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c. Safety Inspection (Cont'd.)

Central Safety Committee (Cont'd.)

Bell Signal Code

The #7 Bell signal code used to turn off or on steam came up for discussion. Because steam is not used in the mines at the present time, the code is obsolete. The committee decided to leave #7 code blank at the present time with the view of probably using #7 for some other purpose in the future.

Athlete's Foot

This subject has come up each year and is still unsolved. Considerable discussion on this subject seemed to emphasize the need of using sandals in the change houses. Some employees seem to be suseptable to Athlete's Foot and others are never bothered. Increases always occur during the summer months. Some men use foot baths but some of the doctors tell employees who have Athlete's Foot not to use the baths. Sandals worn by employees keep the men from coming in direct contact with the fungi.

Fire Control at Mines

The Safety Department has started "Tests of Stench Devices" at the various mines. Mr. Moulton reported on the test at the Maas Mine and stated that it was very successful. After the injection of ethyl-mercaptan, the stench was detected in from 2 minutes to 7½ minutes with one exception in a development drift where compressed air had not been used for a number of days and the air line was filled with water. It required 19 minutes for the stench to reach this point but the condition was an unusual one which would occur only rarely.

The importance of fire control methods was emphasized and at future meetings, superintendents would be asked to report on progress made in each mine.

Signalling Locomotive Operators

Stromquist, Marjama and Westwater were appointed as a committee to investigate improvement in signals between underground haulage train brakemen and motormen; also to recommend a better tail lamp and bell for the last car in a haulage train.

The committee is now having a tail lamp and bell constructed which will be presented to the committee for approval. They will also report at a later date on signal systems.

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Central Safety Committee (Cont'd.)

Re-socketing of Hoisting Ropes

Mr. L. C. Moore and Mr. E. Keast were appointed a committee to investigate this rule and reported back that the rule had applied to the Cliffs Shaft Mine. The Mather Mine cage counter-weight is socketed so it was recommended and approved by the Central Safety Committee that the counter-weight rope socketing be inspected every three months and re-socketed when necessary. Mr. Haller was to request Mr. Stakel's approval of the above.

Aluminum Ladders and Bars

The possibility of using aluminum ladders in the Cliffs Shaft Mine was discussed. A number of accidents have occurred when heavy ladders have been handled so aluminum ladders should decrease the weight considerably and reduce the hazard. Also the use of short portable ladders for raising and raise repairing was brought up. This type of ladder has been in use successfully many years by another company. The ladders are not only strong and light weight but are economical as well because they can be used so many times without repair and the hazard of one man handling them is lessened. Mr. Moore was asked to investigate the availability of the ladders as well as bars to be used for scaling down loose ground in open stopes.

Reporting Missed Holes after Blasting

Stromquist was requested to get information as to methods used by other mining companies when reporting missed holes. This information was given to the committee at a later date. Haller, Atkins and Stromquist then were appointed as a committee to make up a missed hole report form to be used at our mines. This committee will report at a future date.

Smoking Penalties

While the established penalties are generally imposed when violations occur, there have been two occasions when violations were not penalized as they should have been. It was agreed that all superintendents and foremen should observe the present ruling so that a uniform policy is in force at all company properties.

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General Foreman's Conference

Only one meeting was held during the year with an attendance of 86 supervisors present.

Stromquist reviewed accidents and showed where there had been a decrease or increase of accidents. Also, general mine ventilation and dust control was discussed. The necessity of planning ventilation and production together was pointed out and an explanation of modern ventilation systems was made.

Mr. Marjama and Mr. Haller were called on to discuss new rules on Scraper Transfer Drifts and with sketches, showed various methods which would protect men employed in these drifts.

Mr. H.F. Rogers was called on to discuss safety rules most commonly violated.

The secretary also stressed the fact that many supervisors did not understand every rule and many employees could not read the rules.

Because of the above, Mr. Stakel suggested that the safety department hold meetings at each mine to explain safety rules.

Foreman's Safety Conferences at Mines

Mr. Harry Rogers, Mr. T.W. Hill and myself held safety meetings at all the mines to explain safety rules and at the same time discuss the various hazards in and around the mines.

These meetings were very well accepted so it was decided to continue these meetings and somewhat replace the General Foreman's Safety Meetings. The General Foreman's Meetings in the future will cover only subjects which apply to all employees.

A total of sixteen meetings were held at the individual properties and will be continued in the future.

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Mining Club

This annual meeting was again cancelled because of a lack of accomodations for such a large group. It seems we shall have to wait until after the war before another meeting can be held.

Lake Superior Mining Section, National Safety Council

The writer attended three of these meetings at Duluth, Minnesota during January, June and September. A fourth meeting was held at Ishpeming, Michigan, October 25, 1944. The section holds meetings on each of the ranges for the special benefit of the particular mining range. These are very well attended and interesting. At the Duluth, Minnesota meetings usually the attendance is mostly safety engineers and operators. Our company sponsored the October 25th meeting at Ishpeming which was attended by 55 persons. This number could have been doubled but the hotel could not handle more.

The annual meeting held in Duluth, Minnesota attracted over 600 mining men which was the largest attendance since the mining section was first organized.

Mr. C.W. Allen presented a paper on "Safety Practices used in Sinking the Mather Shaft" which was well received.

The writer was a member of the Exhibits Committee and during the meeting was elected chairman of the same committee. The company was represented by six men from the Marquette Range and 17 from the Mesaba Range.

National Safety Council

This meeting, held in Chicago, Ill., was attended by S.W. Sundeen, Supt., Cliffs Shaft Mine, H.F. Rogers and myself of the Safety Department, Marquette Range and Mr. George Whittington of the Mesaba Range.

This meeting was a very instructive one and better than usual because of the coal mining being separated from the mining section. The meeting was held October 3 - 5th.

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Safety Banner Flags

Best safety records of the year went to the Cambria-Jackson, the Tilden and the Cliffs Power and Light Company. The severity rating for these three operations was very good. In fact, the Tilden Mine and Cliffs Power and Light Company had perfect records. It is interesting to note that the severity rating of 14 operating properties was excellant when compared to other similar operations.

Following are listed the winners of the Banner Flags:

Underground operation - Cambria Jackson Mine -	Severity Rate	0.56
Open Pit operation - Tilden Mine -	" "	0.00
Independent Unit - Cliffs Power & Light Co.	" "	0.00

Miners' Safety Bulletin

The Bulletin was issued four times during the year to all employees. A number of the articles written for the Bulletin were reprinted in a number of other safety magazines in the district and also in "Mining Safety" magazine of the National Safety Council.

Foreman's Bonuses

A total of $6,386.70 was paid to 115 foremen participating in the Safety Bonus plan. $163.92 was the amount lost to the foremen because of failure to maintain the companys' safety standards.

Table XIX shows distribution of bonuses by mines and operations and table XX gives the occupations of those participating.

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TABLE XIX

SAFETY BONUSES PAID TO FOREMEN

Mine or Plant	Amount	Men Participating	Amount of Penalties Imposed
Athens	$ 806.57	15	28.78
Cliffs Shaft	1,172.19	15	14.17
Lloyd	671.78	11	43.77
Maas	1,115.65	14	6.79
Mather	370.97	13	4.00
Negaunee	965.44	13	32.29
Spies-Virgil	217.49	6	5.26
Princeton	356.35	9	2.30
Cambria-Jackson	522.32	11	26.56
General Storehouse	103.98	4	--
C.P. & L. Co.	83.96	4	--
Totals	$ 6,386.70	115	163.92

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TABLE XX

OCCUPATIONS OF MEN PARTICIPATING IN BONUS

Title	Athens	C.S.	Lloyd	Maas	Mather	Neg.	Spies Virgil	Prince-ton	Camb. Jack.	Gen. Sthse. & Shops	C.P. & L.	Total
Shift Boss	9	10	7	10	5	10	2	3	4			60
Mechanic Foreman	1	1	1	1	1	1	1	1	1	1		10
Elect. "	1	1	1	1	1	1	1	1	1		2	11
Surface "	1	1	1	1	1	1	1	1	1			9
Timber "	1	1	1	1	1	1	1	1	1			9
Garage "										1		1
Scraper "		1										1
Trammer "	2							3	3			8
Pipe Line "											2	2
Carpenter "										2		2
Totals	15	15	11	14	9	14	6	10	11	4	4	113

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d. Ventilation

In order to operate most mines, adequate ventilation must be provided to insure efficiency and lessen hazards. In some cases, natural ventilation is probably enough but in a great majority of cases, large power fans must be installed. Very few of the older mines were planned to include ventilation but at the present time, most mines are provided with main mine fans and air raises have been driven in the foot rock to carry air to every working place in the mine. It is a common agreement among ventilation engineers that at least 3,000 c.f.m. should be provided for rock headings, shaft work, etc. and at least 500 c.f.m. should be provided for ore headings, contracts, etc. This amount of air is needed to drive out smoke and gas from blasting, provide fresh air for better work conditions and dilute and carry away dangerous dusts. In case of fire, approach to the fire can be made with little trouble, also if the ventilating currents are strong enough and a fire should break out, men in the mines can usually get out to surface and safety because the heat of the fire cannot reverse air currents. With all this in mind, the safety department has continually kept a check on ventilation conditions in all the company mines. All of our rock headings have been well ventilated and most ore places have been fair but indications are that a number of our mines need better ventilation in mining contracts.

The safety department, with the cooperation of the engineering department, have made two ventilation surveys of each mine during the year. Reports of the surveys with recommendations have been sent to the superintendents.

Mr. Edward Urban, Field Engineer, Saranac Laboratory, also has assisted with ventilation surveys and dust control.

Following is a brief summary of ventilation at each mine, the number of c.f.m. delivered and a few comments on conditions.

Athens Mine — Mine fan delivering 66,000 c.f.m. Drive pulley on motor had been changed so the fan would deliver less air. Air raises between 6th and 4th levels almost closed due to caving ground. New raises will soon

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d. Ventilation (Cont'd.)

be completed.
Distribution of air - good, except above 4th level where conditions were from fair to poor. These conditions should be corrected by February 1945 when new raises are completed.

Cambria-Jackson — Fan delivering approximately 17,000 c.f.m. Distribution good except for west end of 7th level but total air is insufficient for size of mine. Present plans are for larger fan and connection to Mather Mine through which air will be taken instead of old caves now being used.

Cliffs Shaft — 50,000 c.f.m. during cold weather. Natural ventilation. Insufficient volume for mine this size. Should have large fan for quick removal of smoke after blasting. Most blasting now done at end of shift but with fan, could probably be done at any time of shift.

Lloyd Mine — Fan delivering 18,000 c.f.m. Very well distributed but in need of a larger fan. Dust counts in ore somewhat high with high silica content.

Mather Mine — Fan delivering 36,000 c.f.m. well distributed. This is a temporary set-up to be used as mine is developed. Large fan will be installed when necessary.

Maas Mine — 50,500 c.f.m. return air from the Negaunee Mine which carries much smoke and dust. Water sprays in Negaunee connections should be kept in better condition to knock down more of the smoke, gas and dust. Air is poorly distributed. Air raises in rock badly needed.

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d. Ventilation (Cont'd.)

Negaunee Mine — 66,000 c.f.m. delivered by mine fan. Well distributed except a portion of 13th level workings which is badly crushed. Life of mine short so ventilation raises would be expensive. Auxiliary fans can be used on the 14th level to distribute air to contracts above level in need of ventilation.

Princeton Mine — 23,500 c.f.m. delivered by fan. Air very well distributed through mine. Fan of insufficient size to keep #3 shaft up-cast to prevent freezing. Fan of 40,000 c.f.m. capacity had been recommended.

Spies-Virgil — Fan being used, originally bought for the Lloyd Mine, of 40,000 c.f.m. capacity. Because of fire at the Virgil, this fan was installed to help conditions. 9,000 c.f.m. now being taken through Virgil workings and is sufficient for present operations. Fan being used in new development at the Spies delivers 3,000 c.f.m. which joins air from Virgil giving a total of 12,000 c.f.m. Distribution of air and conditions good. Because of sulphur fires in old stopes in Virgil Mine and small cross section of airways for return air, ventilation system must be watched closely at all times.

Dust Elimination and Analysis

To eliminate the dust hazards in the company operations, a number of things must be done. In underground workings, the first and most important thing is to have enough air in circulation to dilute the dust to a point where it is harmless to a person. This usually means a good mine fan to bring enough air into the mine, and then the use of auxiliary fans to carry the air into dead ends and the source of dusts. To assist these ventilating air currents, water blasts are used to knock down a great portion of the dust caused by blasting. Then to clean the air, which must be used in other parts of the mine,

11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Cont'd.)

water sprays are used. These are all simple methods of dust elimination but require constant watching and supervision. The desirable limits of dust particles in the mine are not more than a total of 10,000,000 in ore and not more than 5,000,000 in rock. Some companies try to keep all totals below the 5,000,000 mark. With the exception of the Lloyd Mine, the average silica content of our ore is approximately 4½ per cent and average silica in rock about 48 to 50 per cent. The Lloyd Mine silica content of the ore is very high which means there should be greater dilution of dust in all ore contracts by using more air than the average mine. It is generally conceded that the total silica in any work place should never exceed 5,000,000 particles but to be within reasonable safety limits, the silica should not exceed 2,000,000. Apparently, some persons are more suseptable to the effects of silica dust than others so it seems almost impossible to set a correct upper limit of particles per cubic foot. The only reasonable method is to keep the dust down to the lowest possible limit, use all protective devices possible and allow men to work in dusty places only a limited amount of time. Occupational Disease laws are becoming stricter all the time so it seems to be a good policy to keep ahead of the law makers by using the best of preventative measures.

Dust counts taken in our mines have showed a decided improvement and our averages are very good with possibly one or two exceptions. In rock headings where our standard ventilating system has been used and kept in good condition, the dust counts have been excellant.

A brief explanation of dust count averages in ore and rock in table XXV follows.

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d. Ventilation (Cont'd.)

The following tables give location and various occupations where dust counts were taken, also total averages of counts since 1933 when the first counts were made.

TABLE XXI

Dust Samples Collected in Rock and Ore Work

Mine or Plant	1944 In Ore	1944 In Rock	Total 1944	Total 1933 -- 1944
Athens	3	48	51	436
Cliffs Shaft	20	59	79	1,293
Cambria-Jackson	11	27	38	46
Lloyd	9	21	30	440
Maas	9	33	42	460
Mather	4	50	54	209
Negaunee	18	20	38	630
Princeton	11	25	36	59
Spies-Virgil	-	26	26	60
Tilden	-	-	-	21
Miscellaneous	-	*15	15	111
Totals	85	324	409	3,765

* C.R.C.

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TABLE XXII

VARIOUS OCCUPATIONS WHERE DUST SAMPLES WERE COLLECTED

Occupation	Athens	Cliffs Shaft	Camb. Jack.	Lloyd	Maas	Mather	Neg.	Prince-ton	Spies Virgil	Totals
Drilling	29	61	20	14	23	27	18	8	6	206
Scraping	18	11	5	4	12	6	14	18	-	88
Using loader to fill cars	1	2	6	4	-	16	-	3	20	52
Blasting	-	-	5	3	2	2	2	-	-	14
Timbering	2	-	-	-	2	-	1	1	-	6
Hand shoveling	-	-	-	-	-	-	-	3	-	3
Breaking chunks	-	-	-	-	-	-	-	1	-	1
Barring back	-	-	1	1	-	-	-	-	-	2
Blowing cars	1	-	1	-	-	-	-	-	-	2
Loading cars at chute	-	-	-	2	-	-	-	-	-	2
General mine air	-	2	-	-	-	-	-	1	-	3
Rigging machine	-	-	-	-	1	1	-	-	-	2
Charging holes	-	-	-	-	2	1	3	-	-	6
Drilling timber	-	-	-	-	-	-	-	1	-	1
Blowing drill holes	-	1	-	-	-	1	-	-	-	2
Crushing plant picking belt	-	2	-	-	-	-	-	-	-	2
Change house	-	-	-	2	-	-	-	-	-	2
Totals	51	79	38	30	42	54	38	36	26	394

TABLE XXIII

AVERAGE LIGHT FIELD COUNT OF ALL SAMPLES TAKEN

Mine or Plant	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944
Athens		32.90	14.12	28.32	26.69	12.85	12.59	9.89	7.28	25.80	4.90	8.33
Cliffs Shaft	17.94	14.56	8.29	8.98	15.53	9.86	10.36	7.77	8.18	7.55	5.99	6.23
Cambria											12.10	6.21
Lloyd		9.90	12.42	39.25	20.25	10.84	13.47	11.73	8.05	6.95	5.01	14.45
Maas		7.46	27.55	35.75	150.98	11.24	36.90	8.71	17.29	8.46	12.48	8.78
Mather									2.42	5.58	6.64	7.57
Negaunee		53.80	17.77	33.25	59.06	56.26	25.49	10.79	14.02	17.02	4.65	11.81
Princeton											10.59	6.32
Spies Virgil					70.61	26.99	1.80	8.40	6.97			5.59
Tilden				67.52	285.27	74.60	60.40		49.60			
Gardner Mackinaw		27.77		8.61	48.53							
Miscellaneous			8.66	3.00	6.80	14.73				3.00		

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d. Ventilation (Cont'd.)

TABLE XXIV

COMPARISON OF DUST COUNTS

IN RAISING TO DRIFTING

Mine	Average in Raising	Average in Drifting	General Average
Athens	18.00	6.63	8.33
Cliffs Shaft	10.75	3.11	6.23
Cambria-Jackson	8.42	5.12	6.21
Lloyd	28.06	10.79	14.45
Maas	--	9.80	8.78
Mather	--	7.57	7.57
Negaunee	80.49	6.24	11.81
Princeton	10.18	5.80	6.32
Spies-Virgil	--	5.59	5.59

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d. Ventilation (Cont'd.)

TABLE XXV

AVERAGES IN ORE COMPARED TO AVERAGES IN ROCK

Mine	Average in Ore	Average in Rock	General Average
Athens	5.83	9.59	8.33
Cliffs Shaft	9.05	5.01	6.23
Cambria-Jackson	7.70	5.60	6.21
Lloyd	23.48	5.43	14.45
Maas	3.44	10.24	8.78
Mather	13.97	6.45	7.57
Negaunee	17.39	6.24	11.81
Princeton	5.78	6.49	6.32
Spies-Virgil	--	5.59	5.59

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d. Ventilation (Cont'd.)

Athens Mine

Average count in ore 5,830,000. The ore carries a high moisture content and is very sticky. Any dust is quickly diluted by large quantities of air which is available in this mine.

Average count in rock 9,590,000. This high count is because of poor ventilation of rock headings, failure to keep vent-tube close to the breast of heading, re-circulation of air by wrong location of auxiliary fan and failure to wet down broken rock.

Cliffs Shaft

Average dust count in ore 9,050,000. This is a fine average and is due mainly to wet drilling.

Average count in rock 5,010,000. Again this is a fine average and is again due to wet drilling, plus wetting down broken rock, water sprays and ventilation of headings with auxiliary fans.

Cambria-Jackson

Average count in ore 7,700,000. Very good average due to moisture in ore and well distributed ventilation.

Average count in rock 5,600,000. This count must be considered as good because when first samples were taken, the standard ventilating set-up was not in use. Standard equipment used later was an auxiliary fan drawing air from the breast, a water blast and an air mover.

Lloyd Mine

Average dust counts in ore 23,480,000. This high count because of dryness of ore and lack of great enough volumes of air to dilute dust. Air in the mine is very well distributed but main mine fan is not large enough. A fan originally bought for the Lloyd Mine is now used at the Spies-Virgil. This fan has a 40,000 c.f.m. capacity compared to only 18,000 c.f.m. capacity of fan now in use.

Average dust count in rock 5,430,000. These counts are held within good standards by use of auxiliary fans,

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d. Ventilation (Cont'd.)

water blasts, water curtains, wet drilling and wetting down.

Silica content of both rock and ore in Lloyd Mine is high and requires constant supervision.

Maas Mine

Average dust count in ore 3,440,000. Low count comes mainly because most of the ore body is wet.

Average dust count in rock 10,240,000. Failure to provide adequate ventilation, wetting down and water blasts.

Mather Mine

Average dust count in ore 13,970,000. All ore counts were taken in main drift headings. Because of the difficulty of handling ore when wet, the blasted material was not wet down. Silica content was not high and no hazard was involved.

