller that he was being transferred to the timber yard. This change did not appeal to him, and after working one day on that job he said that he could not stand it and would have to stay home. A short time later he requested that he be paid group insurance, stating that he was ill, and he signed an application for insurance benefits in which he stated that he was suffering from rheumatism. He drew benefits for the maximum period of thirteen weeks. On June 5th, 1942 he filed an application for adjustment of his claim under the Workmen's Compensation Law, claiming that he fell down the steps of the Lloyd Mine engine house on the morning of January 11, 1942, which was the last day that he worked as a watchman. The matter came on for hearing on August 25, 1942 before Deputy Commissioner James W. Nolan. Following the closing of the testimony we requested and received permission to take the deposition of Dr. R. J. Wescott who had last taken care of Frank Johnson. Prior to the opening of this case Dr. Wescott had severed his connection with the Ishpeming Hospital and had gone to Everett, Washington. Following the filing of this deposition with the Deputy Commissioner he made a ruling in our favor. Ray Derham, the plaintiff's attorney, appealed the matter to the full board and hearing was set for November 17, 1942. On December 11, 1942 the full board entered an award in our favor sustaining the Deputy Commission and ruling that plaintiff had not sustained an accident on January 11, 1942, and was therefore not entitled to compensation benefits.

11.

a. WORKMEN'S COMPENSATION (Continued)

FATALITIES

The following fatalities occurred in 1942.

William Ryan Age 59	Hill Trumbull Mine Occurred May 16, 1943 Decapitated by train No dependents Funeral expense Payment to State of Minnesota Special Compensation Fund	$ 150.00 300.00 $ 450.00
Leslie Wertanen Age 30	Negaunee Mine Occurred July 5, 1942 Died on July 7, 1942 Repairing measuring pocket. Struck by steel plate Dependent widow and children Compensation - 300 weeks at 18.00 Funeral expense	$5,400.00 200.00 $5,600.00

11.

a. WORKMEN'S COMPENSATION (Continued)

Following is a list of the more serious cases occurring during 1942 other than fatalities:

Mine and Report no.	Name	Nature of Injury	Compensation Paid
Athens #400	Everett J. Martonen	Loss of half of 2nd finger, left hand	270.00
Athens #401	Jacob Sarkiniemi	Loose semi-lunar cartilage, right knee	441.00 *
Athens #410	Joseph Benaglio	Fracture, right patella	213.00 *
Gen. Shops #56	Edward Kenney	Amputation, right thumb	36.00 *
Princeton #181	Alexander Arzuffi	Fracture of 5 transverse processes	378.00 *
Princeton #186	Walfred Salo	Comminuted fracture, both bones lower right leg	216.00 *
Maas #580	Cecil Bartle	Fracture. Dislocation, left ankle	465.00
Lloyd #815	Joseph Zoppetti	Fracture, right leg	459.60
Lloyd #818	Gordon Vercoe	Contusion, chest, leg & rt. hand. Fracture, 4th metacarpal, right hand	377.28 *
Lloyd #819	Jacob Korpi	Fracture of pelvis	576.00 *
Negaunee #693	Harvey Harju	Fracture of tarsal bones, right foot	696.00
Negaunee #708	Otto Kangas	Fracture, right ankle	387.00
Negaunee #702	John Koski	Loss of vision, right eye	576.00 *
Hill Trumbull #97	Philip Iver	Loss of use of major portion, right index finger	160.00 *

* Payments still being made.

11.

a. WORKMEN'S COMPENSATION (Continued)

ANNUAL STATEMENT OF COMPENSATION PAYMENTS
FROM JANUARY 1st, 1942 to DECEMBER 31st, 1942

Compensation paid on 1942 accidents	$ 13,240.29	
Compensation still pending	71,893.01	
Cost of medical and hospital service, also special expense	26,252.28	
		111,385.58
Less pending for years 1932 to 1941 inclusive	59,556.29	
Less medical and special expense on accidents occurring prior to January 1, 1942	2,337.06	
		61,893.35
		49,492.23
Less compensation paid in 1942 on Occupational Disease cases	4,125.00	
Estimated compensation still pending on Occupational Disease cases	7,642.00	
		11,767.00
Estimated cost of 1942 accidents		37,725.23
Percentage of payrolls		.00491
Percentage of payrolls including Occ. Dis. cases		.00644
Number of fatal accidents		2
Number of compensable accidents		75
Number of non-compensable accidents		24
Number of slight accidents		944

The following Occupational Disease cases occurred during the year. The cost of these cases is included in the regular compensation costs, but for statistical purposes they are not included in the accident table.

