GWINN DISTRICT

Not many changes or additions have been made in the mechanical equipment of the Gwinn District, and as a consequence there is not much of importance to record.

The operation has all been of a routine nature and has gone forward in a very satisfactory manner, with only minor delays from time to time; which in itself would indicate that the equipment and its operation is quite satisfactory.

The only changes of any importance to record are the electrification of the hoists at the Stephenson Mine and the completion of the new mine hoist at Princeton No. 2, which was started in the summer of 1921, but was discontinued in August of that year when the mine was shut down for an indefinite period.

AUSTIN MINE

Operations at this mine were resumed on June 1st.

At present a new loading pocket is being erected at the railroad several hundred feet east of the collar of the new shaft, and a tramway from the shaft to this pocket is under construction.

A new engine house will soon be erected and the present hoist will be moved into it to hoist through the new shaft.

FRANCIS MINE

The American "Sirroco" ventilating fan #8, originally installed at the collar of the Gwinn Mine shaft for ventilating the Gwinn and Francis mines, was moved in January to the Francis and installed on the 1060 ft. level. This level connects the Gwinn and Francis mines and the fan performs the same function in its new location as formerly.

GWINN MINE

This mine was idle the entire year with the exception of the underground pumps.

GWINN CRUSHING PLANT

The crusher plant was operated from May to October, inclusive. Its operation was very satisfactory.

At the beginning of the season a new 36" conveyor belt was placed on the Robbins conveyor serving the crusher, the old original one being worn out.

GARDNER MINE

This mine was idle the entire year.

The hoist motor was taken out and sent to the Stephenson Mine to be used for driving the skip hoist.

MACKINAW MINE

This mine was idle the entire year. The underground pumps are still in operation, however.

PRINCETON MINE

This mine was idle the entire year with the exception of the underground pumps.

During November and December the motor from the old Webster, Camp & Lane mine hoist at #2 was removed and connected to the new mine hoist and other details of the installation of this new hoist were completed. This new hoist will be used at intervals for lowering timber for repair work in the mine, etc., and should be in excellent shape for hoisting when the operation of this mine is resumed.

PRINCETON CENTRAL POWER PLANT

This plant operated very well throughout the year and at this time the whole plant is in excellent condition, the best since 1915.

The Weller coal handling outfit, which was installed in 1921 to supply coal to the Murphy stokers in place of the equipment which was burned at the time of the power house fire, works very nicely and is much cleaner and more efficient in every respect than the old equipment.

The steam turbine was operated from October 2nd to 7th, October 12th to 26th, October 30th to November 8th and from December 7th to 22nd.

Several new bents were added to the coal trestle in November in order to be able to stock coal enough for the winter requirements of the steam turbine.

PRINCETON PUMP STATION

No changes or alterations were made to the equipment at this station during the year. The operation has been entirely routine and satisfactory.

STEPHENSON MINE

During the month of August the skip hoist was electrified. It is now driven by a 400 H.P. General Electric motor secured from the Gardner Mine hoist. The gears were secured from the Maas Mine, where they were used on the old cage hoist. Hoist was first run electrically on August 12th.

September 23rd to 27th the cage hoist was electrified. This is driven by a 400 H.P., 360 R.P.M., General Electric motor secured from the General Storehouse, where it had been held as a spare hoist motor. The herringbone gears were furnished by the Falk Company.

These two hoists were the only remaining steam driven units in the Gwinn District, so that now the whole district is operated electrically.

STEPHENSON MINE (Cont'd)

These two hoists are operating very nicely, being equipped with single reduction gears, and "Lilly" safety devices makes their operation very smooth and as safe as it is possible to make them.

A counterweight was also placed on the cage hoist, making its operation much easier, safer and more satisfactory.

The saving in coal the last month has been approximately 200 tons, with one man less charged to the operation of the boilers and hoists, which indicates a very satisfactory saving, to say nothing of many minor sources of expense in operation which have been eliminated.