Average dust count in rock 6,450,000. Two or three high counts taken when ventilation conditions were poor when cutting for new shaft stations, brought the average up considerably. This is a condition hard to avoid. Normal counts were very favorable. All modern means of dust allaying used in all rock headings.

Negaunee Mine

Average dust count in ore 17,390,000. Nearly all Negaunee Mine ore is dry and dusty. Ventilation is very good in the mine except for a portion of the 13th level where airways were permitted to crush badly. Higher dust counts came from this area. Silica content is low.

Average dust count in rock 6,240,000. Very little rock work was done in the mine so first class ventilation of headings were not attempted. Count is not unreasonably high.

Princeton Mine

Average dust counts in ore 5,780,000. This low count because of sticky moist ore.

Average count in rock 6,490,000. This average is not

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d. Ventilation (Cont'd.)

too bad but some of the counts in rock headings and raises were consistently too high and brought up the average. There was some failure in providing good ventilation and water.

Spies-Virgil Mine

There was but very little work in ore and no dust samples were taken.

Average dust count in rock 5,590,000. Before adequate ventilation system could be installed, there were a number of high counts. After fan, water blast and air mover were installed, the conditions were ideal. The ventilation system used in the 4th level development was a standard set-up and was kept in first class condition at all times. It would be next to impossible to have better conditions.

Besides giving employees protection as already mentioned, they are also furnished with respirators which should be used at all times in rock work. As we know that some men will not wear the respirators when not watched, we must try to protect ourselves by protecting the employee with the best of dust allaying methods.

All dust count analysis are sent to the superintendent and recommendations made when necessary.

A field representative of the Saranac Laboratory also receives a copy of our analysis and he also assists and checks our work on ventilation and dust allaying.

The savings in dollars and cents to the company in dust elimination work cannot readily be made. It would take years to show any decrease of the effects of silica on a persons lungs. Some men show the effects very quickly and others not for many many years. Also, some men now showing increases probably were affected many years ago when there was hardly any effective dust elimination work done in the mines.

Through dust elimination work in the mines, we do know that it has increased the efficiency of the operations in that the men

11. ACCIDENTS AND PERSONAL INJURY

d. Ventilation (Cont'd.)

have better working conditions, instead of waiting one or two hours before returning to work after blasting they now return in about fifteen minutes so there is a great savings in time. Very few if any of the men develop headaches from gases. There are very few accidents mainly because the air is clear so the men can see plainly what they are doing.

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e. Mine Safety and Mine Rescue Courses

First Aid Training

This course was conducted by U.S. Bureau of Mines representatives, H.B. Humphrey, Mng. Engr. and M.L. Williams, Ass't. Engr. Mr. Hill, Mr. Rogers and myself assisted these men during all classes and also had complete charge of classes in the absence of the Bureau of Mines instructors. Classes were held at Gwinn, Negaunee, North Lake and Ishpeming on the Marquette Range. The course was offered employees of the Spies-Virgil Mine but attendance was only four men for two classes so it was cancelled.

Attendance was voluntary. 211 employees completed the course and were recommended for certificates. About 56 employees took part of the course and were not recommended.

All departments and mines and the Cliffs Power and Light company were represented at the classes.

Mine Rescue Training

This training was conducted by Mr. H.F. Rogers, Mr. T.W. Hill and myself of the Safety Department and examinations were by Max Petersen, Mng. Engr., U.S. Bureau of Mines. The men all passed tests in Mine Rescue but some were not certified by the Bureau representative because applicants were not up to physical standards. Three were eliminated by the Safety Department because of nervousness, too fast heart beat and nausea caused by rubber mouthpiece.

Table XXVI lists men available at each mine.

TABLE XXVI

MEN TRAINED BY THE SAFETY DEPARTMENT AND EXAMINED BY U.S. BUREAU OF MINES 1944

Athens Mine	18	Lloyd Mine	15
Negaunee Mine	14	Princeton Mine	11
Maas Mine	16	Cliffs Shaft	17
Spies-Virgil Mine	10	Cambria-Jackson	19
Mather Mine	10	Engr. Dept.	3

Total certified by the U.S. Bureau of Mines 133

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

TABLE XXVII

FIRST AID SUPPLIES DISTRIBUTED

Material	Number Distributed
Merthiolate Pads	35,630
Ounces of Merthiolate	251
1" Roller Bandage	332
2" " "	373
3" " "	238
Rolls of Adhesive Tape	46
Picric Gauze	273
Plain Gauze	607
Leather Finger Cots	226
Merthiolate Applicators	1,056
Ozs. Aromatic Spirits of Ammonia	8
Tubes of Unguentine ($\frac{1}{2}$oz)	30
Ozs. Absorbent Cotton	6
Triangular Bandages	8
Pairs of Scissors	2
Totals	39,086

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

Lecture "Magic of Fire"

Lecture Demonstrations on the "Magic of Fire" were held at Gwinn, Negaunee, Ishpeming, North Lake and Mineral Hills, Michigan for employees. Because of a request received after the first demonstrations had been held the Lecture Demonstration was again held at the same locations for the public and some of the public schools.

The lecture demonstration showed all the hazards of fire, how fires and explosions start and methods of extinguishing. The lecture was in the layman's language and all demonstrations were plainly visable as all fires and explosions were propagated inside glass containers.

Job Relations Training

Mr. Herbert Carr, War Manpower Commission, Training Within Industry, trained 125 of the company supervisors in Job Relations.

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f. Miscellaneous

Stench Warning Tests

These tests were run at the Lloyd, Maas, Princeton and Athens Mines and all of them were successful.

1,000 c.c. of Ethyl Mercaptan was used in each test and seemed sufficient for even a mine as large as the Maas. Men were posted at various parts of the mine to check the time when the odor was first detected. Time required for the Stench to come through compressed air lines and ventilating current ranged from two to approximately ten minutes.

Tests will be run at the various mines at regular intervals to assure us that the Stench Injection Device is working properly and to acquaint the men with the odor and the purpose.

Cambria-Jackson Mine Fire

A small fire occurred in number 10 contract, #601 raise, 200 feet above the 6th level. The only material burned was part of a timber leg and cap and the lagging on one side of the timber set along with a short portion of the electric cable which furnished power for the contract.

The mine was idle during the day with the exception of repair gangs, timber hoisters and pumpmen. Three gangs of repair men had been working in the vicinity where the fire occurred and some timber hoisting had been done. This required the use of power on the sub-level.

The circuit breaker for the power cable in #601 raise is located in the main drift at the bottom of the raise. At the top of the raise, the power cable had been caught and squeezed between the timber set leg and a prop which had been placed under the cap of the same set. The cable finally shorted at this point and started the fire. The circuit breaker did not throw out until some time later.

At about 3:15 P.M., the men who had been working on the sub climbed down and noticed for the first time that the circuit breaker was out. They also noticed smoke and reported to the shift boss. Men working below the 6th level also smelled and could see smoke as they were returning to the shaft at the end of the shift.

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f. Miscellaneous (Cont'd.)

The shift boss, Ed. Anderson, hurried into #601 raise and found smoke rolling out of a number of raises on the 6th level. He immediately turned off the power and this in turn stopped the main mine fan. The alarm was then sent out.

I was called at about 3:50 P.M. and in turn called Mr. H.F. Rogers and Mr. Tom Hill of the Safety Department. I arrived at the mine at about 4:20 P.M. and already some mine rescue men were present. Mr. Rogers arrived with Oxygen apparatus at 4:35 P.M. and at 5:00 P.M. the men started the first trip to the 6th level. They made a thorough inspection of the level first and then reported to surface. Smoke was already clearing on the level. The second trip was started at about 6:10 P.M. The pumps on the 4th level were put into operation. The fresh air base was established just outside of #601 raise where one crew waited while a second crew climbed #622 raise to the 300 sub. From there they walked through clear air to the #601 raise and found the fire was out. Tests were made for Carbon Monoxide during the trips and at one point at the far end of the main level, there was approximately 0.3% Carbon Monoxide (0.5% is fatal).

After discussing conditions with Mr. Trosvig and Mr. Tregoning, it was decided not to start the fan until the next day (Sunday) at which time CO and Oxygen tests could be made in all parts of the mine. This was the plan followed.

There is some question as to the value of a circuit breaker to prevent fires. It happened to be one of the main subjects at the Chicago Meeting of the National Safety Council where many mining men told of mine and other fires starting because circuit breakers did not throw out when there was only a small short circuit.

The fire at the Cambria-Jackson Mine could have been a rather bad one but the entire mining area above the 6th level is dead ended and therefore as soon as the fan was stopped, the natural ventilation air current shorted past the area. Oxygen was soon so low that there was not enough to support combustion.

The supervising officials at the Cambria-Jackson Mine should be congratulated for the quick action taken during this fire.

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11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous (Cont'd.)

Carbon Monoxide Gas in Brownstone Shops

Carbon Monoxide gas was inducted into the shops because of holes burned through the bottom of the heating boiler. When the stoker was operating the fan in the stoker forced burning coal through the holes in the boiler and through cracks in the concrete foundation. The gas then spread under the floors of the shops.

For a number of days before the trouble was detected, men in the shops suffered from headaches and finally one of the men collapsed and was taken to the hospital. No tests for CO were made of the mans' blood but it is certain that it was CO as was later proved by tests for CO in the shops. The Safety Department had not been notified up to this time. From the symptoms, it was assumed to be CO so tests were made with the departments' CO Indicator. These tests showed from .01 to .07 per cent Carbon Monoxide (.5% is fatal). Investigation showed the afore mentioned trouble with the boiler. A grouting machine was used to force cement under the floor of the boiler house and this took care of the trouble. Permanent repairs to the boiler will be made when weather permits.

Exhibits of Safety Devices

Fifteen safety devices made up in our own shops and thought up by employees were exhibited for a week at each mine and the shops. The idea was to acquaint all employees with the safety devices not already in use at his mine or shop and to encourage men to express their ideas of safety devices. Most of the devices are not only used to prevent accidents but also are labor savers.

Mine Rescue Station

Equipment kept at the Mine Rescue Station, which is located at the Negaunee Mine, as well as equipment kept at various properties, is inspected and repaired,if necessary, at least onee each month. The station is also used for training purposes and Foremans meetings.

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11. ACCIDENTS AND PERSONAL INJURY

f. Miscellaneous (Cont'd.)

Mine Rescue Station (Cont'd.)

The station is very well equipped for nearly any emergency which may occur.

The U.S. Bureau of Mines has inspected our station and equipment and has given it a high rating.

Summary

Our accident rate for the year of 1944 is not as good as desired and can and should be improved. It is better in both frequency and severity than our 1943 record. Compared to National Metal Mining Rates of 1943, our records look very good but I feel convinced that we can improve on our rates with but very little effort on the part of each employee.

During 1945, the Safety Department personel shall concentrate more on those hazards which caused the majority of the accidents in 1944 and this work alone should improve our accident rates.

Table XXVIII compares our frequency and severity rates with present available rates. National, District and County rates are not yet available for 1944.

TABLE XXVIII

INJURY RATES AND SEVERITY OF INJURIES

	Frequency	Severity
Metal Mining, National Rate 1943	45.56	8.23
" " " " 3 yr. average 1941 - 1943	24.51	7.08
Cleveland Cliffs Iron Company 1943	20.30	3.986
Cleveland Cliffs Iron Company 1944	15.61	3.24

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EXPENSES FOR YEAR 1944

Salaries	11,644.75
Auto Expense	281.08
Furniture & Fixtures	52.14
Heat, Light & Power	2.50
Insurance	15.03
Postage	6.16
Stationery & Printing	272.75
Supplies	74.95
Traveling & Entertainment	729.90
Telephone & Telegraph	25.96
Unemployment Insurance Tax	141.52
General - Unclassified	292.75
Old Age Benefit Tax	108.88
Depreciation	199.84
Total	13,848.21

Respectfully submitted,

A.J. Stromquist
Director of Safety

ANNUAL REPORT OF THE MINING ENGINEERING DEPARTMENT FOR THE YEAR ENDING DECEMBER 31, 1944

The regular books of photographic maps and sections comprising the map report for the year 1944 accompany this report. The maps show in color the areas in the operating mines where mining operations and development was conducted during the year. The sections are of the Minnesota open pit properties and also show in color, the remaining material left in place adjacent to the open pits. There are also views of some of the properties. Books have been prepared for the different companies interested in the various mines and 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, Cambria-Jackson, Cliffs-Shaft, Hill-Trumbull, Holman-Cliffs, Lloyd, Maas, Mather, Morris, Negaunee, Pontiac, 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
Teal Lake Iron Mining Company	Cambria

There were two bound volumes made for The Cleveland-Cliffs Iron Company, - one for the Cleveland office and one for the Engineering Department at Ishpeming. One bound volume and two loose-leaf books were prepared for the Canisteo Mining Company. One loose-leaf book was prepared for each of the partners in the Mesaba-Cliffs Mining Company and an extra copy for the Republic Steel Corporation. The books for the Bethlehem Steel Company and Pickands Mather and Company were also loose-leaf books.

There were similar loose-leaf books made for the fee owners and superintendents as follows:

Person	Mines
Arthur Iron Mining Company	Hill-Trumbull and North Star-Bingham Lease of Holman-Cliffs
Walter A. Sterling, District Supt.	Canisteo, Hill-Trumbull, Holman-Cliffs and Pontiac
H. C. Bolthouse, Supt.	Hill-Trumbull and Holman-Cliffs
W. A. Pakkala, Supt.	Canisteo
H. O. Moulton, Supt.	Maas
O. Marjama, Supt.	Lloyd and Spies-Virgil
F. J. Haller, Supt.	Mather
S. W. Sundeen, Supt.	Cliffs-Shaft
W. R. Atkins, Asst. Supt.	Negaunee
C. R. Sundeen, Asst. Supt.	Athens

B. MAP REPORTS

At the end of each month, two sets of blueprints of mine maps of the Michigan Mines, scale 1" = 50', were prepared, showing in red the areas mined during that month. One of these sets was for the Assistant Manager and the other for the Mine Superintendent. Maps of the Cliffs-Shaft Mine are posted four times a year, instead of monthly, and sets are made for the Assistant Manager and Mine Superintendent.

Other sets of blueprints of Michigan Mines were prepared for fee owners and others, as follows:

ATHENS MINE

Each month, except December, 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. There was no work done on the Corbit Lease during the year so no maps were sent to the trustees of the Maria Corbit estate.

CLIFFS-SHAFT MINE

Two sets of white prints of the geological maps of the Bancroft and Section 10 Leases, scale 1" = 50', were prepared for the Oliver Iron Mining Company after each quarterly survey, - one for the Ishpeming office and one for the Duluth office. These maps showed in red the work done since the previous survey. The maps at the end of the year showed in red the work done during the entire year, as well as the areas used in making the estimate of the ore reserves for the Michigan State Tax Commission. Two copies of the estimate of ore reserves of the Bancroft and Section 10 Leases as of Dec. 31, 1944, prepared for the Michigan State Tax Commission, accompanied the maps for the end of the year.

MAAS MINE

Each month, a set of blueprints, scale 1" = 50', of the Maas Mine underground maps was sent to Mr. R. C. Miller of Negaunee, Michigan showing in red the workings in the Maas Mine during the month. There was comparatively little work done on the Roman Catholic Cemetery Lease during the year but blueprints of that portion of the mine were sent to Mr. R. S. Archibald, Negaunee, Michigan for the months in which mining was done.

NEGAUNEE MINE

A set of blueprints of the working tracings of the Negaunee Mine maps, scale 1" = 50', were sent to Mr. R. C. Miller, Negaunee, Michigan showing in red the areas mined during the month. At the end of the year, 15 sets of Annual Map Reports of the 9th, 13th and 14th Levels were forwarded to the fee owners of this property. A set of white prints of the North-South cross-sections affected by mining in 1944, scale 1" = 50', of the Negaunee Mine were sent to Mr. W. L. Cunings, Geologist for Bethlehem Steel Company, Bethlehem, Pennsylvania.

SPIES-VIRGIL MINE

Five sets of blueprints of the Virgil Mine working maps, scale 1" = 50', were sent quarterly to the fee owners of the Virgil property showing the areas mined during the previous three months. Five sets of these maps were sent for the first three quarters of the year and six for the last quarter.

MICHIGAN STATE TAX COMMISSION

Estimates of ore reserves, as of Dec. 31, 1944, in the Athens, Cambria-Jackson, Cliffs-Shaft, Lloyd, Maas, Negaunee, Princeton and Spies-Virgil Mines were made for the Michigan State Tax Commission. Accompanying these estimates of ore reserves were Annual Report Maps of each of the mines showing the areas used in compiling these estimates and the general geological structure adjacent to the areas mined, during the year. The estimate of the Mather Mine was made in sections instead of plan maps, as was done with all the other mines. Two sets of these estimates were prepared, - one for the Tax Commission and one for the Engineering Department at Ishpeming, Michigan.

C. REMARKS ON MISCELLANEOUS DOCUMENTS AND ABSTRACTS

All documents affecting lands and rights held by the Company passed the Engineering Department for recording and approval. These documents were placed on the Department's records and initialed by Mr. Brewer. Documents that affected the disposal of Company lands were approved by the Geological Department and initialed by Mr. Derby. Copies of documents, except farm, garden and residence leases, which affect mineral lands, are kept on file in the Engineering Department.

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

Classification	Number Received	Last File Number
Mining Leases	0	76
Miscellaneous Documents	32	1547
Easements	1	422
Rights of Way	0	224
Water Rights	0	66
Surface Leases	187	5779
Applications for Sale	0	180
Sales	150	3260
Tax Histories	1	704

The following comments cover the various documents as listed above which were entered on the records in the Engineering Department during 1944:

MINING LEASES

There were no mining leases made or surrendered during the year.

No. 76 - Dean Mine. This lease was entered on the records during 1943 but copies were not received until 1944. The Dean Mine comprises the S½ of the NE¼, and the SE¼ of the NW¼ of Section 15, 58-19, Minnesota. Inland Steel Company owns a 3/4 interest and The Cleveland-Cliffs Iron Company a 1/4 interest. An operating agreement dated July 1, 1944 provided that beginning in 1944, The Cleveland-Cliffs Iron Company would operate the property.

MISCELLANEOUS DOCUMENTS

This is the general classification covering all documents that has to do with rights sold or acquired, affecting either the operating mines or mineral lands. There were 13 documents covering purchases in connection with the Carlson lands at the Spies Mine, comprising the NE¼ of the SW¼, Section 24,

43-35. There were 8 easements covering Minnesota property and 6 on Michigan lands. There were 5 documents covering houses in the City of Negaunee.

EASEMENTS

This heading concludes all rights acquired by the Cliffs Power and Light Company. There was one easement correcting the location of the transmission line to the Hoist Plant.

RIGHTS OF WAY

This file covers railroad rights of way.

WATER RIGHTS

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

SURFACE LEASES

These surface leases all originate in the Land Department and cover permits for use of Company lands such as residences, camps, farms, gardens, etc. All the occupied areas on the Cambria-Jackson Mine in Sections 35 and 36, 48-27, were put under lease during the year. The lots in the Austin Location where the houses were sold were put under a joint lease with the Escanaba River Land & Iron Company.

APPLICATIONS FOR SALE

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

SALES

This classification covers the transfer of property of all kinds. There were 32 Warranty Deeds covering sales of the lots in the Plat of Gwinn. A great many of the Company owned houses in mine locations were sold during the year, - 44 in the Austin Location; 8 in the Princeton Location and 7 in the Ravenna Location. There were 54 land contracts and 5 rights of way.

TAX HISTORIES

The tax history of the Johnson Lease covering the SW¼ of Section 19, 43-34, was placed on file during the year.

ABSTRACTS

There was no general work on abstracts done during the year.

D. THE FORCE

There were quite a few changes in the Engineering Department during the year. Messrs. Westwater and Sundeen were made Assistant Superintendents; Arvo E. Kujala, Engineer, left in July for the Navy; T. Adolph Kauppila entered the Department as Engineer in March; Edgar G. Curtis entered the Department in February as Surveyor and two new helpers were employed.