Number of deaths	1
Number of disability cases	6

WELFARE DEPARTMENT

ANNUAL REPORT - 1942
STATEMENT OF COMPENSATION PAYMENTS FROM
JANUARY 1, 1942 to DECEMBER 31, 1942

	Average No. of Employees	No. of Fatal Accs.	No. of Non-fatal Accidents			Actual Comp. Paid in 1942	1932	1933	1934	1936	1937	1938	1940	1941	1942	Estimated Compensation Still Pending	Medical & Special Expense	Fatal Cases Pending	Injury Cases Pending
Cliffs-Shaft	495		4	1	97	6,267.00			936.00			2,880.00		993.00	1,458.00	8,625.00	3,477.74	3	3
Cliffs-Shaft Laboratory	10				3												58.00		
Chief of Police	1																6.00		
District Welfare	3																18.00		
Employes Wood, Gwinn District						204.00	204.00												
Gardner-Mackinaw						936.00						936.00				1,620.00		1	
General Storehouse	132				20												792.25		
General Welfare	2																12.00		
Geological Department	3																20.00		
Gwinn Office																	3.00		
Ishpeming Office	25				1												149.50		
Lloyd	321		6	1	108	7,169.24					2,808.00			1,991.36	2,369.88	12,790.52	3,316.60	1	8
Maas	522		12	1	201	8,462.36				936.00		936.00	2,169.00	2,980.40	1,440.96	18,090.00	4,257.49	3	6
Mechanical Engineering	5																30.25		
Mining Engineering	10				1												57.75		
Miscellaneous	5				2												32.00		
Princeton	132		7	3	37	702.00									702.00	342.00	937.50		2
Purchasing Department	6																36.00		
Repairs to Steam Shovels			1			36.00									36.00	1,044.00			1
Safety Department	2																12.00		
Shipping Department	7																44.50		
Spies-Virgil	85				10												508.75		
Tilden	37		1	1	8	114.00									114.00		225.00		
Workmen's Compensation	2																12.50		
Chemical Plant						478.40		478.40											
Cleveland Roll	16																95.50		
The Cliffs Power & Light Company	86				11	1,050.00								1,050.00		4,140.00	525.25	1	
Negaunee	487	1	19	7	156	15,551.32			915.20		936.00		1,872.00	8,166.00	3,662.12	17,980.60	3,482.82	4	8
Mather	86				25	420.00								420.00			530.50		
The Athens Iron Mining Company	419		13	4	143	7,012.68					9.00	1,023.36	2,605.32	1,293.00	2,082.00	4,775.24	3,743.22	1	9
Total - Michigan Mines	2899	1	63	18	823	48,403.00	204.00	478.40	1,851.20	936.00	3,753.00	5,775.36	6,646.32	16,893.76	11,864.96	69,407.36	22,384.12	14	37
Hibbing Office	26																154.75		
Holman Cliffs	218		5	2	43	936.88 ✓								601.55	335.33	2,485.65	1,310.00	1	
Canisteo	139		2	4	32	207.00				207.00							860.50		
Hill-Trumbull	228	1	5		46	1,908.93 ✓								868.93	1,040.00		1,542.91		
Total - Minnesota Mines	611	1	12	6	121	3,052.81				207.00				1,470.48	1,375.33	2,485.65	3,868.16	1	
Total - All Mines	3510	2	75	24	944	51,455.81	204.00	478.40	1,851.20	1,143.00	3,753.00	5,775.36	6,646.32	18,364.24	13,240.29	71,893.01	26,252.28	15	37

Canisteo Mine risk insured by The Employer's Mutual Liability Insurance Company since January 1, 1939

11.

a. WORKMEN'S COMPENSATION (Continued)