BOEING MINE

The pumping load for mine and most of pit was carried throughout the year. It was necessary to overhaul the Allis-Chalmers 1,000 G.P.M. centrifugal pump in February due to cutting caused by fine sand in the mine water. In May the pumping load increased to 1400 G.P.M., and to care for a larger flow a 500 G.P.M., 600 ft. head, Prescott centrifugal pump was secured from the Lake Mine and installed in underground pump station. By May month the sand and mud was so high in the east drift it was necessary to remove it, and to take care of the water in the pit a 1,000 G.P.M., 175 ft. head, Allis-Chalmers pump from Crosby Mine underground was installed in east end of pit and a 2300 volt transmission line run to it from mine Sub-station. This, together with electric pumps already installed by Winston-Dear Company, cared for pit water until drift cleaning was completed in July. To save running compressor to operate rotary dump while cleaning drift the mechanism was changed so dump could be turned over with electric locomotive.

The Winston-Dear Company loaded all ore for year, with exception of stockpile. As soon as our #20 shovel finished loading Meadow Mine stock-pile it was moved to the Boeing Mine stockpile, arriving July 25th. The #19 locomotive was brought over from the Hill-Trumbull Mine and used until

BOEING MINE (Cont'd)

loading was completed in August, when it was returned to the Hill-Trumbull. While working here the engineer on #19 locomotive attempted to pass the shaft house, caught the cab on a steel chute and tore most of cab loose from engine. This is being repaired this winter at the Hill-Trumbull shops.

Some trouble was experienced with Substation. One 150 K.V.A. transformer burned out August 25th and it was necessary to secure two from the Great Northern Power Company to carry the load. On September 5th the Great Northern Power Company transformer burned out, but by this time ours was repaired and the load was put back on two of our transformers. On October 6th two new General Electric transformers were received and the load then placed on three transformers, carrying the fourth as a spare. On December 13th the 150 K.V.A. Westinghouse transformer burned out and was replaced with the spare. This spare blew up on December 14th and was replaced with a similar machine from the Hill-Trumbull Substation. Another General Electric transformer has been ordered.

Orders were received in October to operate the mine and machinery was put in shape and mine started as soon as possible. The rotary dumps and motor tram cars needed the most attention, as the heating system had been overhauled and put in good condition in September. Hoisting was started November 16th and the mine is still operating.

CROSBY MINE

With exception of washing stockpile from July 5th to September 29th, most of work here consisted of removing from underground and dismantling the mine equipment. It was necessary to replace one pole of Prescott pump in engine house, which was ruptured by water seeping inside and freezing.

The disposal of equipment at this mine to date is as follows:

The 1,000 G.P.M., 175 ft. head, Allis-Chalmers centrifugal pump from underground was sold to Boeing Mine and shipped in June.

CROSBY MINE (Cont'd)

Two Type LM-101 General Electric locomotives were overhauled and shipped, with all repair parts, to the Spies Mine in October.

Ottumwa Iron Works electric hoist, with 75 H.P. General Electric motor and electric equipment, shipped to Stephenson Mine in October.

Two set of dump plates from shaft house and four skips were shipped to Gwinn Mine in October.

Sullivan 12" x 12" belt driven compressor, with 50 H.P. motor, shipped to Dead River Storage Dam in October.

General Electric motor-generator set, with electric equipment, shipped to General Storehouse, Ishpeming, in October.

No. 2 locomotive, Model "60" Marion shovel #22, six 50 ton ore cars and six 7-yard rock cars were shipped to Hill-Trumbull Mine in October.

Two Model "28" Marion shovels, #12 and #13, were shipped to Hill-Trumbull in October.

Two Type LM-2-T-6 General Electric locomotives were shipped to the Hill-Trumbull shops to be overhauled and to be stored until needed elsewhere.

After closing down for season the Washing Plant equipment was not disturbed with exception of conveyor belt, which was worn out. This was removed and sent to the Hill-Trumbull Mine for patching belts at the Washing Plant.

HILL-TRUMBULL MINE

Additional repairs were put on 85-C steam shovel. New oak timbers were put in boom and a portable crank pin turning machine was secured to true up base plate pintel. A coal bin of seven tons capacity and hopper were added to both #26 and #27 shovels so that they can be coaled with locomotive crane and can take on enough coal to last at least two shifts.