The following table shows the personnel of the Department during the year, their positions and period of employment:

Name	Position	Entered	Left	1944 Employment
Carl Brewer	Chief Mining Engineer			12 months
Arvo E. Kujala	Engineer		July 19	7½ "
Raymond L. Sunblad	Helper	July 24	Aug. 22	1 month
Curtis R. Sundeen	Engineer		Aug. 31	8 months
William M. Junttila	Helper		Feb. 29	2 months
James L. Westwater	Engineer		Mar. 31	3 "
Grant T. Hollett	Engineer			12 "
W. Harlow Stannard	Draftsman			12 "
T. Adolph Kauppila	Engineer	March 2		10 "
John M. Haivala	Engineer			12 "
Ernest A. Oja	Helper			12 "
Harry C. Swanson	Surveyor			12 "
Hugo H. Korpinen	Engineer			12 "
Maxwell H. Madsen	Engineer			12 "
Edgar G. Curtis	Surveyor	Feb. 1		11 "
John J. Dobson	Helper			12 "
Werner J. Anderson	Helper	Mar. 2		10 "
Clifford Amel	Helper	May 10		7½ "
Marie J. Nicholas	Stenographer			12 "
Elizabeth M. LaForais	Stenographer			12 "

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

Name	Date Entered	Length of Service
Carl Brewer	August, 1906	26 years, 3 months
Grant T. Hollett	August, 1940	4 years, 4½ "
W. Harlow Stannard	November, 1940	4 years, 2 "
T. Adolph Kauppila	March, 1944	10 "
John M. Haivala	March, 1943	1 year, 10 "
Ernest A. Oja	March, 1943	1 year, 9 "
Harry C. Swanson	June, 1943	1 year, 7 "
Hugo H. Korpinen	September 1942	2 years, 3½ "
Maxwell H. Madsen	September 1943	1 year, 4 "
Edgar G. Curtis	February, 1944	11 "
John J. Dobson	December, 1943	1 year, ½ "
Werner J. Anderson	March, 1944	10 "
Clifford Amel	May, 1944	7½ "
Marie J. Nicholas	March, 1943	1 year, 9½ "
Elizabeth M. LaForais	October, 1943	1 year, 3 "

The above "length of service" covers only the period that the men were employed in the Engineering Department.

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

Name	Days Worked	Days Sick	Days Absent
Carl Brewer	278	1	6
Grant T. Hollett	272½	2	13½
W. Harlow Stannard	268	1	12½

Name	Days Worked	Days Sick	Days Absent
T. Adolph Kauppila	232	-	6
John M. Haivala	270½	1	15
Ernest A. Oja	282	-	8½
Harry C. Swanson	283½	4	6
Hugo H. Korpinen	274½	2½	9½
Maxwell H. Madsen	281	-	8
Edgar G. Curtis	263½	1	1
John J. Dobson	277	2½	5½
Werner J. Anderson	225½	5½	-
Clifford Amel	179½	-	2½
Marie J. Nicholas	267	3½	11
Elizabeth M. LaForais	274	2	4½
Arvo E. Kujala	154½	1	5
Raymond L. Sunblad	24½	-	-
Curtis R. Sundeen	189	1	5½
William M. Junttila	45	-	2
James S. Westwater	48	-	-

The following table showing the distribution of time spent underground, in the field and in the office, covers only those who were engaged in the mapping and surveying in the mines:

Name	Underground	Field	Office	Total
Carl Brewer	6	57½	214½	278
Grant T. Hollett	115½	27	130	272½
W. Harlow Stannard	6½	14	247½	268
T. Adolph Kauppila	60½	52½	119	232
John M. Haivala	91½	21½	157½	270½
Ernest A. Oja	126	41½	114½	282
Harry C. Swanson	136½	66	81	283½
Hugo H. Korpinen	104	32	138½	274½
Maxwell H. Madsen	91	20½	169½	281
Edgar G. Curtis	126½	42	95	263½
John J. Dobson	125½	58½	93	277
Werner J. Anderson	76	49	100½	225½
Clifford Amel	27½	81	71	179½
Arvo E. Kujala	51½	16	87	154½
Raymond L. Sunblad	-	-	24½	24½
Curtis R. Sundeen	82	2	105	189
William M. Junttila	11	3½	30½	45
James S. Westwater	17½	1	29½	48
TOTAL	1,255	585½	2,008	3,848½
%	32.6	15.2	52.2	100.0

The following resume of the work done by the various men in the Department only mentions some of the special work that they did. Weekly inspections of all working places in the soft ore mines were made by the engineers, accompanied by either the mine captain or the shift boss. This has proved very beneficial to the operation of the mines and assisting in the general planning of mining and development. The engineers made the monthly map reports and

assisted the Superintendent in preparing their monthly reports. They also assisted the Superintendent in planning new development, and with the Geological Department in geologizing all underground workings. They made the estimate of ore in stock and the estimates of ore reserves. The reduction in the number of engineers necessitated a change in the underground surveying. Two survey crews of three men each were organized, - one under Mr. Swanson and the other under Mr. Curtis, - each having two helpers. These survey crews are responsible for giving lines and grades for new developments, surveying sub-levels, etc. as were required. The crew under Mr. Swanson took care of the necessary surveying at the Cambria-Jackson, Lloyd, Mather and Spies-Virgil mines and the crew under Mr. Curtis took care of the Athens, Maas, Negaunee, Princeton and Tilden mines. Mr. Madsen continued to do the surveying at the Cliffs-Shaft mine. The establishment of these survey crews has produced excellent results. It has relieved the engineer of this work which had become increasingly greater during these years of large underground development and construction.

CARL BREWER, Chief Mining Engineer, supervised the entire work in the office and general planning for surface and underground maps, surveys, etc. He assisted Mr. Westwater in making a study of the surface water situation at the Princeton mine. He prepared the tax list for the Mining Department and the Cliffs Power and Light Company lands. He spent considerable time on the abstracts and purchase of the lots in Carlson's Maple Valley Addition, City of Iron River, and the NE¼ of the SW¼ of Section 24, 43-35. He did some special work for the Cleveland office. He also compiled the Annual Report Books, Tax Commission Report, stockpile estimates and made some special reports on Company lands. At the end of the year, his title was changed to Recorder.

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

Property	Underground	Field	Office	Total	%
General Engineering	½	41	205½	247	88.9
Cambria-Jackson		3½	2	5½	2.0
Cliffs-Power & Light Co.		2	1	3	1.1
Cliffs-Shaft	1			1	0.3
Francis		1½		1½	0.5
Maas	½		1½	2	0.7
Mather	2			2	0.7
Princeton	1	5	2	8	2.9
Spies	1	4½	2½	8	2.9
TOTAL	6	57½	214½	278	
%	2.1	20.7	77.2		100.0

CURTIS R. SUNDEEN, Engineer, was in charge of the engineering work at the Maas mine until Aug. 31st. when he became Assistant Superintendent at the Athens mine. He spent a great deal of time in planning the development above the 6th Level Maas mine and the connection to the shaft.

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

Property	Underground	Field	Office	Total	%
Maas	76	1	104	181	95.8
Mather	1			1	0.5
Negaunee	5			5	2.6
Spies		1	1	2	1.1
TOTAL	82	2	105	189	
%	43.4	1.1	55.5		100.0

JAMES S. WESTWATER, Engineer, had charge of the Athens and Tilden mines until Feb. 28th when he became Assistant Superintendent at the Princeton mine. Most of his time, for the two months, was in connection with the estimates of ore reserves and Annual Report.

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

Property	Underground	Field	Office	Total	%
Athens	15½		21	36½	76.0
Mather	2			2	4.2
Tilden		1	8½	9½	19.8
TOTAL	17½	1	29½	48	
%	36.5	2.1	61.4		100.0

GRANT T. HOLLETT, Engineer, was in charge of the engineering work at the Mather mine throughout the year and at the Princeton mine until Sept. 1st and after Sept. 1st at the Cambria-Jackson mine. At the Mather mine, he supervised the construction of pockets and planned and watched the development of the main levels and mine areas. He was unable to spend as much time as necessary at the Princeton mine because of the pressure of work at the Mather mine.

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

Property	Underground	Field	Office	Total	%
General Engineering		2		2	0.7
Cambria-Jackson	10½	7	16½	34	12.5
Maas	1			1	0.4
Mather	73	16½	70	159½	58.5
Princeton	31	1½	43½	76	27.9
TOTAL	115½	27	130	272½	
%	42.4	9.9	47.7		100.0

HUGO H. KORPINEN, Engineer, had charge of the engineering work at the Lloyd and Spies-Virgil mines throughout the year. Both of these mines required a great deal underground attention throughout the year, - the former, because of the narrow and small deposits which required careful planning for development. The

new 4th Level drift at the latter also needed constant attention where he supervised the construction of the pocket and trench on both 8th Level Lloyd and 4th Level Spies.

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

Property	Underground	Field	Office	Total	%
Lloyd	55	2½	72	129½	47.2
Maas	1			1	0.4
Mather	1	1		2	0.7
Otis Steel Company		9½		9½	3.4
Spies	47	19	66½	132½	48.3
TOTAL	104	32	138½	274½	
%	37.9	11.7	50.4		100.0

JOHN M. HAIVALA, Engineer, in charge of the engineering work at the Cliffs-Shaft mine until March 1st and at the Athens from March 1st until the end of the year. Between March 1st and July 1st, he took care of the engineering work at the Tilden mine and in the middle of July, took over this work at the Negaunee mine. This change from the hard ore to the soft ore mines necessitated considerable time being spent underground to become familiar with these properties.

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

Property	Underground	Field	Office	Total	%
Athens	48½	7½	84½	140½	51.9
Cliffs-Shaft	17		22	39	14.4
Maas	1			1	0.4
Mather	2			2	0.7
Negaunee	23	1½	37½	62	22.9
Tilden		12½	13½	26	9.7
TOTAL	91½	21½	157½	270½	
%	33.8	8.0	58.2		100.0

ARVO E. KUJALA, Engineer, had charge of the engineering work at the Cambria-Jackson and Negaunee mines until the middle of July. He left the Department on July 19th and entered the service of the U. S. Navy.

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

Property	Underground	Field	Office	Total	%
Cambria-Jackson	17½	15½	42	75	48.5
Maas	1			1	0.7
Mather	3			3	1.9
Negaunee	30	½	45	75½	48.9
TOTAL	51½	16	87	154½	
%	33.3	10.4	56.3		100.0

MAXWELL H. MADSEN had charge of the engineering work at the Cliffs-Shaft mine most of the year, and now has a very comprehensive knowledge of this property. After Sept. 1st, he took over the engineering work at the Tilden mine.

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

Property	Underground	Field	Office	Total	%
Athens			3	3	1.0
Cambria	1			1	0.3
Cliffs-Shaft	86	10½	157	253½	90.2
Maas	2			2	0.7
Mather	1	2	1	4	1.4
Negaunee	1	½	½	2	1.0
Princeton			1½	1½	0.5
Spies		1	½	1½	0.5
Tilden		6½	6	12½	4.4
TOTAL	91	20½	169½	281	
%	32.4	7.3	60.3		100.0

T. ADOLPH KAUPPILA, Engineer, entered the Department on March 2nd as a Surveyor. He gave lines for development and ran surveys in the various mines. In the Spring, he made the surface surveys and completed the maps of the Cambria-Jackson mine comprising practically all of Sections 35 and 36 lying South of Teal Lake. Between July 1st and Sept. 1st, he had charge of the engineering work at both the Cambria-Jackson and Tilden mines. After Sept. 1st, he was in charge of the engineering work at the Maas and Tilden mines.

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

Property	Underground	Field	Office	Total	%
General Engineering		1½	14	15½	6.7
Athens	1	½		1½	0.6
Cambria-Jackson	12½	22½	27	62	26.7
Cliffs-Shaft	3½	1	2	6½	2.8
Lloyd	1			1	0.4
Maas	25	1	30½	56½	24.4
Mather	1		1½	2½	1.1
Morris			3	3	1.3
Negaunee	½		1	1½	0.6
Princeton	15	15	25½	55½	23.9
Spies	1	2	6	9	3.9
Tilden		9	8½	17½	7.6
TOTAL	60½	52½	119	232	
%	26.1	22.6	51.3		100.0

W. HARLOW STANNARD, Draftsman, was in the office most of the year making maps of the different mines, both working maps and for the Annual Report. He also posted the diamond drill records for the Geological Department, and assisted in underground and surface surveys. He made several mechanical drawings and

miscellaneous maps, during the year.

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

Property	Underground	Field	Office	Total	%
General Engineering		½	47	47½	17.5
Athens		1	10	11	4.1
Cambria-Jackson			50	50	18.7
Cliffs-Shaft			7½	7½	2.8
Geological Department			61½	61½	23.0
Lloyd		2	½	2½	.9
Maas	1½		26½	28	10.4
Mather	1		20	21	7.8
Negaunee		1	7½	8½	3.2
Otis Steel Co.		9½		9½	3.6
Princeton	4		11½	15½	5.8
Spies			6	6	2.2
TOTAL	6½	14	247½	268	
%	2.4	5.2	92.4		100.0

HARRY C. SWANSON, Surveyor, had charge of a survey party for making surveys, giving lines, grades, etc. at all the properties. After Sept. 1st, he and his crew confined his surveying to the Cambria-Jackson, Lloyd, Mather and Spies-Virgil mines. He did considerable mapping and assisted the engineers in planning underground developments.

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

Property	Underground	Field	Office	Total	%
General Engineering		10½	3	13½	4.7
Athens	8½		2½	11	3.9
Cambria-Jackson	2½	4½	7½	14½	5.1
Geological Department		3	½	3½	1.2
Lloyd	25½	3	12½	41	14.5
Maas	13½	½	3	17	6.0
Mather	40	22½	25½	88	31.0
Negaunee	1		½	1½	0.5
Princeton	18½		7½	26	9.2
Spies	27	22	18½	67½	23.9
TOTAL	136½	66	81	283½	
%	48.1	23.3	28.6		100.0

EDGAR G. CURTIS, Surveyor, entered the Department on Feb. 1st. Until Sept. 1st, he did general survey work at all the properties, working with the engineers. After Sept. 1st, he did all the surveying at the Athens, Maas, Negaunee, Princeton and Tilden mines. He assisted the engineers in mapping and planning underground developments.

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

Property	Underground	Field	Office	Total	%
General Engineering			7	7	2.7
Athens	18	1	13¾	32¾	12.4
Cambria-Jackson	3	3½	6	12½	4.8
Cliffs-Shaft	½	2		2½	0.9
Geological Department		3	½	3½	1.3
Lloyd	10		5½	15½	5.9
Maas	24	2	20½	46½	17.7
Mather	25	5½	12¾	43¼	16.4
Negaunee	5	½	4½	10	3.8
Princeton	29	11½	20¼	60¾	23.0
Spies	12	9	3¼	24¼	9.2
Tilden		4	1	5	1.9
TOTAL	126½	42	95	263½	
%	48.0	15.9	36.1		100.0

ERNEST A. OJA, Helper, assisted in the underground surface surveys throughout the year. He assisted chiefly in the work at the Cliffs-Shaft mine, - both in mapping and calculations of surveys.

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

Property	Underground	Field	Office	Total	%
General Engineering		½	47	47½	16.8
Athens	4	1	2½	7½	2.7
Cambria-Jackson	9	12	3	24	8.5
Cliffs-Shaft	74	7½	58	139½	49.5
Lloyd	4½	2½		7	2.5
Maas	7		1½	8½	3.0
Mather	12½	4½		17	6.0
Negaunee	3½			3½	1.2
Princeton	4	3		7	2.5
Spies	7½	7	2	16½	5.9
Tilden		3½	½	4	1.4
TOTAL	126	41½	114½	282	
%	44.7	14.7	40.6		100.0

JOHN J. DOBSON, Helper, assisted in underground and surface surveys throughout the year. In the office, he helped with the blueprinting and looked after the automobiles of the Department.

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

Property	Underground	Field	Office	Total	%
General Engineering		8½	91	99½	36.0
Athens	13			13	4.7
Cambria-Jackson	7½	7½		15	5.4
Cliffs-Shaft	4	½		4½	1.6
Geological Department		2		2	0.7
Lloyd	19	3		22	8.0
Maas	2½	2		4½	1.6
Mather	37½	12½		50	18.0
Negaunee	2			2	0.7
Princeton	16½	3½		20	7.2
Spies	23½	16½	2	42	15.2
Tilden		2½		2½	0.9
TOTAL	125½	58½	93	277	
%	45.3	21.1	33.6		100.0

WILLIAM M. JUNTTILA, Helper, assisted in underground and surface surveys and blueprinting in the office until March 1st when he returned to his regular job at the Tilden mine.

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

Property	Underground	Field	Office	Total	%
General Engineering			27½	27½	61.1
Athens	1			1	2.2
Cambria-Jackson	3	2½		5½	12.2
Lloyd	1½			1½	3.4
Maas			3	3	6.7
Mather	4½			4½	10.0
Princeton	1			1	2.2
Spies		1		1	2.2
TOTAL	11	3½	30½	45	
%	24.4	7.8	67.8		100.0

WERNER J. ANDERSON, Helper, entered the Department on March 2nd. He assisted in the underground and surface surveys and did a good deal of the blueprinting in the office.

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

Property	Underground	Field	Office	Total	%
General Engineering		2½	100	102½	45.5
Athens	9½	1		10½	4.7
Cambria-Jackson	4	18½		22½	10.0
Cliffs-Shaft	4½	3½		8	3.5
Geological Department		½		½	0.2
Lloyd	3			3	1.3
Maas	18½	2		20½	9.1
Mather	7	½		7½	3.3
Negaunee	5½	½		6	2.7
Princeton	20½	13½	½	34½	15.3
Spies	3½	4½		8	3.5
Tilden		2		2	0.9
TOTAL	76	49	100½	225½	
%	33.7	21.7	44.6		100.0

CLIFFORD AMEL entered the Department as Helper on May 10th. In the early part of the year, he assisted in the surface surveys and the blueprinting and calculations in the office. Because of his physical condition, he was not permitted to go underground until September when he was permitted to assist in underground main level surveying.

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

Property	Underground	Field	Office	Total	%
General Engineering		10	57½	67½	37.6
Athens	2½		4	6½	3.6
Cambria-Jackson	1½	19½	6	26½	14.8
Cliffs-Shaft		10	½	10½	5.9
Geological Department	1	4		5	2.8
Lloyd	1			1	0.6
Maas	4½	1	½	6	3.4
Mather	6½	8		14½	8.1
Negaunee	2			2	1.1
Princeton	6	8½	2½	17	9.5
Spies	2½	9½		12	6.7
Tilden		10½		10½	5.9
TOTAL	27½	81	71	179½	
%	15.3	45.1	39.6		100.0

MARIE J. NICHOLAS did much of the blueprinting, including almost all of the Annual Report. She assisted in the stenographic work for the Engineering, Geological and Safety Departments. She also did some drafting.

ELIZABETH M. LAFORAIS did the stenographic work for both the Geological and Engineering Departments for the entire year.

RAYMOND L. SUNBLAD, Draftsman, entered the Department on July 24th. During the month that he was in the Department, he was engaged in making hard maps and tracings of the maps in Sections 35 and 36, 48-27. He left the Department on August 22nd.

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

Property	Underground	Field	Office	Total	%
General Engineering			2½	2½	10.2
Athens			2	2	8.2
Cambria-Jackson			11	11	44.9
Maas			5	5	20.4
Mather			1	1	4.1
Princeton			3	3	12.2
TOTAL			24½	24½	
%			100.0		100.0

E. DISTRIBUTION OF TIME

Most of the work of the Department, during the year, has been in connection with the underground mining. The main surface work was the mapping of the Cambria mine, - both field work and completing the maps in the office. We were fortunate to get this work done before losing so many engineers from the Department. A little field work was done in connection with the triangulation system and in boundary line surveys.