Compensation Payments including Medical and Special Expense

Year	C. C. I. Co.	Negaunee Mine Co.	Athens Ir. Mng. Co.	Cliffs Pr. & Light Co.	Mesaba-Cl. Mng. Co.	Holman-Cl. Mng. Co.	Canisteo Cl. Mng. Co.	Alexandria Mine	TOTAL
1912	1,073.81	105.08							1,178.89
1913	13,149.70	1,152.87	27.15						14,329.72
1914	27,416.82	2,840.13	446.63						30,702.58
1915	15,657.71	1,699.28	656.07						18,013.06
1916	32,404.74	3,496.75	672.29						36,573.78
1917	45,129.92	5,301.30	911.46						51,342.68
1918	43,734.77	6,198.93	1,197.57						51,131.27
1919	59,417.51	11,724.68	2,234.77		263.00				73,639.96
1920	59,535.76	8,888.01	2,928.15		3,057.46				74,409.38
1921	59,065.26	4,709.80	5,208.92		2,953.08				71,937.06
1922	56,794.35	5,283.24	2,048.23		1,866.67				65.992.49
1923	57,856.37	4,142.00	5,007.88		4,874.48				71,880.73
1924	56,335.89	5,487.07	6,394.01		9,408.59				77,625.56
1925	49,376.47	4,464.79	8,305.60		7,316.55				69,463.41
1926	51,123.41	5,433.85	7,087.93	514.40	9,537.84				73,697.43
1927	86,156.10	5,311.69	5,489.81	939.86	7,147.98				105,045.44
1928	87,186.58	6,532.66	6,235.08	1,331.30	4,576.56	9.00			106,371.18
1929	76,959.01	8,899.76	6,303.92	1,895.50	3,557.86	292.83	4.50		97,913.38
1930	76,753.51	10,603.63	5,803.45	1,930.48	2,531.15	1,236.18	1,357.05	1,993.76	102,209.24
1931	75,167.79	10,723.30	5,233.65	1,867.50	1,489.36	559.63	1,346.64	1,700.87	98.088.74
1932	52,920.75	12,137.00	5,012.72	1,398.25	1,336.00	33.75	65.50	1,074.00	73,972.97
1933	23,425.69	9,605.70	5,298.56	993.45	2,180.61			614.00	42,128.01
1934	26,672.34	7,573.97	8,429.38	468.46	2,468.61				45,612.76
1935	34,874.17	6,854.34	5,154.12	218.75	3,778.56				50,879.94
1936	31,597.79	7,139.26	4,588.74	438.50	3,514.63				47,278.92
1937	32,509.48	8,695.66	7,235.96	615.72	3,647.16				52,703.98
1938	35,664.38	11,236.47	6,174.30	526.75	3,465.08				57,046.98
1939	39,532.53	7,183.99	6,838.49	855.50	4,110.34				58,520.85
1940	38,659.10	9,720.57	6,754.69	642.50	5,281.16				61,058.02
1941	37,451.05	11,985.67	12,376.95	1,238.50	5,501.05				68,553.22
1942	38,471.33	19,984.64	10,755.90	1,575.25	6,920.97				77,708.09
	1,422,064.09	225,116.12	150,812.38	17,950.67	100,784.75	2,131.39	2,768.69	5,382.63	1,927,010.72

WELFARE DEPARTMENT

11.

a. WORKMEN'S COMPENSATION (Continued)

The following made up the personnel of our Michigan Compensation Department for the year 1942:

John W. Gibson, Chairman
Frederick G. Palliaer
David M. Martin
Harold E. Bledsoe
Elizabeth Belen
James L. Hill
Joseph Koski, Secretary

Jerome C. Nadolney served as Deputy Commissioner for this District throughout the year.

The following table shows the principal items of the changes made at different periods as affecting our properties:

MICHIGAN LAW	When Law went into effect Sept. 1, 1912	As amended in effect Aug.14,1919	In effect Aug.18,1921	In effect Sept.4, 1927
Percentage of weekly wages	50	60	60	66 2/3
Maximum weekly compensation	10.00	14.00	14.00	18.00
Minimum weekly compensation	4.00	7.00	7.00	7.00
Waiting period	2 weeks	1 week	1 week	1 week
Waiting period picked up at end of	8 weeks	6 weeks	6 weeks	6 weeks
Maximum payment for death	3,000.00	4,200.00	4,200.00	5,400.00
Maximum compensation for total disability	4,000.00	6,000.00	7,000.00	9,000.00

The Occupational Disease Law became effective on October 29, 1937.

A study commission appointed by Gov. Murray D. Van Wagoner, held hearings during the year including one at Marquette, Michigan on June 29, 1943. This commission was to recommend changes in the Workmen's Compensation Law but to date no results of the study have been announced.

11.

a. WORKMEN'S COMPENSATION (Continued)

MINNESOTA COMPENSATION LAW

There were no changes made in the Minnesota Law in 1942.

The present members of the commission are as follows:

P. J. O'Connor, Chairman
N. H. Debel
J. D. Williams
E. D. McKinnon, Secretary
Emily L. Olson, Asst. Secretary

The following table shows the principal items of the changes made at different periods as affecting our properties:

MINNESOTA LAW	When Law went into effect Oct.1,1913	As Amended April 26, 19 19	As amended June 6, 19 21	In effect since Oct. 1, 19 23
Percentage of weekly wage	50	66 2/3	66 2/3	66 2/3
Maximum weekly compensation	10.00	15.00	18.00	20.00
Minimum weekly compensation	6.00	6.50	8.00	8.00
Waiting period	2 weeks	1 week	1 week	1 week
Waiting period picked up at end of	-	-	4 weeks	4 weeks
Maximum death payment	3,000.00	4,500.00	7,500.00	7,500.00
Maximum compensation for total disability	4,000.00	5,000.00	10,000.00	10,000.00

11.

c. GROUP INSURANCE (Continued)

The direct work in connection with claims under the group insurance plan has been taken care of by Mr. Walter E. Johnson since the adoption of the plan on October 1, 1936. Every effort has been made to facilitate the prompt payment of claims. Frequent contacts are made with the men drawing benefits, and we find their attitude toward the plan exceedingly favorable.