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

Property	Underground	Field	Office	Total	%
General Engineering	½	56	837½	894	19.5
Athens	121½	12	143¼	276¾	6.0
Cambria-Jackson	72	101	171	344	7.5
Cliffs-Shaft	191½	35	247	473½	10.3
Lloyd	120½	13	90½	224	4.9
Maas	179	9½	196	384½	8.4
Mather	220	73	131¾	424¾	9.3
Morris			3	3	0.1
Negaunee	78½	4½	96½	179½	3.9
Princeton	146½	61½	117¾	325¾	7.1
Spies-Virgil	125	98	108¼	331¼	7.2
Tilden		51½	38	89½	1.9
Geological Department	1	10½	62½	74	1.6
Otis Steel Co.		19		19	0.4
Francis Mine		1½		1½	0.03
Cliffs Power & Light Co.		2	1	3	0.1
Stenography			541½		11.8
TOTAL	1256	548	2785½	4589½	
%	27.4	11.9	60.7		100.0

F. COSTS

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

	1942	1943	1944
Salaries	$21,913.49	$27,057.96	$30,138.74
Auto Expense	1,325.26	1,896.56	2,174.41
Furniture and Fixtures	193.90	76.08	47.30
Heat, Light and Power	625.49	671.07	563.04
Insurance	33.78	10.19	12.55
Postage	29.90	46.06	37.67
Repairs	885.08	466.43	68.62
Stationery and Printing	252.55	124.55	251.15
Supplies	2,497.84	2,934.60	3,532.24
Taxes	45.49	41.63	46.79
Travel and Entertainment	166.60	177.08	155.78
Telephone and Telegraph	120.38	128.58	199.44
Papers and Periodicals	10.25	11.50	10.07
Unemployment Insurance Tax	361.58	341.74	378.55
General - Unclassified	65.24	351.06	502.92
Old Age Benefit Tax	225.96	262.86	291.20
Depreciation	84.96	104.07	104.07
Equipment		88.91	15.09
TOTAL	$28,861.17	$34,806.06	$38,449.63

H. AUTOMOBILES

The Ford four-door sedan furnished by Four Wheels, Inc. was operated throughout the year. The Company-owned Ford and Chevrolet Station-Wagons also operated throughout the year. The Sedan is beginning to show its age and is seldom used for long trips.

The following table shows the mileage covered in 1944, the total mileage to the end of the year and the date the car was received in the Department:

	Miles		
Car	1944	Total	Date Received
Ford Sedan	5,130	34,273	Jan. 30, 1941
Ford Station-Wagon	6,000	26,352	Jan. 24, 1941
Chevrolet Station-Wagon	14,296	19,464	July 29, 1943

I. MINES

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

GENERAL

Owing to the shortage of engineers, it has become impossible to continue the weekly inspections of soft ore mines but these inspections have been continued just as frequently as has been possible, - averaging about three per month. The establishment of the two survey crews has given the engineers more time for these inspections and other work in connection with underground operations. Furthermore, many more surveys have been made and it has been possible to have more complete check surveys than for some time in the past. The maps of our underground workings of the various mines have received pretty hard usage and it is advisable that many of these be remade. It, however, has not been practical to do as much of this work as would have been desired. The new survey crews have assisted materially in locating and surveying underground drill holes for the Geological Department. The Engineers assisted the various superintendents with their Monthly and Annual Reports.

ATHENS MINE

The extreme limits of the caved area have not increased materially during the year although settlement is constantly going on and the cracks are becoming more connected and deeper. On June 8th, two wires were hung in the North skip to check the alignment of runners which had been tightened since the previous plumbing in August, 1943. This work showed that the runners were in very good alignment. The resumption of mining along the North footwall in the Northeast portion of the mine is liable to endanger the South steel stocking trestle. Subsidence pins were set between the caved area and the trestle to be checked semi-annually. Plans were prepared for the mining of ore on the Corbit Lease but actual mining had not started at the end of the year. The development of the area East of Block 4, 6th Level, was planned. Plans were prepared for mining in the zone that had been blocked off because of fire. Mining in Block 2 above the 9th Level had been stopped at the end of the year.

CAMBRIA-JACKSON MINE

Early in the year, the surveys in this mine were changed over to the triangulation system of coordinates. Previously, they had been on Republic coordinates. Many hard maps and tracings were prepared on the new system. On surface, concrete iron pins were set and almost the entire surface leased from the Teal Lake Iron Mining Company was mapped. Plans were prepared for the enlargement of the timber yard and stocking ground which included the change of the L. S. & I. main line leading to the shaft. Ground settlement under the pocket tracks, West of the shaft, cut off the approach from this side, and subsidence pins were placed to ascertain the amount of settlement. Some of these pins have settled as much as two feet. The rockpile near the office was used for grading the stockpile ground and timber yards. Grades and lines were given for this work as needed. Underground check surveys were run on the 6th and 7th Levels and the connection between the two was 15 minutes in course and .02 for coordinates. This was very gratifying, considering the difficulty in plumbing Hartford Shaft No. 2. Lines were given for development on the main levels and surveys run for the Subs as required.

CLIFFS-SHAFT MINE

Quarterly surveys were made of this property and special surveys were made for raises and development. A few old stopes were surveyed and a special survey was run in the old No. 3 mine up to the bottom of No. 5 Shaft. Lines and grades were given for development on Section 10 Lease. The water which increased in these drifts, apparently coming from the old Moro mine, made it necessary to provide extra pumping facilities. Plans were drawn for a new pump house on the 15th Level and lines were given for the excavation.

LLOYD MINE

The development of the ore body above the 8th Level required constant attention throughout the year. It was necessary to plan and supervise additional drifting on the 7th Level around the ore body. The arrangement of tracks and trench and the cutting of plats on the 8th Level was planned and supervised.

MAAS MINE

The connection on the 6th Level between the winze and the shaft was made on Oct. 10th. Prior to this, check surveys were run from the 6th Level, plumbing both the winze and the shaft. The cutting of the plat and the track arrangement on the 6th Level was planned and supervised. The new pump house on the 3rd Level was also planned and supervised. Extreme care was necessary because of its nearness to the old pump house.

MATHER MINE

Early in the Spring, it was noticed that the pits of the Cleveland-Hematite mine to the North of the Mather Shaft were being drained. Elevations were run to the water levels from the pits and various shafts on the Cleveland-Hematite, as well as to the Detroit mine on the Northwest. By the end of the year, the water level in the Cleveland-Hematite had dropped at least 108 feet and was below where it could be measured from the open pits. The water level at the Detroit pits was only lowered about 5.2 feet. Lines and grades for construction were given for the extension of the West timber tunnel and a special survey was run and lines given for the commencing of the rock tunnel for the West timber tunnel. Work on this was discontinued after about 50 feet of tunnel had been excavated. During the Summer and Fall, curbs were built for the driveways in front of the buildings. In the Fall of the year, all the roads were hard surfaced. This work was planned and supervised by the Department.

Early in the year, double check surveys were run on the 2nd Level in anticipation of making a connection with the 7th Level Cambria-Jackson mine. Plans for this connection were changed, however, later in the year. Lines and grades were given for the 2nd and 5th Levels development work. Surveys were run to the Subs and stopes. The construction of the pockets and trench on the 5th Level were planned and supervised.

NEGAUNEE MINE

Very little development was done at this property during the year except the 14th Level drift in the Maas area.

PRINCETON MINE

A study of the surface water situation was made. Two test pits and 11 churn drill holes put down, endeavoring to locate a water course for intercepting water prior to entering the mine. Some pumping was done but cold weather interfered before any definite results could be noted. Check surveys were run on the 6th and 7th Levels and plans made for drifting and raising in No. 3 Shaft. The 7th Level almost reached this shaft location by the end of the year.

SPIES-VIRGIL MINE

The finding of the new ore body on the East side of the Spies property made it necessary that surveys be run to locate the property boundary lines in this area. Double check surveys were run from the mine to the East line of the property and the levels over the survey stations were also double checked. A few of the property corners were found and surveyed. The location of the ventilating shaft and the preliminary drill hole was staked out. The check plumbing to the 4th Level was made in the Spies shaft on Feb. 20th and double check surveys and elevations were run on the 4th Level to the new deposit. Lines were given in this drift as needed, during the year. The construction of the pocket and trench on this level were also planned and supervised.

TILDEN MINE

Several blasts of the surface pits were planned and supervised by the engineer in charge. Drill holes were located as needed.

J. MISCELLANEOUS

SHAFT GAUGING

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

Mine	Date
Athens	March 19th
Hartford No. 2 - Cambria	March 5th
Lloyd	April 2nd
Maas	April 23rd
Mather	April 16th
Negaunee	March 11th
Princeton	April 30th

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 Michigan mines, as of Nov. 1, 1943 and 1944:

Mine	November 1, 1943	November 1, 1944	Difference
Athens	4,820	8,616	3,796
Cambria-Jackson	48,148	4,666	-43,482
Cliffs-Shaft	87,045	67,216	-19,829
Lloyd	105,011	208,460	103,449
Maas	12,242	23,265	11,023
Negaunee	65,228	13,235	-51,993
Princeton	96,430	127,187	30,757
Spies-Virgil	71,644	58,369	-13,275
TOTAL	490,568	511,014	20,446

TAXES

The delinquent tax lists for the Annual Tax Sale, held in May, were checked by Mr. Brewer concerning property. The usual tax lists for the Mining Department lands and the Cliffs Power and Light lands were made.

SURVEYS

There were no triangulation surveys made during the year but a few surveys were run to locate a few corners. Considerable work will have to be done this coming year to complete the work of boundary lines in Sections 1 and 2, 47-27. A survey, with elevations, was run around the East end of Teal Lake to establish as near as possible the location of the original shore line of Teal Lake as existed at the time of Government surveys in 1845 and 1846. This high water mark is very clearly defined on rock outcrops on the Northeast shore of the lake. The elevation of this high water mark was needed to locate the corresponding elevation on the South shore. It was necessary to obtain this original lake level to make a sub-division of the mineral boundaries at the Eastern end of Teal Lake. This survey located as many of the property corners as could be found.

During the Summer, there was some agitation in the City of Negaunee relative to the possible settlement of the Park Street School because of Maas mine operations. Points were established on 100' intervals along Park, Case and Main Streets between Mitchell Avenue and caved ground. Elevations were run over these streets during various times in the Fall, without finding any indication of the slightest settlement. Monthly elevations will be continued next year after the snow disappears.

EXPLORATIONS

Explorations on Company lands required locating various drill holes for the Geological Department. The following drill holes were surveyed during the year:

Holes Nos. 137 to 140 incl. in Section 1, 47-27
Hole No. 53 in Section 2, 47-27
Holes 38 to 42, in Section 3, 47-27
Holes 32 and 33, Section 5, 47-27
Holes 2 to 7 incl. in Section 19, 43-34
Holes 68 to 71 incl. in Section 24, 43-35

VENTILATION

Ventilation surveys were not made at all the properties this year as this work has largely been taken over by the Safety Department. The engineers assist that Department in making the survey and in the preparation of the maps.

UNDERGROUND WATER

The elevation of the water in the test holes at the Athens, Maas and Negaunee mines were measured monthly, during the year. The following table shows the water elevations at the beginning and at the end of the year and the net differences:

Elevation of Water

Test Hole	Jan. 1, 1944	Jan. 1, 1945	Difference
Maas Mine			
W1	1258.8	1250.1	-8.7
W2	1251.2	1242.0	-9.8
W5	1253.0	1248.5	-4.5
W9	1271.4	1269.4	-2.0
W13	1309.8	1305.6	-4.2
W14	1295.0	1295.0	-
W15	1308.0	1309.7	+1.7
W16	1280.0	1280.6	+0.6
W18	1253.6	1251.3	-2.3
W20	1262.4	1259.6	-2.8
W21	1246.1	1237.6	-8.5
Negaunee Mine			
6A	1180.1	1176.6	-3.5
7	1186.4	1182.3	-3.1
Athens Mine			
W104	1292.6	1295.6	+3.0
W105	1297.6	1298.5	+0.9
W106		1295.2	

Maas Well No. 1 pumped about 150 gallons per minute from April 21st to the end of the year. Well No. 2 operated throughout the year, pumping over 500 gallons per minute. Well No. 4 pumped from 125 to 150 gallons per minute up to the end of May. Since then, it has been idle. Between January and May 25th, Negaunee Well No. 1 pumped about 165 gallons per minute. It was then shut down six weeks for repairs and averaged about 160 gallons per minute for the rest of the year. Athens Well No. 1 operated throughout the year, pumping about 225 gallons per minute. Athens Well No. 2 operated intermittently up to June and was stopped after the well became dry. It probably did not pump over 230 gallons per minute when it was operating.

OFFICE HOURS

The office hours throughout the year were the same as in 1943; namely, from 8:30 to 12:00 Noon and 1:15 to 5:00 P.M., except Saturday when the office closed at 12:00 Noon.

SHAFT PLUMBING

Underground surveys are carried from surface and from level to level by the shaft plumbing method. This consists of hanging two wires in the shaft so that they hang clear from all obstructions. The course and location of each wire is taken either on surface or from a main underground level. On the level where the new surveys are to be made, the course and location of the wires are similarly used as a starting point for the new surveys. The 75# weights hung on the No. 10 piano wire are fully immersed in water to reduce the swinging. Falling water and air currents tend to cause the wires to vibrate which keeps the weights from becoming motionless. Accuracy of shaft plumbing depends on the minimum motion of the wires as viewed through the transit. It has been found practically impossible in long plumbing, over 500 feet, to keep these weights absolutely still, and it is necessary to use the middle point of swing of the wires in assuming the course between them. Experiments have been made to find a dense medium that might be used in shaft plumbing to reduce the motion of the weights. Thick oil could be used but is a very messy substance to handle. During the year, the use of Bentonite in the water with the weight has been successful. In order to secure as complete a mixture of the Bentonite with the water, a wetting agent, Sodium Tetraphosphate, known as "Quadrafos", has been used with good results. Several trials were needed to determine the required quantities of each substance needed, as it was found that Bentonite prevented the weight from hanging exactly plumb. It was found that 3 lbs. of Bentonite with 3 lbs. of Quadrafos in the 30 gallon barrel used for plumbing, made a satisfactory mixture. To secure complete mixing, a large mechanical mixer, similar to an egg beater, was designed which answers the purpose very satisfactorily with a minimum of time required for the mixing. This thickener was used with good results in plumbing at the Mather and Spies Shafts, although the distance was only 600 feet. It is believed that this thickener will be of greater benefit in longer plumbing.

HOLIDAYS

The following holidays were granted during the year:

January 1st	New Years Day (1/2 day)
May 30th	Memorial Day
July 3rd	1/2 day
July 4th	Independence Day
September 4th	Labor Day
November 30th	Thanksgiving Day
December 25th	Christmas Day

Carl Brewer

CB:el

Recorder

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ATHENS MINE

Many changes were made in the headframe during the year due to heavy wear and corrosion. Besides repairs to the dump plates, a new butterfly deflector replaced the old one. Below the tram floor the present steel is in such poor condition, new structural parts have been purchased and replacement will start after the first of the year. Due to the standard 8' diameter bicycle sheave axle breaking at the Lloyd Mine, heavier sheaves were purchased and a set installed here in December. The axle diameter was increased in the hub from 7" to 8" and in the bearings from 6" to 7".

A test has been run for the year on the application and amount of lubricant to skip hoist ropes to increase their tonnage. The 8 ft. diameter head sheaves were attached to oil pumps that dropped lubricant on the rope in various amounts as the rope passed around the head sheave. Records on types and quantities of oil fed are being kept which should lead to improved results in the future.

The heating system needed considerable attention. Besides cleaning and rebricking boiler in change house, new steam return lines were installed from headframe to heating plant which returns all condensation to boiler.

In the shaft the top 500 ft. of 6" air line is in poor condition. One 20 ft. section was replaced with new pipe and repairs were added in other places. The line may last for one more year. Some improvement was made in shaft steel to smooth the worse spots in the skip road. At present the skips are running at 1450 F.P.M. A new skip with longer frame was built in the General Shops giving 4 ft. more distance between guide shoes. This will be tried out in January and it is hoped will be easier on skip runners.

The old chemical laboratory building was fixed up as new quarters for mine captain, surface boss and master mechanic. The heating boiler in office was moved to the basement of this building and a stoker added with changes in piping to heat both buildings.

In engine house, the Nordberg compressor intercooler developed tube leaks that required a cleaning and overhauling. A fire developed in discharge pipe of Ingersoll Rand Compressor in October that started an investigation of temperature relays on compressors at all the mines. A more sensative and dependable relay is being tried out which it is hoped will eliminate any compressor fires in the future.

CAMBRIA-JACKSON MINE

During the year the steel headframe was rebuilt. The main supporting legs and railroad pocket were in such poor condition that all legs under the pocket were replaced and main legs rebuilt. All structural steel members supporting the landing floor, skip dumps and steel trestle were replaced with new material. The railroad pockets were completely rebuilt, new skip dumps were constructed in General Shops and installed on weekends. The headframe has been inclosed with ferro-board from the landing to sheave deck. A new top tram car control room was built on landing floor and the skip roads inclosed from surface to top landing with ferro-board, even the sway bracing had to be replaced. The job was completed in September with all new steel given a coat of paint. The east head sheave axle worked loose and was replaced with a new sheave in December.

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CAMBRIA-JACKSON MINE (Cont'd.)

In the engine house repairs were made to main bearings of Ingersoll Rand compressor in February and to thermostatic relay installed on discharge line in November. The 26" wide belt driving this machine has seen its best days and was replaced with an old belt that had been rebuilt in December. The belt taken off was sent to the Chicago Belting Company to be rebuilt.

The main hoist which operates both skips and cages is equipped with only one post brake. An inspector from the U. S. Bureau of Mines suggested that the hoist would be safer if equipped with two brakes. A design is being drafted to equip the motor shaft with post brake in case of emergency and this will be presented through a new E & A in 1945. Tests are being carried on covering the proper lubrication for hoisting ropes which should determine the best oil or grease to use and the proper method of application. When testing is completed it will be covered in a separate report.

Some improvements were made in the shops. A new power back saw with individual motor drive replaced a worn out one in machine shop. A new exhaust fan was installed in Blacksmith Shop. Due to corrosion, new steam and air lines replaced the old ones. A semi-automatic jackbit grinder secured from the Cliffs Shaft Mine was set up in the south end of Blacksmith Shop after a new concrete floor was laid.

Additional changes were made in heating plant and change house. Besides replacing the hot water tank and covering the heating boiler, a new sewerage system was installed consisting of a concrete tank and two vertical pumps which removes all waste water from change house and office and discharges it into mine water discharge line draining to the south.

Underground, the necessary repairs were made to mine pumps on various levels. A new clean water pump was installed in the old cage shaft and supplies cooling water for compressors. This water was condemned for drinking so the Negaunee city supply is now used for that purpose.

With the removal of the old concrete stack and boiler plant building during the fall a better view of the mine surface equipment can be secured from the highway. The motor generator set located in this building was moved to the east end of engine house.

CANISTEO MINE

Ore operations for the season opened May 22nd on two shifts per day and 6 days per week schedule and closed October 26th with production of concentrates totaling 567,150 tons. Due to cold weather in February, a take-up axle broke on No. 48 shovel and a drive gear pinion on No. 49, both accidents causing a 48 hour delay. Stripping continued from January to May with exception of two weeks from April 11th to 24th when the 15 ton trucks and drivers worked at the Holman Mine to assist in stripping there, where work was delayed due to scarcity of labor. In addition to stripping in pit, a channel was cut from main sump to old Oliver shaft to the west to secure faster drainage of pit water.

The two new pumps purchased last year of 1250 G.P.M., 370 ft. head completed the year in the pit sump and gave no trouble.

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CANISTEO MINE (Cont'd.)

At the crusher and screening plant new hinges were added to 8 ft. pan conveyor, a new screen plate with hard weld added around holes was built for 5' x 12' scalping screen and the edges vulcanized on lower flight of 36" belt conveyor.

In the washing plant before shipping season started, the 5' x 14' single deck screen was replaced with a double deck and the 36" conveyor gallery raised 18" to accommodate the screen change.

In June the Minerals Separation North American Corporation installed a flotation layout in west wing under the supervising of Messrs. Toderant and Johnson and ran tests the rest of the season. The equipment is still there which means it is planned to do more testing next season.

Due to the excellent performance of the Selective Media Concentrator at the Hill-Trumbull cone plant, two machines were purchased for this mine and will be installed in east wing of washing plant. These will replace two of the present four Akins Classifiers so that accurate comparative tests can be run between the two types of machines on the same ore by splitting the load equally between them. It is planned to have this equipment installed ready for operation when stripping season starts in 1945.

Of the 12 trucks used this year, 3 - 15 ton Euclids were sold to the Govt. of India due to age and condition and were replaced with two new 20 ton Euclid trucks received in May.

CLIFFS SHAFT MINE

In crushing and screening plant, the No. 8 crusher required more repairs and overtime than the rest of the mine machinery. In January a new ring gear, pinion and rebabbitted eccentric were installed. In June a new mantle was needed and in December the main frame had to be replaced with a secondhand one formerly used at the old Jackson pit. This is the first time the main frame has been replaced since the crusher was installed 30 years ago. The old Symons disc crusher was removed from this building and sold for scrap in February. The pan conveyor received its annual overhaul in June.

At "B" shaft house the spokes became loose in 8 ft. turn sheave which was replaced with a new one. A new 48" deflecting sheave was replaced on hoist rope near the shaft. The doorway in shaft house was enlarged to allow a 12' diameter head sheave to pass through. Near this shaft house the old brick stack connecting to boiler plant was removed.

In engine house air filters were installed on No. 1 compressor. A connecting rod bearing burned out on No. 3 compressor and the water cooling system was cleaned out on all three machines. In November one of the contactors on "B" shaft hoist control stuck causing the skip to overwind and its bonnet to hit the head sheave girders. No serious damage was caused but plans are under way to equip present motor brakes with a heavier type.

In the shops the old bolt and pipe threading machine was replaced with two new "Oster" type machines, one with capacity up to 2" pipe and the second up to 8" pipe. In the drill bit shop a reducing valve was placed in the oil line feeding the furnace.

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CLIFFS SHAFT MINE (Cont'd.)

One cylinder cracked on the 6½" x 24" pole pump in 15th Level pump station in November and was operated with a patch until replaced with a new cylinder in December. Due to heavy increase in mine water, plans are under way to equip the 15th level with a new 1000 G.P.M. plunger pump.

To eliminate any danger of scalding water in showers at change house, a new hot water heating system was installed with necessary piping, circulating pump and tanks that prevents any excessive temperatures and still supplies plenty of hot water to the showers.

HILL-TRUMBULL MINE

Ore operations started May 8th and closed down October 27th with the Washing Plant producing 475,367 tons of concentrates. The cone plant tonnage was 305,884. In the pit stripping continued until March 19 when trucks and drivers were transferred to Holman Mine to hurry stripping there. They returned and continued stripping in April. At the crushing and screening plant a heavier conveyor chain was installed on pan conveyor between bin and belt conveyor that lasted the full season. The Ross chain feeder is showing severe wear in chains. The links are being rewelded with abrasion resistant metal. A steel bar caught in discharge chute of horizontal 36" conveyor and scored the rubber surface so bad it had to be vulcanized but did not rip the belt.

At the shops locomotives 103, 104 and 106 were overhauled in the spring and returned to the Holman Mine. The electric locomotive No. 302 needed new wheels and minor repairs. Before shipping season started, repairs were completed on Shovels No. 35 and 60 while No. 34 carried on the stripping and later No. 34 was overhauled.

Stokers were installed under heating boilers at shops and office to eliminate expense of night firemen necessary on account of labor contract with the C.I.O. In the fall, 5 - 30 yd. dump cars were overhauled and sold to Birmingham Rail and Locomotive Company for $2200 each. We still have several good 19 x 26 steam locomotives that should also be disposed of.

At the washing plant the most extensive change was diverting the tailings to a new pond by pumping them 4200 ft. through a 12" pipe with a 12" hydro seal pump driven by a 200 H.P. motor. As the load was almost too much for one pump it is planned to operate two in series next season and extend the discharge pipe several hundred feet. As a new type suction seal had been developed for this pump it was returned to the factory in the fall for a complete overhaul when the new seal was added. The 5' x 14' vibrating screen caused several delays due to roller bearings failing. The present bearings are not built as good as previous ones but post war should correct this. Due to delays in shipments, the new 120-B Bucyrus electric shovel erected in July stood idle for over a month waiting for a motor generator set from Westinghouse Electric & Mfg. Company.

One of the two portable "Pioneer" conveyors used at washing plant was moved to shops to unload coal and feed hopper of heating boiler stoker.

In June the Stearns-Roger Mfg. Company, Denver, Colorado installed a new design Selective Media Concentrator in cone plant and ran tests on it the rest of the season. Results were so good that a second machine, as well as this one, was bought for this plant to replace Akins Classifiers whose results have not been satisfactory. Harry L. McNeill was in charge of this machine.

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HILL-TRUMBULL MINE (Cont'd.)

In the Cone plant the 3' x 16' horizontal vibrating screen were rebuilt to 4 ft. wide and were floor mounted instead of supported with cables from overhead. The feed for this plant was supplied with Caterpillar tractor instead of double drum slusher as last year. The 60" classifier was rebuilt to operate with a 50 H.P. D.C. motor instead of the old 15 H.P. A.C. unit due to increase in load. A bucket elevator was completed in the spring to clean up floor spillage.

Some delays developed due to interruption in power but these were about the same as last season.

The electric haulage installed last year gave no trouble for the season. Due to overloading of 30 yd. cars some frames were broken near the bolster. When repaired, this frame is reinforced for a heavier load.

Of the 10 - 15 ton Euclid trucks used here, three were sold to the Govt. of India due to age and condition.

HOLMAN-CLIFFS MINE

The season opened when washing plant started May 15th and closed October 30th with production of 678,451 tons of concentrates. An addition to this of 6,344 tons was made by a hydrotator installed about a week before close of shipping season. Recovery from tests with this machine showed that it might be a good investment.

In the pit the most serious wreck of the year occurred in February on No. 57 shovel when the operator forgot an overhanging bank and hit it so hard with the dipper, when swinging, that he snapped off one dipper stick 3 ft. from the saddle, broke both boom foot lugs and one sway brace. This machine is a 120-B bought new last year. Repairs were made at mine with welding equipment in 10 days and machine operated until July. At that time the upper revolving frame supporting track and rollers were replaced due to the first set not giving the desired service.

In April the Bingham stripping was completed and shovels No. 32, 51 and 55 moved to the Holman Brown pit until November when stripping was continued in the North Star basin. Due to age of old trucks, seven 15 ton capacity were sold to the Govt. of India and seven new 20 ton Euclids purchased to replace them. One of the six 15 ton trucks kept at the mine was equipped to operate on Butane gas. Tests were run on it for 4 months but no decided savings was shown over diesel oil.

At the shops, No. 101 locomotive was overhauled while 102 and 103 were shipped to the Hill-Trumbull shops for repairs. On its completion in February the 30 yd. cars, many of which had broken frames, were overhauled. During the summer 3 new stokers were received and installed under heating boilers at shops, office and washing plant. During the summer the new truck repair garage and testing laboratory were completed with new machinery and heating boiler in operation. The garage was badly needed as some of the old trucks are in poor condition and need repairs.

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HOLMAN-CLIFFS MINE (Cont'd.)

At washing plant the 5' x 14' vibrating screen caused delays due to bearings failing. Some of the rollers on 36" belt conveyor idlers had to be replaced due to wear from patch plates used to splice the split belt. These plates were covered with rubber this fall and should give better service next season. During the last week of the ore season a hydrotator was operated on material taken from tailings discharge pipe. The recovery secured warranted more testing next season. To secure data on best machine for this recovery it is planned to also install a hydrosizer and hydro concentrator as built by the Dorr Company and split the load between them.

LLOYD MINE

In January the thread on the mantle shaft on #6 McCully crusher stripped. A new type nut was ordered and installed in February. In May the axle on the north skip sheave broke allowing sheave to fall over on the south skip sheave and breaking it. The north skip rope broke and the skip dropped to bottom of shaft. The skip was repaired and again put in operation. Some damage was done to the headframe. One sheave girder was so twisted it was necessary to rebuild the girder and reinforce both the girder supports and the corners of the headframe on the sheave deck. This caused a 3 day delay. New liners were installed in the south skip sheave in June. The 8' skip sheaves were changed in December to the new heavy type with the large axle. Considerable repairs were made to the chutes and pockets in headframe during October and November.

The 8th level Ingersoll-Rand motor pump was overhauled in February. On November 8th a new Ingersoll-Rand pump was installed on 8th level, capacity 250 G.P.M., 300 ft. head.

Due to a complaint of government inspector the intake pipe on both compressors were changed, raising the point of intake 12 ft. above the ground. The Sullivan compressor intercooler was repaired in July due to leaky tubes.

A new Chicago Pump Company centrifugal pump, 50 G.P.M., 60 ft. head was installed in the basement of engine house to furnish cooling water for compressors.

A new stack was installed on heating boiler for change house in June. A new hot water tank was installed in the change house in September.

In July and August the water lines on chlorinator at Morris Mine for location water supply were cleaned and repaired. The water supply pump on 2nd level crankshaft bearings were babbitted in September. The location water supply tank was cleaned in October.

In November some repairs were necessary to main water lines to location. The cage and counterweight ropes were changed in July.

MAAS MINE

In January new oil rings were installed in the skip hoist pinion shaft bearing. In April the motor shaft on the skip hoist broke close to the coupling. A spare rotor with shaft was installed. The broken shaft with rotor was shipped to Milwaukee for repairs. The pinion shaft bearings and coupling were in poor condition. New bearing and flexible coupling were ordered for replacement. The bearings were received and installed in September.

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MAAS MINE (Cont'd.)

The rotor with the new shaft is at the mine and will be installed when the new coupling is received. A new set of brake blocks were installed on this hoist in June.

In February a crack was discovered in the back head on the #1 Ingersoll-Rand compressor. A new head was received and installed in November.

On the #2 compressor some repairs were made to the valves and carbon removed in June. In January a new set of brake blocks was installed on the winze hoist, and a new rope was put on in October.

The addition to the 3rd level pump house has been completed. A 6" x 16" Aldrich triplex pump purchased from the Calumet and Hecla Company has been changed to 9" x 16" plunger with capacity 900 G.P.M., 1200 ft. head and will be installed in this addition.

A new Worthington pump, size 6" x 10", capacity 250 G.P.M., 350 ft. head was installed on 6th level in June. Some repairs are necessary to the 5th level Prescott pump as soon as repair parts are received.

The hot water tanks and heaters in the change house were cleaned and repaired in February.

A rope formerly used at the Athens Mine was installed on the south skip in April.

Heavier 8' sheaves were installed on headframe for the skips in May. These sheaves have the oversize axle adopted as standard. The south skip sheave was transferred to the cage side in May.

In June some repairs were necessary to the air line in the shaft and several bad leaks were stopped.

In October some changes were made to the Crusher Plant to take care of a special hard ore from the Negaunee Mine.

MATHER MINE

The changes to the Larry car brakes made by the Lake Shore Engineering Company were completed in March. Additional trouble with the Larry car getting out of control occurred in December. A steel and wood bumper has been built to stop the car if any further trouble develops.

In May the 16" crusher became plugged with fine sticky rock causing the dust collar to raise and permit the rock to get into the oil pump and eccentric. This froze the eccentric to the head shaft causing a short delay but cleaning caused no damage to the eccentric or shaft. It was necessary to install a new dust collar.

In June the counterweight pipe was extended 152 ft. above collar of shaft in headframe.

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MATHER MINE (Cont'd.)

In July work underground was stopped the last two weeks of the month to permit the installation of four lines of 6" x 10" wood runners in the cage compartment of the shaft for the new double deck aluminum cage. The counterweight was installed at this time. Also, during the shutdown, the structural steel crew made some changes to the grizzly bars changing the spacing from 4½" to 6" and using heavier construction. The upper half is now stationary while lower section can be raised so that rock can bypass the crusher.

A permanent door was installed in elevator shaft at surface in July. In August the elevator shaft was enclosed from surface to the lower sheave deck in accordance with the state law.

The new coal elevator in the boiler room was put in operation in March. In June new grates were put in the heating boiler, also rebuilt the ash pit, cleaned boiler and repaired return valves in heating system.

The second or #2 Aldrich Triplex pump was placed in operation on the 1750 ft. level in April. The coupling on the pinion shaft of #1 pump became loose causing some gear trouble. The coupling was pushed back in place and spot welded. The gear teeth, which were in poor condition, were reground, relined and are now in good condition.

The 3rd level mechanical loader was rebuilt in May. Shaft gates on the levels were changed according to recommendations by the Safety Department.

The fence enclosing hoist ropes from headframe to engine house was completed in August. Rope slides are being installed in the engine house to close the holes in the wall through which the hoist ropes travel.

In August oil pipe connections on skip hoist brake cylinder pulled out discharging two barrels of oil. Repairs were completed in three hours.

In September snubbers were installed on skip and cage hoist brake levers to control speed at which brakes may be set.

In October considerable sand was found in cooling pipes of compressors and flywheel sets bearings. They were cleaned and a coat of asphalt laid on parking ground to prevent dust from flying.

The gasket on the H.P. cylinder head on #1 compressor blew out in November but repairs were made with no delay to mining operations.

In October the main 16" sewer and discharge line across Mud Lake swamp slid off the stands, but the pipe was replaced and stands rebuilt. In June water lines were installed in the timber yard for fire protection.

NEGAUNEE MINE

The water leg in the #2 heating boiler in the change house was in poor condition and it was necessary to replace the inside plate about 6" wide all the way around the firebox. A new hot water tank was installed in the change house in November.

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NEGAUNEE MINE (Cont'd.)

The material for repairs to steel trestle was received and repair work started in August and completed in November. New and larger gussett plates were used under the girders. Knee braces were straightened and tied together so that any side strain would be carried by four braces instead of only one.

In July new liners were put in the south skip sheave. One spoke broke in the 8' top tram sheave in December. It was repaired. A spare sheave from the Hard Ore Yard will be installed in this plant in the spring as soon as shipping season opens.

A new herringbone gear was installed on the 12th level Aldrich pump in May. The 12" discharge pipe in 10th level pump house was repaired in November. This pipe is in poor condition and will be replaced. The 10th level sump was cleaned in July and a bad leak in the air line in the shaft was repaired.

The #2 Layne pump was closed down in March. Repairs were completed in June and pump again put in operation.

Unit heaters, in heating plant of #2 ventilating shaft, were repaired in October. In December the old ventilating fan at #2 shaft was put in operation on account of burned out motor operating new fan. A motor from the Mather Mine is being used to drive fan while repairs are being made.

The 120B Bucyrus Erie Electric shovel purchased for the Mather Mine was erected at Negaunee Mine stock pile and started operating in July. The 4-yard bucket loaded 10 - 50 ton cars in 30 minutes but the best record so far is 105 cars in an 8 hour shift.

In engine house, during September, some of the tubes in the Nordberg compressor intercooler started to leak and were replaced.

PRINCETON MINE

In January the smoke stack on the #2 heating plant blew down. A new stack was built at the General Shops and installed in February. This boiler was cleaned during the month of September.

A new water line was built from Princeton location to #2 shaft. Fire protection water lines were installed at #2 shaft in July. A water line for fire protection in #3 shaft and timber yard was completed in June.

A Sullivan hoist from the Cambria Jackson to be used in the timber yard was sent to the mine in February.

A 20,000 cu. ft. ventilating fan was installed on 7th level #3 shaft in February.

New skip dump liners were installed in June and a radiator in skip dumps in October.

At the Gwinn pump station the well points were cleaned, allowing ample water to flow into sump for village supply. In August a new meter was installed in Princeton water line. In August all hydrants were tested and repairs made.

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PRINCETON MINE (Cont'd.)

No. 8 steam shovel boiler is being used at #3 shaft to thaw ice in skip compartments during the winter.

SPIES-VIRGIL MINE

In January 24 - 75 cu. ft. underground tram cars were received from the Lake Shore Engineering Company; also a steel camel back dump to operate them at the underground pocket. In February this equipment was installed on 4th level ready to start main drift east. This drifting equipment consisted of the following:

One Jumbo car with necessary equipment for rock drills
One 75 cu. ft. low head car
A camel back for dumping car
One Eimco loader

All of these were connected ready to operate. To start the drift it was necessary to lay 600 ft. of 14" ventilating 6" air and 2" water pipe in March. In May a man car was built to transport the men from shaft to drift heading. The ventilating fan was installed in June. This fan did not furnish enough air to ventilate the drift as the heading became further away from the shaft. In November a new Sturtevant size 45 planovane top horizontal discharge fan was installed on 4th level. It is design #3, arrangement 4, with fan wheel mounted on 25 Hp., D.C. 1800 R.P.M. motor shaft. In July new bleeder valves were installed on the 8th level pumps. Also in August a new check valve was put on the #1 pump.

In July water lines were installed in shaft house to flood shaft in case of fire. In June equipment in shop was rearranged to make room for Jack bit equipment, a small oil furnace and new J-54 Jack bit sharpener.

In April a new 3" water meter was installed on village water supply line. The new bulldozer is being used to spread stockpile and save on stocking trestle.

In June the cage hoist was equipped with safety guards on gear and pinion. The Lilly hoist control was also put in operation.

In February a new pin and brasses were installed on high pressure cylinder crosshead of compressor. A rebuilt intercooler core was installed in compressor in June to replace the old one which was leaking. The old cooler was shipped to the General Shops for repair. The exciter pulley on compressor split on September 19th. Repairs were made and a new pulley ordered.

The #30 steam shovel boiler is being used during the winter to heat the headframe and thaw ice in shaft.

TILDEN MINE

In east 10" crusher, in January, new upper and lower mantles were installed and concaves turned. In March a new spider cap and new frame was installed. In July new concaves were installed and in November, the motor was cleaned.

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TILDEN MINE (Cont'd.)

On West 10" crusher, in July, concaves were turned. In November a new ring gear was installed. Coupling on motor shaft in General Shops for repairs.

Also installed new divider between east and west 10" crushers.

On 42" crusher, repairs during the winter were as follows:

New lower mantle
New spider bushing
Two new wearing plates
Eight new diaphragm liners were installed.

Also relined fine dirt chute. Also 16 new wearing strips were installed on grizzly bars.

No. 29 shovel caterpillar track was repaired in January. Repaired power cable, drum and intercasting on equalizing beam of No. 31 shovel in November. In December repaired dipper, dipper sticks and tightened up vertical swing shaft casting. Also removed boom for repairs on #46 shovel. In December installed new friction clocks on hoist.

#52 shovel dipper was repaired in October.

D-8 Tractor welded new grouser strips on tread.

All locomotive boilers were cleaned during October.

Three new 15 ton Euclid trucks were received in May, one equipped with a hydrotarder. After tests on 10% grades a decision can be made if more hydrotarders are necessary to save the brakes when carrying loads down hill.

Installed new oil filters on #3, #4 and #5 trucks. Also repaired #2 truck in December.

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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					
1935	288,053	516,140,000	1,791	366,504,523	692
1936	484 310	907 194 000	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
1943	669 300	1 368 045 000	2 044	376 325 326	718
1944	614 214	1 459 890 000	2 376	448 361 410	851
ATHENS MINE					
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
1943	532 590	1 013 220 000	1 902	195 041 792	372
1944	443 576	900 765 000	2 030	162 835 951	308
MAAS MINE					
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
1943	782 074	1 916 100 000	2 450	575 868 620	1 098
1944	614 836	1 542 835 000	2 509	578 257 239	1 097
NEGAUNEE MINE					
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
1943	978 130	1 137 375 000	1 162	401 169 615	765
1944	760 871	1 165 140 000	1 531	375 706 897	713

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1945

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					
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 M).)	91
1942	588 749	588 451 000	999	39 486 100	74
1943	531 260	525 280 500	988	65 024 800	124
1944	391 057	436 293 000	1 115	51 625 550	97.6
TILDEN MINE					
1935	190,511				
1936	291 341				
1937	305 418				
1938	85 889				
1939	170 276				
1940	205 612				
1941	302 943				
1942	235 207				
1943	139 991				
1944	214 824				
PRINCETON MINE					
1942	83,918				
* 1943	248 845	490,680,000	1,971	109,444,342	250
1944	236 310	434 091 000	1 836	104 716 106	198.5
(* Air and water figures are for last 10 months of 1943.)					
MATHER MINE					
1943	29,517	(First hoisting in September)			
1944	127 438	425,700,000	3,340	74,006,311	140
CAMBRIA-JACKSON MINE					
* 1943	155,513	216,657,000	1,393	123,714,000	431
1944	286,761	410 875 000	1 432	196 252 831	372

(*This mine operated by the Cleveland-Cliffs Iron Co. from June 1, 1943 and the above figures are for the last 7 months of the year only.)