The increase of 25% in life insurance, which became effective on December 20, 1937, remained in force throughout the year. A copy of the notice which was given to each employee at the time the increase was announced will be found in the annual report of the year 1937. This notice shows the amount of increase for each class of insurance, also the monthly premium, and the weekly benefit for sickness and accident.

Effective November 13, 1941, men placed on the Retirement Roll will be insured for an amount equal to one-half of the face value of the policy held at the time of retirement. The 25% increase which became effective on December 20, 1937 does not apply to the insurance policies of men placed on the Retirement Roll.

11.

c. GROUP INSURANCE

The group insurance plan, which became effective on October 1, 1936 at all of our properties, has continued in force during the year.

The following statement shows the total cost for the policy year ending September 30, 1942. It includes all cases in which disability began prior to September 30, 1942.

	Death Claims		Health & Accident		Total	
	No. of Cases	Amount Paid	No. of Cases	Amount Paid	No. of Cases	Amount Paid
Cliffs-Shaft	10	15,625.00	43	2,799.43	52	18,424.43
General Roll	2	6,875.00	6	323.43	7	7,198.43
General Storehouse & Shops	1	1,875.00	11	513.71	12	2,388.71
Ishpeming Hospital			7	763.83	7	763.83
Lloyd	2	3,125.00	44	3,672.57	46	6,797.57
Maas	4	6,875.00	67	4,229.44	71	11,104.44
Princeton			1	10.00	1	10.00
Spies-Virgil			8	385.72	8	385.72
Tilden						00
Retirement Roll	11	7,375.00			11	3,735.00
Total - C. C. I. Co.	30	41,750.00	187	12,698.13	215	54,448.13
Negaunee	4	6,250.00	38	2,656.01	41	8,906.01
Mather			5	311.43	5	311.43
Total - Neg. Mine Co.	4	6,250.00	43	2,967.44	46	9,217.44
Athens Iron Mining Co.	2	3,125.00	49	2,780.57	51	5,905.57
The C. P. & L. Company			2	242.56	2	242.56
Total - All Companies	36	51,125.00	281	18,688.70	314	69,813.70

Three of the thirty-six death claims shown above were paid disability benefits in addition to the death benefit which accounts for the discrepancy in the total number of cases shown.

11.

c. GROUP INSURANCE (Continued)

The following deaths occurred during the policy year ending September 30, 1942:

Name	Mine	Date of Death	Amount of Insurance
Eero V. Kivisto	Athens Mine	11-8-41	1875.00
John Hellier	"	12-2-41	1250.00
George Beauchamp	Cliffs Shaft	1-9-42	1875.00
Dan Seablom	"	1-22-42	1875.00
Gust A. Peterson	"	2-26-42	1250.00
John Maronen	"	3-30-42	1875.00
Victor J. Ombrello (1)	"	4-25-42	1875.00
Charles Koskie	"	4-28-42	1875.00
Edward Guy	"	7-7-42	1250.00
Raymond S. Peterson (1)	"	7-23-42	1250.00
Emil Manty	"	8-6-42	1250.00
Conrad M. Peterson	"	9-11-42	1250.00
Fred Linn	General Roll	12-23-41	1875.00
Royden K. Durland	"	5-20-42	5000.00
George H. Gill	Gen. Storehouse	12-20-41	1875.00
Emil Erick Maki (2)	Lloyd Mine	11-26-41	1875.00
James J. Colombo	"	5-12-42	1250.00
Felix Delarye	Maas Mine	11-7-41	1875.00
Alfred Loak	"	11-23-41	1250.00
Victor S. Luoma	"	12-19-41	1875.00
John Trethewey	"	1-31-42	1875.00
John Polini	Negaunee Mine	10-22-41	1875.00
Einar J. Johnson (3)	"	12-7-41	1250.00
Jacob Rudolph Annola (3)	"	12-18-41	1250.00
Leslie Wertanen (2)	"	7-7-42	1875.00
Arthur E. Johnson (3)	"	9-26-42	1250.00
Nels Oja	Retirement Roll	10-24-41	1875.00
Peter Nadeau	"	12-7-41	500.00
John Hendrickson	"	11-24-41	500.00
William J. Curtis	"	1-27-42	500.00
Andrew Larson	"	1-30-42	500.00
Alfred Anderson	"	4-23-42	500.00
Silvio DeGabriel	"	5-21-42	500.00
Arvid Jernquist	"	5-29-42	750.00
August Olson	"	7-2-42	500.00
George B. Bredesen	"	7-11-42	750.00
Charles V. Anderson	"	8-22-42	500.00

(1) Suicide
(2) Killed in occupational accidents
(3) Killed in Non-occupational accidents

WELFARE DEPARTMENT