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
YEAR 1944

On July 1, 1944 the mining industry went from a 6 day week to a 5 day week. This reduction in working schedule resulted in a decrease in electric energy sales, but the decrease was not as marked as might have been expected. The kilowatt-hours generated and purchased during 1944 amounted to $106,486,560 which was a decrease of 2.7% below energy furnished to the transmission system for the previous year. Kilowatt-hour sales decreased also by an amount of 2½%, whereas gross revenues were reduced by only 1%. Of the amount of energy furnished to the transmission system, we produced 79,627,000 kilowatt-hours in our own plants and purchased 26,859,560 which is an increase of 18,459,560 kilowatt-hours in the energy that it was necessary to purchase over the amount purchased last year.

The production of energy during the year 1944 illustrates the effect of the manner in which precipitation occurs, on the amount of energy which it is possible to produce from hydro electric facilities. The year 1944 was not abnormal in the amount of annual precipitation, however, the moisture fell in such a manner that the hydro electric production was approximately 20,000,000 kilowatt-hours less during that year than it was during either one of the previous two years, while load conditions for the system were approximately the same. In 1944, there was very little snow on the ground at the time of the breakup and the reservoirs did not fill to capacity from the runoff. Precipitation during the summer months occurred in small quantities and resulted in no heavy runoffs, so that during the entire year the Hoist and Carp Basins were never filled. Accordingly, it was necessary to purchase energy during every month of the year.

The company ended the year 1944 with the rate investigation, which was instituted by H. J. Adams during the latter part of 1943, still in progress. The cities of Ishpeming, Negaunee and Munising, on Mr. Adam's recommendation, had during 1943 retained Dr. John Bauer to investigate the rates of both the Michigan Gas & Electric Company and the Cliffs Power & Light Co. Dr. Bauer submitted his preliminary report during January of 1944 and called a meeting of the interested parties for February 9th. At that time he filed his report and throughout the month of February this report was given considerable publicity by the local press. At the same time, Mr. Francis Bell and I discussed the situation with the Michigan Public Service Commission and with representatives of the Michigan Gas & Electric Company. The company reiterated its stand that it was not involved in the present controversy since the committee conducting the investigation had no jurisdiction over the company's operations. In May, the rate situation was further complicated by a Michigan Supreme Court decision in regard to the Michigan Public Service Commission's treatment of Federal Excess Profit Taxes in calculation of earned returns. The Public Service Commission's subsequent decision to reduce utility rates to the point that no such Excess Profit Taxes would be paid was protested by various companies in the State, and at the end of the year the Public Service Commission's ultimate manner of treatment of this tax expense was still undecided. In June, an attempt to compromise the rate controversy between the various cities and the Michigan Gas & Electric Company was attempted before the Public Service Commission at Lansing. However, when our company refused to participate in such a compromise, the meeting was adjourned. Subsequently, the Michigan Gas & Electric Company put into effect a new and lower schedule of rates in its entire Northern Division effective September 1st. These new rates were accepted as satisfactory by the City Council at Munising but were not approved by the City Council in Ishpeming. The status of this controversy at the end of the year was that a formal petition had been submitted by the city of Ishpeming, the other two cities having dropped out of the controversy, to the Michigan Public Service Commission asking for a formal hearing on rates charged by our company to the Michigan Gas & Electric Company and of the rates charged by this latter company to the consumers in Ishpeming.

THE CLIFFS POWER & LIGHT COMPANY
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YEAR 1944

At the close of 1943 work was under way pouring new intake section on the Silver Lake Dam and an attempt was being made to have the Longyear Estate procure flowage rights on considerable more property so that the level of Silver Lake could be raised approximately 7 feet. It was necessary for the Longyear Estate to deal with the city of Marquette, the Ford interest and the Oliver Iron Mining Company in regard to this additional flowage. In spite of our continued efforts it was not possible to get clearance on the flowage rights from these three interests until August, at which time a contract for the construction necessary to raise the level of the dam was let to A. Lindberg & Sons. This contracting company experienced considerable difficulty in obtaining the labor necessary to conduct the work and had not completed the concrete work on the dam before cold weather set in. At the end of the year the concrete work was still in progress and it does not seem possible to complete construction in time to catch the flood waters in the spring runoff of 1945.

Prior to March 1944 the Cliffs Dow Chemical Company had been operating in parallel with our transmission system. During some periods of the day they fed energy into our system, but since we had never previously felt that this energy had any value to us, we had not paid them for it. However, during March, we agreed to pay that company for energy delivered to our lines at a rate of 5 mils per kilowatt-hour during such periods in which we were purchasing off peak energy from other purchase power sources. This resulted in our continuing to pay them for energy for the rest of the year.

Generator troubles during the year 1944 were minor. During March, the thrust bearing on the #2 generator at the Hoist Plant overheated and the machine was shut down and overhauled. It was taken out of service March 30th and returned to service on April 18th. On April 24th the brake on the #1 unit at Au Train operated faultily and set while the unit was in service. This caused considerable damage to the unit and required its being out of service from that time until May 8th and also required further work during the fall on the same unit.

In May, following the spring high water, a slight sinking in the toe of the Au Train levee was noticed. This settling had been taking place over a number of years, and it was decided that though the condition was not dangerous it would be advisable to correct the situation at that time. Accordingly, additional drainage tiles were placed in the drainage ditches on either side of the county road, the existing tiles were cleaned out and the river below the spillway of the dam was cleaned out and deepened. This latter work included the removal of the old crib dam which was still in the river near the chief operator's cottage and also included the reinforcement of the piers supporting the penstock where it crossed the river.

The penstock from the dam to the Carp Power Plant failed on June 15th about 3:30 P.M. Failure took place at two points. First discovered was one ruptured section of the lock bar steel pipe approximately 2800 ft. from the power house and later, three ruptured sections were discovered 300 ft. from the main penstock on the riser line to the surge tank. Reports on the break were made to the Michigan State Police and to the Federal Bureau of Investigation with the request that they investigate for possible sabotage. No report to us was ever made by the Federal Bureau of Investigation, but the results of the Michigan State Police investigation was that no sabotage was involved. Normal operation of the Carp Power Plant was resumed on July 9th. When the pipe line was refilled after the break it was discovered that the high water velocity at the time of the break had caused vibration of the pipe resulting in many small failures in the concreted section near the top of Spur 2 Hill. Following this discovery, attempts were made to seal

these breaks in the concrete pipe by various methods, some of which were partially successful. However, it was found that complete closure of all leaks was very difficult and later in the fall the cracked sections were covered with earth so that they would not freeze during the winter, were drained with tile and left until the coming summer. It is hoped that fine earth and other foreign matter in the water will seal most of these cracks as time goes on.

During the summer months investigations were conducted on the possibility of utilizing the Yellow Dog River for power production. Mr. O. D. McClure visited the various possible dam sites and made a report on the project. Later in the year, the Longyear Estate, who own the Hills dam site, were asked for a statement of the type of lease under which they would permit us to carry on the development of this and other dam sites on the stream. We were not sure whether such a development was advisable, but at the same time wished to obtain from the owners a statement of their probable development terms. No report had been received from that company at the end of the year.

THE CLIFFS POWER & LIGHT COMPANY

STATISTICAL DATA - 1944

	KILOWATT HOURS GENERATED & PURCHASED								STATION USE	DELIVERED TO LINES	KWH SOLD	TRANSMISSION LOSSES	
	McCLURE	CARP	HOIST	AuTRAIN	REPUBLIC	ESCANABA	PURCHASED	TOTAL				KWH	%
Jan.	3,312,000	1,459,000	1,140,000	368,000	55,600	187,000	1,961,000	8,482,600	20,460	8,462,140	7,741,777	720,363	8.51
Feb.	3,313,000	1,414,000	1,125,000	336,000	55,800	197,000	2,083,000	8,523,800	22,950	8,500,850	7,952,001	548,849	6.90
Mar.	3,362,000	1,150,000	1,087,000	310,000	61,400	184,000	2,595,240	8,749,640	17,260	8,732,380	7,896,085	836,295	9.57
Apr.	2,827,000	1,648,000	928,000	406,000	95,200	403,000	2,254,320	8,561,520	18,810	8,542,710	8,032,396	510,314	5.97
May	2,870,000	1,360,000	990,000	617,200	324,500	1,033,000	2,425,400	9,620,100	16,270	9,603,830	8,458,634	1,145,196	11.92
June	3,120,000	544,000	1,159,000	648,200	349,600	834,000	2,954,280	9,609,080	14,640	9,594,440	8,764,102	830,338	8.65
July	3,454,000	485,000	1,201,000	415,800	227,300	437,000	2,607,400	8,827,500	16,100	8,811,400	7,972,501	838,899	9.52
Aug.	3,376,000	1,267,000	1,230,000	298,000	204,000	355,000	2,180,480	8,910,480	17,210	8,893,270	7,894,929	998,341	11.22
Sept.	3,087,000	1,640,000	1,150,000	247,900	95,400	286,000	2,202,120	8,708,420	19,540	8,688,880	7,863,349	825,531	9.50
Oct.	3,072,000	1,806,000	1,130,000	227,700	288,500	506,000	2,006,200	9,036,400	17,990	9,018,410	8,143,040	875,370	9.70
Nov.	3,355,000	1,709,000	1,232,000	213,000	224,900	423,000	1,877,240	9,034,140	18,850	9,015,290	8,191,668	823,622	9.14
Dec.	3,219,000	1,396,000	1,197,000	316,200	216,800	365,000	1,712,880	8,422,880	17,440	8,405,440	7,454,750	960,690	11.31
Yr.	38,367,000	15,878,000	13,569,000	4,404,000	2,199,000	5,210,000	26,859,560	106,486,560	217,520	106,239,040	96,365,232	9,903,808	9.32

THE CLIFFS POWER & LIGHT COMPANY
ANNUAL REPORT
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STATISTICAL DATA - 1944

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Precipitation -	0.81	0.71	1.86	1.92	2.47	6.68	4.07	4.87	3.42	1.77	2.70	1.49

Total Precipitation at Ishpeming during 1944 - 32.77" (2.73 ft.)
Average " " Marquette - 32.80" (46 year record)

CARP RIVER PLANT:

Drainage area above Intake Dam		66.66 sq. miles
Cubic feet precipitation in 1944	5,073,361,413	
Kilowatt hours generated in 1944	15,878,000	
Cubic feet water utilized (90 cu. ft. - 1 Kwh.)	1 429 020 000	
" " " in Carp Storage Basin Jan. 1, 1944	328 700 000	
" " " " " " " Dec.31, 1944	224 160 000	
" " " taken from storage in 1944	104 540 000	
" " " wasted over Intake Dam	152 208 000	
Total run-off for year 1944 (Cubic feet)	1 476 688 000	
Run-off per sq. mile of drainage area	22 152 535	
Second-feetof run-off		0.702

	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	1943	1944
Total Precipitation	27.10	30.23	30.10	35.32	33.58	30.34	32.20	34.26	32.04	32.77
Sec.ft. per sq.mile run-off	0.79	0.89	0.86	1.33	1.47	1.05	0.83	0.84	1.17	0.70

McCLURE PLANT:

Drainage area above Intake Dam		140.52 sq. miles
Cubic feet precipitation in 1944 (Hoist Plant 37.62")	12,281,100,916	
Kilowatt hours generated at McClure Plant in 1944	38,367,000	
Cubic feet water utilized (125 cu. ft. - 1 Kwh)	4 795 875 000	
" " " wasted over Intake Dam		
" " " in Hoist Storage Basin Jan. 1, 1944	1 270 000 000	
" " " " " " " Dec.31, 1944	1 508 606 000	
" " " stored in Hoist Stor. Basin in 1944	238 606 000	
" " " in Silver Lake Jan. 1, 1944		
" " " " " " Dec.31, 1944	147 955 000	
" " " stored in Silver Lake in 1944	147 955 000	
Total run-off for year 1944 (Cubic feet)	5 182 436 000	
Run-off per sq.mile of drainage area	36 880 416	
Second-feet of run-off		1.17

	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	1943	1944
Total Precipitation	40.20	35.64	37.62
Sec.ft.per sq.mile run-off	1.15	1.43	1.17

* - 1920 Precipitation figure is total precipitation at Ishpeming.

THE CLIFFS POWER & LIGHT COMPANY
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SUBSTATION TRANSFORMERS:

Substation transformers installed as of December 31, 1944.

	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	
AuTrain Prison Camp Sub	1	1	50	50	5,076 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	
Cambria-Jackson "	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 "	1	1	1 250	1 250	
Palmer Rural "	1	4	15	60	
Negaunee-Athens "	1	3	1 000	3 000	
Mather "	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 " "	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.Rynat 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 Substation	1	1	25	25	
					3 360

THE CLIFFS POWER & LIGHT COMPANY
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YEAR 1944

SUBSTATION TRANSFORMERS: (CONT'D.)

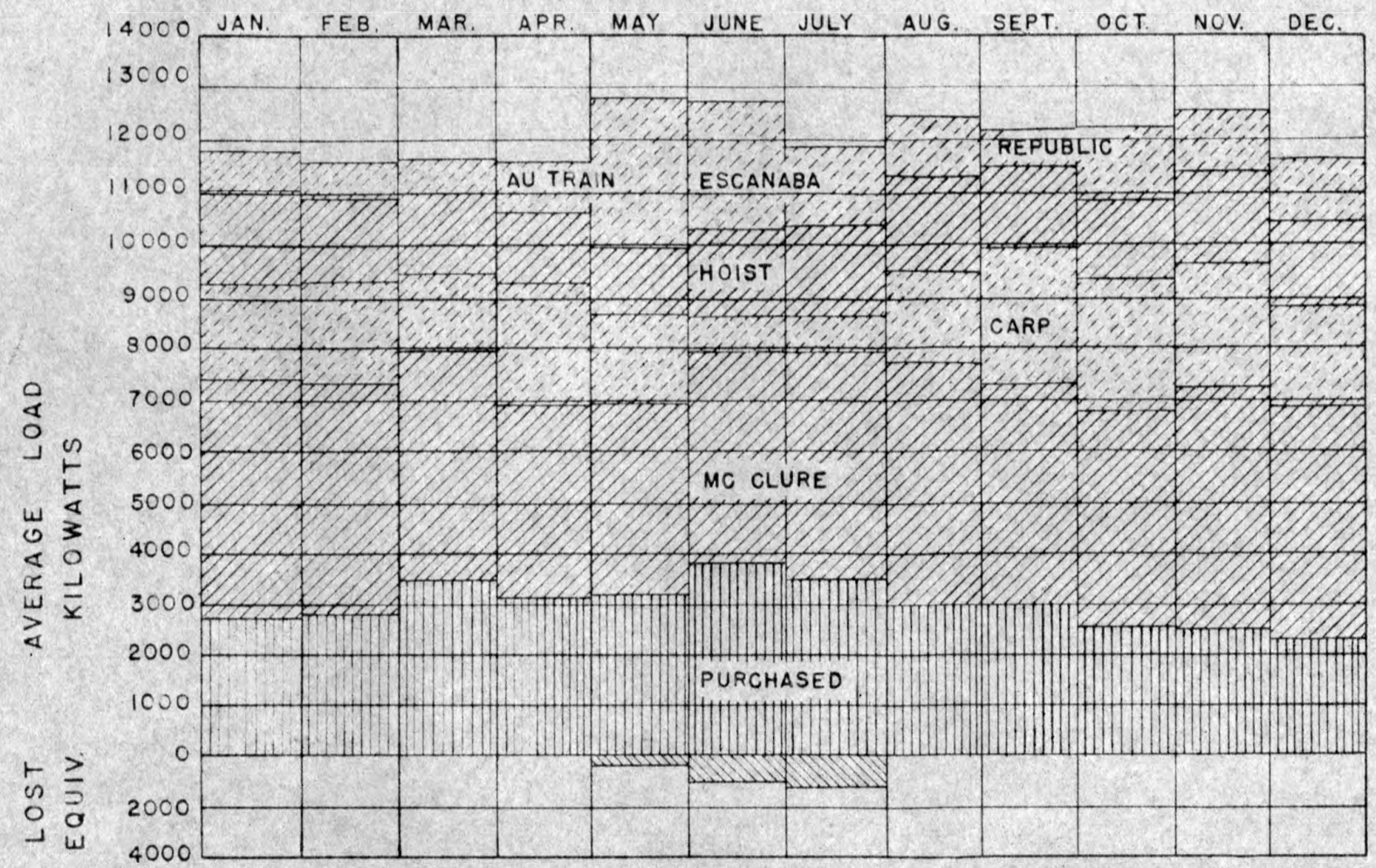
	Phase	No.	K.V.A.	Brought Fwd. Total K.V.A.	61,641 KVA
6,600/2300 Volts					
Inland #1 Substation	1	3	25	75	
Blaney Park "	1	2	25	50	
" " "	1	1	15	15	
AuTrain Lake "	1	1	25	25	
					165
6,600/115-230 Volts					
Furnace Substation Lighting	1	1	1-1/2	1½	
					1½

Grand Total ..... 61,807½ KVA

DISTRIBUTION TRANSFORMERS:

	Number	Capacity
Total at first of year	377	2,281-1/2 K.V.A.
" purchased during year	3	80
" installed " "	2	75
" sold " "	2	10
" at close of year	380	2,426½
In stock at close of year	26	146
" service at " " "	316	1 901-1/2
C.P.&.L.Co. Plants & Auxiliaries	38	379
	380	2 426-1/2 K.V.A.

1944



CURRENT MADE BY WATER POWER

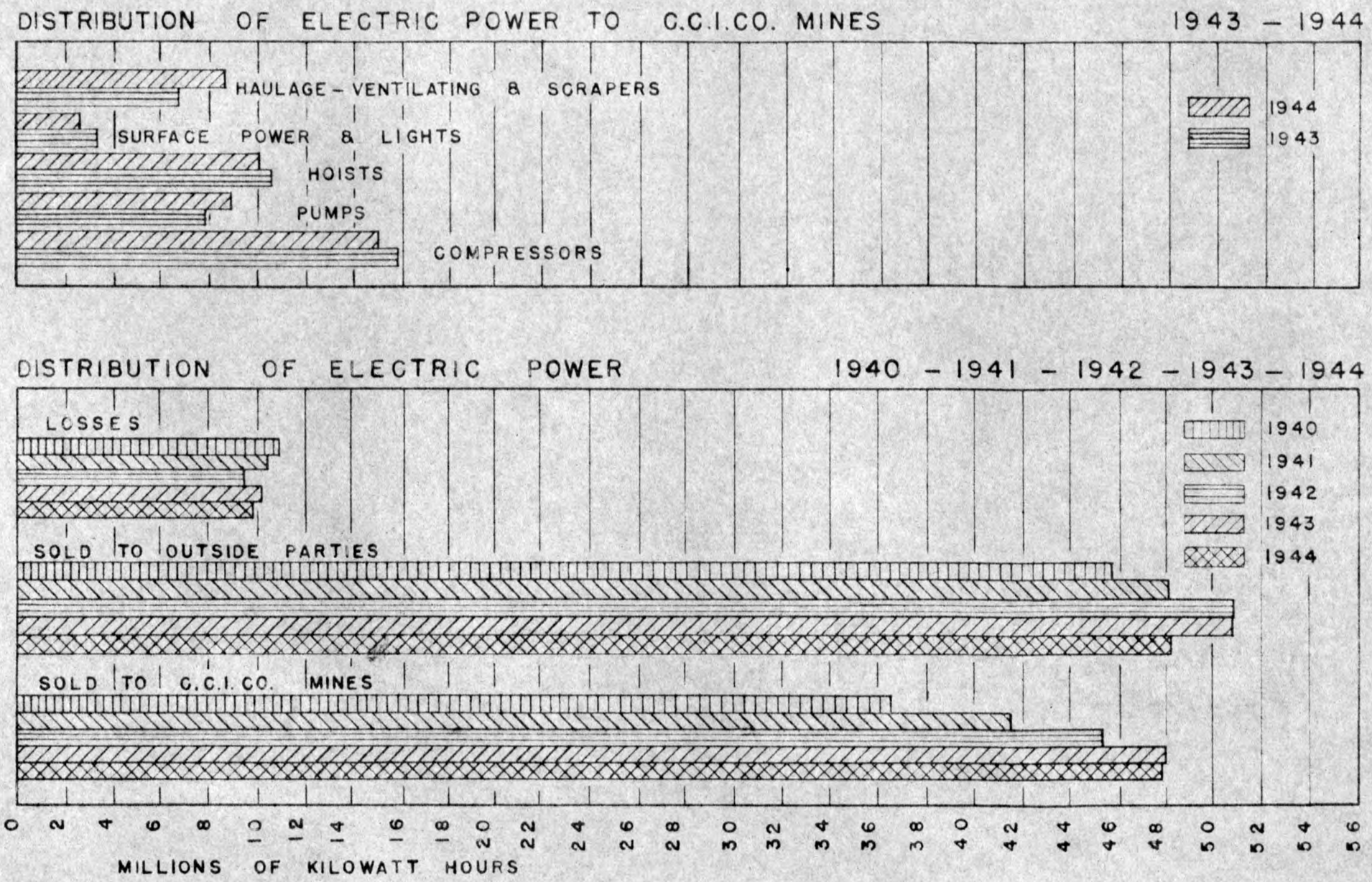
POWER PURCHASED

KILOWATT EQUIVALENT WATER LOST AT CARP

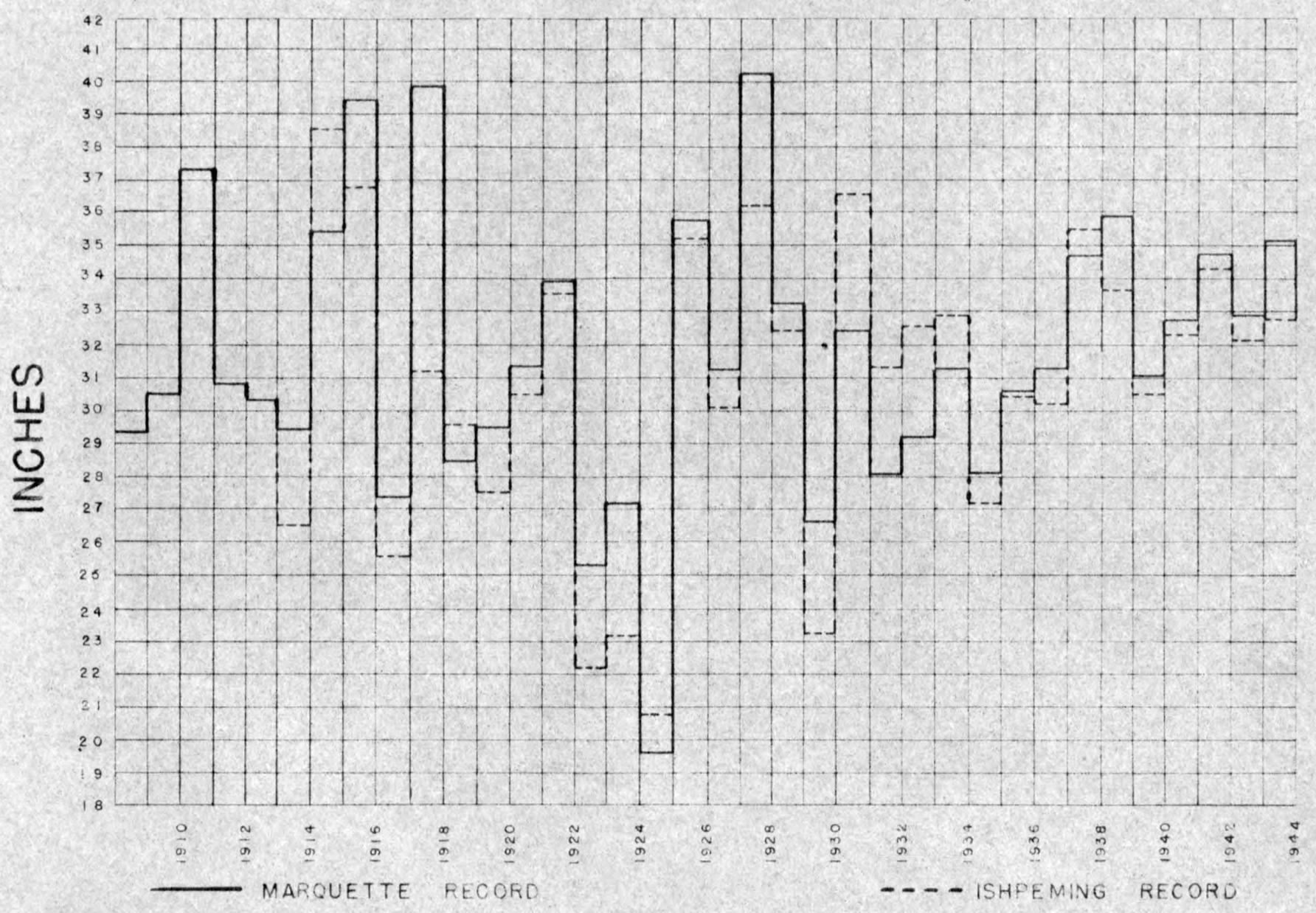
" " " MC CLURE

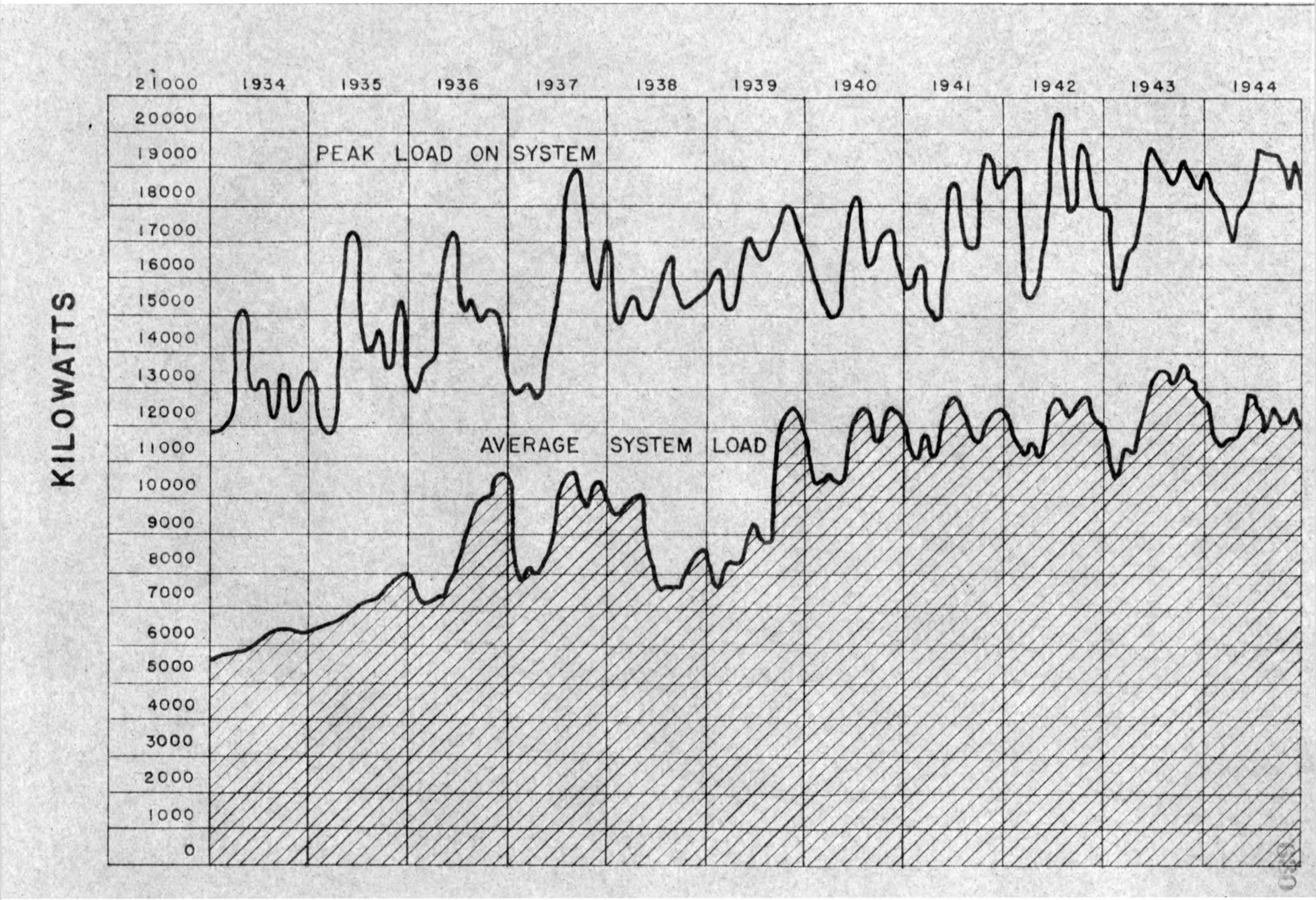
MC CLURE	36.03 %
CARP	14.91
HOIST	12.74
AU TRAIN	4.14
ESCANABA	4.89
REPUBLIC	2.07
PURCHASED	25.22

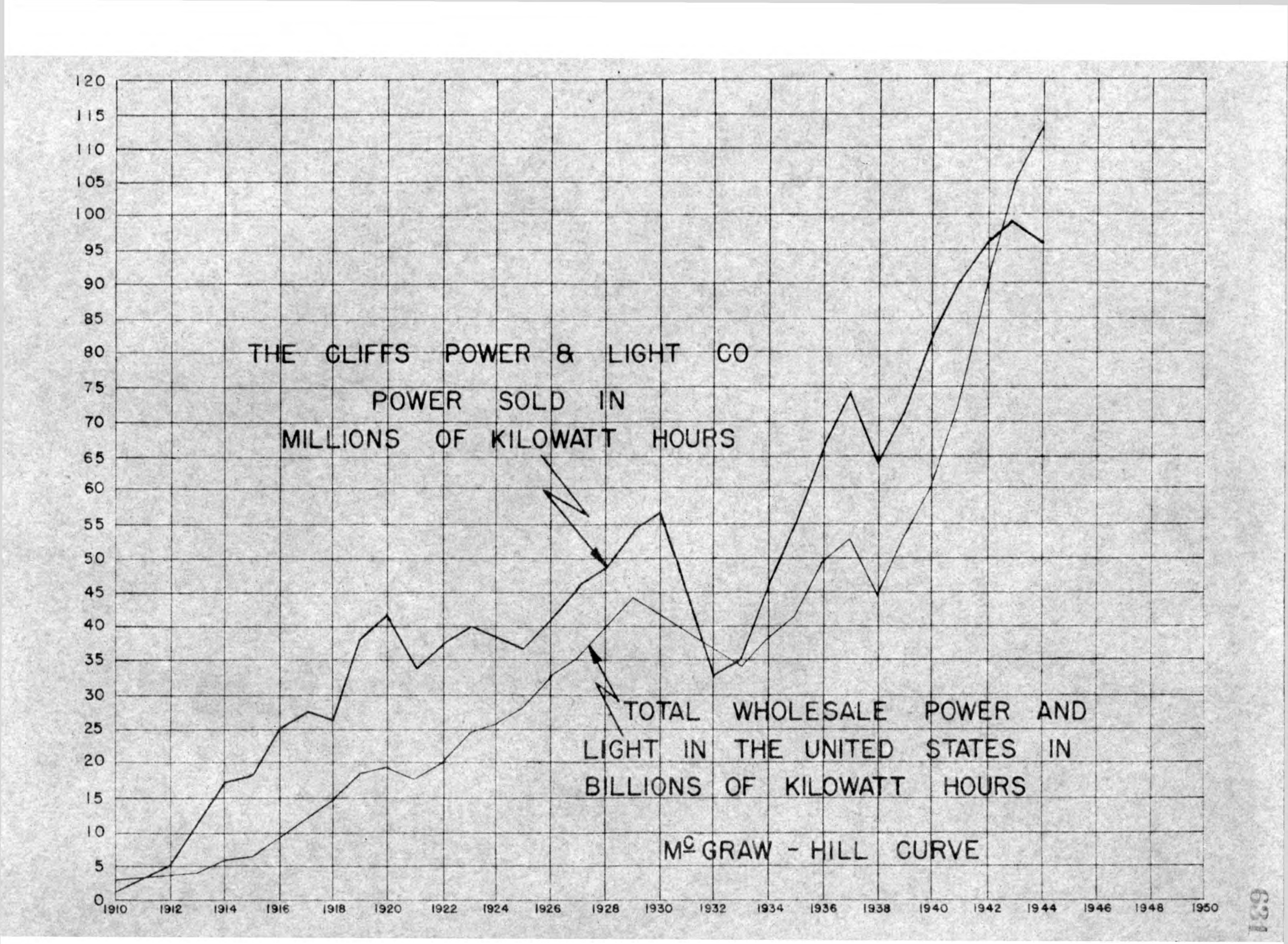
C.P.& L.CO.


DISTRIBUTION OF ELECTRIC POWER TO C.C.I.CO. MINES
1943 – 1944
HAULAGE – VENTILATING & SCRAPERS
SURFACE POWER & LIGHTS
HOISTS
PUMPS
COMPRESSORS
1944
1943
DISTRIBUTION OF ELECTRIC POWER
1940 – 1941 – 1942 – 1943 – 1944
LOSSES
SOLD TO OUTSIDE PARTIES
SOLD TO C.C.I. CO. MINES
1940
1941
1942
1943
1944
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

PRECIPITATION BY YEARS




KILOWATTS
21000
20000
19000
18000
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
PEAK LOAD ON SYSTEM
AVERAGE SYSTEM LOAD


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
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
1910
1912
1914
1916
1918
1920
1922
1924
1926
1928
1930
1932
1934
1936
1938
1940
1942
1944
1946
1948
1950

WELFARE DEPT. ANNUAL REPORT YEAR 1944

The usual functions of the Welfare Department were carried on during the year 1944. During the year there were the usual problems we have had to consider during the war years, particularly those of employees who entered the services and the return of employees who have been discharged. Some consideration has been given to post war problems, as was the case during the previous year. However, from the standpoint of social and welfare procedures, there have been no definite conclusions reached. We hope that during the new year we shall have a keener understanding of what some of our post war problems may be from the welfare standpoint.

The Company's Welfare Department has supervision of all matters dealing with and pertaining to the general welfare and health of the Company's employees. The department is charged with various activities, such as the following: The study of general welfare and social problems, workmen's compensation, group insurance, retirement problems, social security, the Company's pension system which was established some years ago and several cases are still carried as pensions, donations to employees with long and faithful service records who are no longer capable of working but are not eligible for Social Security, matters dealing with civic problems and public health, problems dealing with safety, public relation activities, personnel direction, and all special problems, including the administration of the Ishpeming Hospital which deals with the general welfare of the Company's employees and the best interests of the Company from the standpoint of public relations.

For the purpose of having in the record a definite statement regarding the Welfare Department, it is here recorded that this department was formerly 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. (Mr. Moulton passed away in January, 1944). 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. We wish to record here that throughout the years of our association with Mr. Moulton he was always helpful, cooperative, and eager to assist in any way. His great contribution to the development of this department over his more than thirty years of service has left a challenge to those of us who are privileged to follow in his footsteps. We wish also to record at this time the excellent cooperation of the Safety Department under Mr. A. J. Stromquist, Director, and Captain H. F. Rogers, Assistant Director. This cooperation and coordination with this department has, in our estimation, reacted splendidly to the Company's benefit and we believe the association which we have had has been helpful in every respect.

We also wish to record our appreciation of the splendid manner in which Mr. Walter E. Johnson has carried on as our Compensation Agent in the Welfare Department. This has been a very busy part of the work of the department during the past several years and Mr. Johnson is qualified by experience and understanding to carry on the work of this division in a fine manner.

We wish also to state again that we have enjoyed the cooperation and guidance of Mr. S. R. Elliott, our retired Manager, of Mr. C. J. Stakel, our present Manager, and of Mr. C. W. Allen, our Assistant Manager.

WELFARE DEPARTMENT

WELFARE DEPT. ANNUAL REPORT YEAR 1944

The Police Department, under the direction of our Chief of Police, R. J. Veale, is a well organized and a well operating department. This department was maintained at full strength throughout the whole year. Mr. Veale reports to my desk practically daily and regular conferences are held regarding the operation of our Police Department, and we wish to express our appreciation for the manner in which our police work has been supervised and carried out. We are definitely fortunate that through the war years we have been able to maintain a police department of conscientious, faithful, loyal, and well trained men. A special report from the Police Department is included in this report.

The personnel of the Welfare Department is made up of the following people:

Walter F. Gries, Superintendent
Walter E. Johnson, Compensation Agent
Miss Mary Ryan, Receptionist and File Clerk
Miss Emily Nicholas, Secretary to the Superintendent
Mrs. Shirley Nault, Secretary in the Compensation and Group Insurance Division
Robert J. Veale, Chief of Police

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.

CRESCENZO SAURO - Cliffs Shaft Mine - Acc. Rep. No. 1136

There was no change in the status of this case during the year. Information has come to us, through friends of Mr. Sauro, that his wife is still alive and living in Italy, but we have had no legal proof of this fact, and until such proof is obtained, together with proof of marriage, no payments will be made.

TOBIAS HANNINEN - Athens Mine

On June 17th, 1944, Hanninen filed a claim for compensation through his attorney, Mr. L. J. Archambeau of Iron Mountain. In his petition, he claims to have been overcome by gas which caused tuberculosis and injury to his body and internal organs and his condition is the result of an effect sustained during the fire at the Athens Mine in February, 1943, when he claims he was overcome by gas and smoke. During the period from December 1940 through March of 1943 Mr. Hanninen was disabled on four occasions and on each of these occasions his claim was he was sick and he was paid group insurance. The medical record indicates that on the first occasion his disability was due to influenza and in the subsequent three the diagnosis was myocarditis and neurosis. The matter was heard before Deputy Commissioner James W. Nolan on December 20th, 1944, at which time it was shown that during the period of the Athens fire the only men employed were those engaged in fighting the fire and Hanninen was not one of these. No employees were permitted to return to work until the fire had been brought under control and properly bulwarked, and frequent tests made after the men were permitted to return to work indicated that there was no gas present in any of the working places. Hanninen called his working partner as a witness and the man stated under oath that at no time did he smell smoke or notice gas in his working place. Our testimony was mostly medical and our expert maintained that Hanninen was suffering from a heart condition which had no relation to anything that might have occurred through his work. The Deputy Commissioner found in our favor, stating that Hanninen had failed to sustain the burden of proof necessary to a finding that he sustained an accident within the provisions of the Act, or that his present physical condition was in any way caused directly by any accident arising out of and in the course of his employment. The case will probably be appealed and will be heard by the full board during the coming year.

JOHN DUCOLI - Negaunee Mine

This case was heard before Deputy Commissioner James W. Nolan on December 20th, 1944. It was Ducoli's claim that on January 16th, 1943 he and his partner had set off a dynamite blast in their contract. Following the lighting of the fuse, his partner went in one direction and he went down another travelling

11.

a. WORKMEN'S COMPENSATION (Continued)

road so as to warn anyone who might be approaching the contract. It is his claim that the smoke and the dust from the blast usually was carried off through a connecting raise, but on this occasion it accumulated in the passage-way that he had chosen and that he inhaled much smoke before he could get out. According to the testimony of our medical witnesses, Ducoli has a heart condition, which, they claim, could not have been caused by the inhalation of smoke on this occasion; that the inhalation of smoke might have caused him to be ill for a short period only. The Deputy Commissioner ruled in our favor, stating in his award that he found the plaintiff had failed to sustain the full burden of proof necessary to maintain his action, and that there was no connection between his present condition and any incident that might have occurred on January 16th, 1943. The case will be appealed to the full board.

JOHN AHO - Negaunee Mine

During the past two years, this man has been on group insurance on three occasions, the cause of his disability being lumbago. The last disability occurred on April 14th, 1944, following which he was paid group insurance for the maximum period of thirteen weeks. At no time had he indicated an injury until two or three months following the expiration of his insurance benefits, when he made the claim that he had been struck on the back by some falling ore. He filed a claim for compensation, which was set for a hearing on December 20th, 1944, but as he appeared alone and had no witnesses, the case was not heard. Whether anything will come of it in the future, we can not tell.

WELFARE DEPT. ANNUAL REPORT YEAR 1944

11.

a. WORKMEN'S COMPENSATION (Continued)

FATALITIES

The following fatalities occurred in 1944:

Julius Lafreniere
Age 23

Lloyd Mine
Occurred June 9, 1944
Died June 17, 1944
Struck by fall of ground
Dependent widow and two children

Compensation - 400 weeks at 23.00	$9200.00
Funeral expense	300.00
	$9500.00

Gust Maki
Age 44

Mather Mine
Occurred March 9, 1944
Struck by fall of ground
Dependent widow and one child

Compensation - 400 weeks at 21.00	$8400.00
Funeral expense	300.00
	$8700.00

John Puskala
Age 56

Spies-Virgil Mine
Occurred March 28, 1944
Caught by run of dirt from the mill
Dependent widow and one child

Compensation - 400 weeks at 21.00	$8400.00
Funeral expense	300.00
	$8700.00

11.

a. WORKMEN'S COMPENSATION (Continued)

Following is a list of the more serious cases other than fatalities which occurred during 1944:

Mine and Report No.	Name	Nature of Injury	Compensation Paid to 12-31-44
Athens #449	Salvatore Ombrello	Bruised neck, fracture left ulna and radius, fracture left scapula	$630.00 *
Cliffs Shaft #1157	Nels Luoma	Avulsion of tubercle of left os calsis. Fracture internal malleolus	378.00 *
Princeton #215	Corell Pepin	Fracture left clavicle	707.00 *
Maas #609	Joseph Annear	Bruised lower back	413.00 *
Maas #622	George Olds	Fractured 4 ribs, right side. Left traumatic pneumothorax; partial right pneumothorax. Bruised back and hips.	*
Lloyd #837	Theodore Shepeard	Compressed fracture 1st lumbar vertebra. Fracture lower end left tibia	798.00 *
Lloyd #843	Nestor Korpi	Fracture left clavicle. Fracture internal meleolus of tibia, fracture anterior border of 5th lumbar	462.00 *
Negaunee #758	John Rasmussen	Fracture upper and lower 1/3 left tibia. Fracture lower 1/c left fibula	882.00 *
Negaunee #761	Paul Rantanen	Scalp wounds; chips off 5th cervical and 2nd & 4th lumbar vertebrae. Fracture external maleolus (left)	750.56 *
Negaunee #769	John Lindfors	Fracture 2nd distal phalanx of right thumb	420.00 *
Spies-Virgil #157	James Bertino	Ulcer in center of pupil, right eye. Loss of vision	882.00 *
Hill-Trumbull	Eli Travica	Fracture right fibula. Fracture and dislocation left os calsis.	400.00

* Payments still being made.

ANNUAL REPORT - 1944
STATEMENT OF COMPENSATION PAYMENTS FROM
JANUARY 1, 1944 to DECEMBER 31, 1944

	Average No. of Employees	No. of Fatal Accs.	No. of Non-fatal Accidents			Actual Comp. Paid in 1944	1934	1937	1938	1940	1941	1942	1943	1944	Estimated Compensation Still Pending	Medical & Special Expense	Fatal Cases Pending	Injury Cases Pending
Cambria-Jackson	198		11	4	36	3,562.64							2,754.14	808.50	1,345.86	2,667.32		2
Cliffs Shaft	447		15	17	79	7,833.20	432.00		1,296.00			936.00	1,595.70	3,573.50	9,605.30	4,577.33	1	9
Gardner-Mackinaw						684.00			684.00									
General Storehouse and Shops	165			1	28	402.50							402.50			1,488.00		
Ishpeming Office	170															1,172.62		
Lloyd	271	1	16	15	77	13,456.93		2,808.00			1,385.28	1,173.60	4,402.05	3,688.00	31,336.29	3,309.88	3	14
Maas	446		14	25	99	9,595.76			936.00	2,052.00	936.00		3,632.76	2,039.00	7,260.00	4,127.96	2	6
Princeton	168		11	18	29	6,007.48						460.22	3,956.26	1,589.00	1,623.91	2,274.40		6
Repairs to Steam Shovels			1			328.50						108.00		220.50				
Spies-Virgil	82	1	7	1	17	3,554.42							1,283.92	2,270.50	16,102.00	640.72	2	1
Tilden	28			2	5											248.75		
Miscellaneous	14				2											123.00		
Cleveland Roll	18															164.25		
Cliffs Power and Light Company	66				5	985.00					936.00		49.00		2,268.00	609.75	1	
Negaunee	384		19	19	91	12,973.69	105.60			1,872.00	1,996.72	2,160.00	3,466.70	3,372.67	14,117.78	4,533.42	4	10
Mather	151	1	1	8	38	1,637.00							147.00	1,490.00	7,686.00	2,003.74	1	1
Athens Iron Mining Company	354		21	21	78	7,366.33			612.00	287.04		1,860.51	1,647.43	2,959.35	2,693.09	4,123.01		5
Total - Michigan Mines	2962	3	116	131	584	68,387.45	537.60	2,808.00	3,528.00	4,211.04	5,254.00	6,698.33	23,339.46	22,011.02	94,038.23	32,064.15	14	54
Hibbing Office	27															165.50		
Canisteo	114		2	3	26											686.50		
Hill-Trumbull	163		1	5	31	2,776.67						866.00	1,510.67	400.00	140.00	1,474.98		1
Holman-Cliffs	164		3	4	39	188.80							11.20	200.00		1,033.50		
Total - Minnesota Mines	468		6	12	96	2,965.47						866.00	1,499.47	600.00	140.00	3,360.48		1
Total - All Mines	3430	3	122	143	680	71,352.92	537.60	2,808.00	3,528.00	4,211.04	5,254.00	7,564.33	24,838.93	22,611.02	94,178.23	35,424.63	14	55

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

11.

a. WORKMEN'S COMPENSATION (Continued)

ANNUAL STATEMENT OF COMPENSATION PAYMENTS
FROM JANUARY 1st, 1944 to DECEMBER 31st, 1944

Compensation paid on 1944 accidents	$ 22,611.02	
Compensation still pending	94,178.23	
Cost of medical and hospital service, also special expense	35,424.63	
		152,213.88
Less pending for years 1937 to 1943 inclusive	56,601.61	
Less medical and special expense on accidents occurring prior to January 1, 1944	3,523.38	
		60,124.99
		92,088.89
Less compensation paid in 1944 on Occupational Disease cases	11,000.15	
Estimated compensation still pending on Occupational Disease cases	11,569.00	
		22,569.15
Estimated cost of 1944 accidents		69,519.74
Percentage of payrolls		.00878
Percentage of payrolls including Occ. Dis. cases		.01388
Number of fatal accidents		3
Number of compensable accidents		122
Number of non-compensable accidents		143
Number of slight accidents		680

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	0
Number of disability cases	5

WELFARE DEPARTMENT

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 to 1934	1,133,324.26	142,315.52	90,933.23	11,839.20	64,565.80	2,131.39	2,768.69	5,382.63	1,453,260.72
1935	34,805.17	6,854.34	5,154.12	218.75	3,847.56				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	35,644.38	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	12,085.67	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	6,820.97				77,708.09
1943	53,607.70	17,270.60	8,993.40	1,715.25	9,337.43				90,924.38
1944	66,219.66	21,147.85	11,489.34	1,594.75	6,325.95				106,777.55
	1,541,822.45	263,634.57	171,295.12	21,260.67	116,417.13	2,131.39	2,768.69	5,382.63	2,124,712.65

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, 1944. It includes all cases in which disability began prior to September 30, 1944.

	Death Claims		Health & Accident		Total	
	No. of Cases	Amount Paid	No. of Cases	Amount Paid	No. of Cases	Amount Paid
Cliffs-Shaft	3	5,625.00	48	2,798.85	51	8,423.85
Cambria-Jackson	1	1,875.00	24	1,120.00	25	2,995.00
General Roll	3	8,750.00	17	1,380.55	20	10,130.55
General Storehouse & Shops	2	3,125.00	12	956.00	13	4,081.00
Ishpeming Hospital			3	178.28	3	178.28
Lloyd	1	1,875.00	40	2,899.43	41	4,774.43
Maas	1	1,875.00	48	3,082.56	48	4,957.56
Princeton			16	1,110.29	16	1,110.29
Spies-Virgil	1	1,250.00	5	387.43	6	1,637.43
Tilden			1	22.00	1	22.00
Retirement Roll	6	6,000.00			6	6,000.00
Total - C. C. I. Co.	18	30,375.00	214	13,935.39	230	44,310.39
Negaunee	1	1,875.00	48	2,861.72	48	4,736.72
Mather	1	1,875.00	13	649.43	14	2,524.43
Total - Neg. Mine Co.	2	3,750.00	61	3,511.15	62	7,261.15
Athens Iron Mining Co.	1	1,875.00	37	2,524.86	38	4,399.86
Cliffs Power & Light Co.			3	446.57	3	446.57
Total - All Companies	21	36,000.00	315	20,417.97	333	56,417.97

Three of the twenty-one 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.

WELFARE DEPARTMENT

11.

c. GROUP INSURANCE (Continued)

The following deaths occurred during the policy year ending September 30, 1944:

Name	Mine	Date of Death	Amount of Insurance
Erikki Wiita	Athens Mine	8-12-44	1875.00
John Thompson	Cliffs Shaft	1-29-44	1875.00
William Niemi	" "	2-21-44	1875.00
Andrew Erkkila	" "	7-19-44	1875.00
Carl A. Johnson	Cambria-Jackson	10-30-43	1875.00
William H. Moulton	General Roll	1-30-44	5000.00
George A. Schmeltzer	" "	4- 2-44	1875.00
Harold V. Eman	" "	4-16-44	1875.00
Henry Augustson	General Storehouse	10-25-43	1250.00
Edward Olive	" "	7-21-44	1875.00
Julius G. Lafreniere (1)	Lloyd Mine	6-17-44	1875.00
George Luoma (2)	Maas Mine	12-14-43	1875.00
Andrew W. Kangas	Negaunee Mine	2-10-44	1875.00
John V. Puskala (1)	Spies-Virgil	3-29-44	1250.00
Gust Maki (1)	Mather Mine	3- 9-44	1875.00
William C. Mitchell	Retirement Roll	11-14-43	750.00
William Nault	" "	12-10-43	2000.00
Anton Mengori, Sr.	" "	12-27-43	750.00
Noah Hares	" "	12-28-43	750.00
Esten Peterson	" "	2-17-44	750.00
John O. Andrew	" "	3-21-44	1000.00

(1) Killed in occupational accidents
(2) " " non-occupational accidents

WELFARE DEPARTMENT

23.

a. PENSION SYSTEM.

The pension system which went into effect on January 1, 1909 completed the thirty-sixth year of its operation in 1944.

No changes in the rates of pensions were made during the year 1944. On January 1, 1933, the pension payments were reduced 50%; those under $20.00 remaining the same and those over $20.00 having a minimum rate of $20.00. There have been no additions to the pension rolls since January 1, 1932.

The following Mining Department pensioners passed away during 1944:

No.	Name	Pension Began	Date of Death
69	William Paynter	12-1-1915	5-24-1944
194	George J. Sarasin	6-1-1926	5-25-1944
219	John H. Wills	8-1-1927	11-27-1944
249	John Larson (Holmes Mine)	12-1-1930	7- 3-1944

	1943	1944
Number of deaths	8	4
Number of Old Age pensions in force Dec. 31	32	28
Average annual pension	320.20	303.04

There was one death in the Furnace Department pension payroll. This was

No.			
6	Joseph DeVet, Sr.,	12-1-1923	4-30-1944

On December 31, 1944 there was only one pensioner on the Furnace Department pension roll and his average annual pension was $223.80.

WELFARE DEPARTMENT.

WELFARE DEPT. ANNUAL REPORT YEAR 1944.

23.

a. PENSION SYSTEM (Continued)

Pension payments for the years 1908 to 1944, inclusive, are as follows:

Year	Old Age	Widows and Orphans	Total
1908	69.10	48.00	117.10
1909	351.92	464.00	815.92
1910	896.44	1043.00	1939.44
1911	1690.37	2649.00	4939.37
1912	3865.95	3113.00	6978.95
1913	5133.62	3025.00	8158.62
1914	6179.57	3403.00	9582.57
1915	7910.35	2372.00	10282.35
1916	8787.02	1694.00	10481.02
1917	9327.22	1266.00	10593.22
1918	8889.14	944.00	9833.14
1919	9605.02	888.00	10493.02
1920	12613.29	814.00	13427.29
1921	21856.62	14.00	21870.64
1922	29063.85	168.00	29231.85
1923	29564.57	168.00	29732.57
1924	31987.64	168.00	32155.64
1925	34926.34	163.00	35089.34
1926	38924.88	143.00	39067.88
1927	45841.03	0.00	45841.03
1928	51869.03	0.00	51869.03
1929	52701.19	0.00	52701.19
1930	53779.24	0.00	53779.24
1931	56379.39	0.00	56379.39
1932	40615.13	0.00	40615.13
1933	30981.29	0.00	30981.29
1934	28205.25	0.00	28205.25
1935	24987.66	0.00	24987.66
1936	22736.32	0.00	22736.32
1937	20393.66	0.00	20393.66
1938	18360.44	0.00	18360.44
1939	16544.14	0.00	16544.14
1940	14237.87	0.00	14237.87
1941	12476.76	0.00	12476.76
1942	11632.15	0.00	11632.15
1943	10246.66	0.00	10246.66
1944	8485.25	0.00	8485.25
	782115.14	22547.00	804662.14
Payment made by Cleveland Office in 1930	2500.00		2500.00
	$ 784615.14		807162.14

WELFARE DEPT.

23.

a. PENSION SYSTEM (Continued)

Republic Mine.

There were no deaths of pensioners on the Republic Mine roll during the year 1944.

On December 31, 1944 there were four pensioners on the roll and the average annual pension was $321.25.

The payments made from October 1, 1920 to December 31, 1944, follow:

1920	$ 278.61
1921	3427.97
1922	5672.82
1923	6641.51
1924	8172.96
1925	8379.08
1926	9539.90
1927	12185.24
1928	12768.21
1929	14199.74
1930	13148.40
1931	11809.51
1932	7673.31
1933	4908.04
1934	4400.52
1935	4160.52
1936	4031.36
1937	2853.58
1938	2028.88
1939	1868.88
1940	1868.88
1941	1741.92
1942	1488.00
1943	1285.00
1944	995.04
	$ 145527.89

23.

a. PENSION SYSTEM (Continued.)

Furnace Department.

Pension payments for the years 1910 to 1944, inclusive, are as follows:

Year	Old Age	Widows and Orphans	Total
1910	111.75	0.00	111.75
1911	268.20	120.00	388.20
1912	268.20	180.00	448.20
1913	268.20	180.00	448.20
1914	268.20	180.00	448.20
1915	268.20	180.00	448.20
1916	268.20	60.00	328.20
1917	268.20	0.00	268.20
1918	268.20		268.20
1919	130.55		130.55
1920	223.80		223.80
1921	781.63		781.63
1922	1108.04		1108.04
1923	1179.38		1179.38
1924	2085.32		2085.32
1925	2833.39		2833.39
1926	5351.35		5351.35
1927	4819.73		4819.73
1928	5481.50		5481.50
1929	6137.02		6137.02
1930	6191.42		6191.42
1931	5531.30		5531.30
1932	3327.09		3327.09
1933	2528.04		2528.04
1934	2309.43		2309.43
1935	1930.54		1930.54
1936	1902.72		1902.72
1937	1662.72		1662.72
1938	1446.90		1446.90
1939	1374.96		1374.96
1940	1158.78		1158.78
1941	926.72		926.72
1942	846.72		846.72
1943	687.17		687.17
1944	303.80		303.80
	$ 64527.37	900.00	65427.37

23.

a. PENSION SYSTEM (Continued)

Land Department.

Erick Johnson continued on the pension roll during the year 1944. His annual pension amounts to $240.00.

Total pension payments from January 1, 1927 to December 31, 1944 are as follows:

1927	$ 333.36
1928	333.36
1929	333.36
1930	333.36
1931	333.36
1932	250.08
1933	240.00
1934	240.00
1935	240.00
1936	240.00
1937	240.00
1938	240.00
1939	240.00
1940	240.00
1941	240.00
1942	240.00
1943	240.00
1944	240.00
	$ 4796.88

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b. REPUBLIC MINE FUNDS

Every year it is recorded in the annual report of this department that the 1930 annual report carries a full statement of Sick Benefit Relief and Fatal Accident Funds of the closed Republic Mine. The unused balances which remained in these funds have now been all expended. In our report for 1942 we carry an outline of the use which was made of these funds.

Dr. Paul Van Riper, who has his home and office at Champion, continues to take care of our employees in the Champion-Republic district. He uses the building at Republic, formerly used as a hospital and now established as a health center for the district, as his office when he holds office hours at Republic. Dr. Van Riper is paid on the basis of the number of employees who live in his district.

The Republic Hospital building, which is used as the health center, is now under the control of Republic Township. The township and the school district provide certain funds for the maintenance of the building so that they may have some type of health service in the community.

A registered nurse, a married person, lives in the hospital building, in the portion which has been turned over for living quarters. This nurse is on call in case of emergencies.

c. SUSPENSE FUNDS

The annual report for the year 1918 carries a complete statement of the payments made from the Suspense Funds from February 1, 1912, at which time the Michigan Compensation Law went into effect. Reference to these funds is made in the annual report each year so that it may always be convenient to determine where to look for the final report on the Suspense Funds.

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d. VISITING NURSES

During the year 1944 the usual services of our industrial nurses were maintained. The services of our industrial nurses, particularly during these times when we have fewer doctors than formerly, has meant very much to many of our employees and their families. Each nurse presents a monthly report and these reports indicate that our nurses have been very busy. The type of service provided by our industrial nurses is an excellent example of social medical service extended to employees and we are very fortunate during these times of war emergencies in having on our staff nurses who are very capable, experienced, and who do everything in their power whenever called upon to provide health and medical services. This past year they have been very active and it is our desire to commend them for the excellent work they are doing.

The work of the visiting nurses was started at Ishpeming on May 1, 1908 and in Negaunee on September 8, 1912. These services were also available at Gwinn from September 1, 1910 until October 1, 1927 when the Gwinn mines were closed. Presently we have an industrial nurse in the Gwinn area since we have not been able to secure a full-time physician for Gwinn since Dr. Witters left in the fall of 1943. (We are now planning to transfer Dr. Treshler from the Negaunee District to Gwinn on a full-time basis.)

During the year 1944 the following nurses were employed:

Ishpeming	-	Miss Myrtle V. Welander
Negaunee	-	Miss Ina E. Atkin
Gwinn	-	Mrs. Margaret Kemp (employed since the fall of 1943)
Iron River	-	Miss Laura N. Fisk (Miss Fisk is employed jointly with other companies)

Miss Welander, Miss Atkin, and Mrs. Kemp submit reports each week and we also receive monthly summaries of their work. Each month the monthly summaries of the industrial nurses service are made a part of the monthly report of this department. These reports give an excellent picture of the extent of the services which are rendered by our industrial nurses. They are of great assistance to the doctors in the follow-up work as well as in carrying out medical orders for many people who are ill in their homes. It is felt that the continued services of our industrial nurses has had considerable influence on the reduction of illnesses amongst our employees.

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d. VISITING NURSES.

Following is the report of the Ishpeming Visiting Nurse for the year 1944:

Total number of patients cared for during year	825
Number of new cases cared for during year	441
Total number of visits to patients	4664
Number of families visited for the first time	52
Number of social calls	79
Number died	4

Classification of new cases for the year:

Number of adults	180	Male	26	Female	154
Number of children	261	Male	101	Female	160

Nationalities of new cases for the year:

American	292	Irish	2
English	12	Italian	58
Finnish	56	Norwegian	3
French	6	Swedish	12

Diseases and number of new cases:

Aenemia	2	Measles	10
Appendicitis	1	Miscarriage	3
Asthma	8	Obstetrical	5
Baby Welfare	8	Otitis Media	2
Bowel Trouble	16	Pleurisy	5
Bronchitis	2	Pneumonia	6
Burns	6	Post-Operative	31
Carcinoma	1	.Prenatal	14
Chicken Pox	1	Post-Natal	30
Colds	51	Quincy	2
Convulsions	1	Rash	3
Diabetes	1	Rheumatism	5
Dysentery	3	Rupture	2
Fracture	1	Scarlet Fever	2
Heart Trouble	5	Stomach Trouble	12
Hives	1	Tonsilitis	34
Infants, Newborn	46	Toxoid	5
Infections	36	Unclassified	15
Influenza	20	Undiagnosed	8
Injury	16	Var. Ulcer	2
Kidney Trouble	2	Whooping Cough	17

Visiting Nurse: Miss Myrtle Welander.

WELFARE DEPARTMENT.