The Model "36" Marion shovel was loaned to A. Guthrie & Co. part of the mohth of March to dig drain ditch on north side of pit.

HILL-TRUMBULL MINE (Cont'd)

The Washing Plant was operated day shift only from May 10th to October 30th, 346,931 tons of concentrates being washed. Several troubles developed in the mill during the season, which were as follows :

The 25 H.P. motor on north 25 ft. log got too hot and was replaced with a 40 H.P. motor.

The 50 H.P. belt conveyor motor proved too small and was replaced with a 100 H.P. motor.

During the winter both poles on 2,000 G.P.M. Prescott pump were ruptured by water which seeped inside and froze. They had to be replaced.

The frost heaved the concrete under outboard bearing on the same pump. This foundation was removed and replaced with one reaching below frost line.

The electric post brake on belt conveyor was continually out of order due to heavy vibration of gears. It is planned to remove this brake from intermediate shaft and add it to motor shaft, which will eliminate the vibration and increase its power to hold the load.

In order to eliminate the overflow from 25,000 gallon tank an electric high water alarm was installed in pump house.

To prevent tailings from blocking launder leading from washing plant to basin a 14" pipe line was put in, which can be shifted in any direction. This pipe line will permit tailings to flow by gravity for one more season, but after that it may be necessary to pump them.

In the Pit the #27 shovel did most of the work. A new 1-5/8" chain was put on in June, but with the exception of eccentric strap on boom engine breaking the shovel gave no trouble. The #26 shovel was taken to the Pit to be ready for emergency. It was on some clean-up work October 13th when the hoisting drum broke. This drum will be replaced during winter repairs.

The 50 H.P. locomotive type boiler from Helmer Mine, stored here for two years, was sold to a small sawmill outfit north of Nashwauk.

MEADOW MINE

The only work at this mine was loading out the stockpile and removing the equipment. Stockpile loading was started with #20 shovel on April 19th and was completed July 20th.

Due to rivets on "A" frame patch breaking, the boom dropped, wrecking "A" frame and swinging circle. These were repaired at Hill-Trumbull shops and the shovel put back into commission. After the stockpile loading was completed the shovel was shipped to the Boeing Mine.

In November it was decided to scrap or remove the equipment. The Lake Shore Engine Works double drum hoist, Sullivan compressor, two Milwaukee gasoline locomotives, four Cameron steam pump and blacksmith shop equipment were loaded with warehouse supplies, rail and pipe and stored at the Wade Mine. The boilers, cars and other equipment were sold as scrap iron. All of the mine equipment is now cleaned up.

WADE-HELMER MINE

This mine was idle the entire year, with the exception of the pumps.

In August orders were received to prepare for Helmer pit stockpile loading and Model "36" Marion shovel and one Lima locomotive were steamed up, but on August 22nd orders were received to shut down, so machines were laid up for the winter.

In March a spare set of dipper sticks for Marion Model "36" shovel were shipped to Hill-Trumbull Mine.

In October the last of three 50 H.P. locomotive boilers in Helmer Incline boiler house was loaded and shipped to the Spies Mine.

The 100 H.P. motor on Platt underground centrifugal pump has given some insulation trouble. Two coils on stator and one on rotor broke down and were repaired.

All the equipment reserved from the Meadow Mine was stored at the Wade under a shelter built from Meadow warehouse material.

REPUBLIC MINE

Full time mining operations were resumed on June 5th.

No new equipment was installed, there were no changes and no delays of importance. All equipment operated in a satisfactory manner.

SPIES MINE

This mine was idle the entire year.

The opening and equipping of the Virgil Lease through the Spies shaft was authorized in September. New equipment was ordered for this work as follows:

Lake Shore Engine Works 10' x 7' single drum hoist.

General Electric 400 H.P. motor with control equipment.

Falk herringbone gears.

This equipment was ordered in September and October, but has not yet been received.

Two electric locomotives were received from the Crosby Mine in October.

A 50 H.P. locomotive type boiler was received from the Helmer Mine in October and installed for heating purposes.

DEAD RIVER STORAGE DAM

The Storage Dam on the Dead River at the Hoist Plant was authorized on September 15th and work was commenced immediately. A force of men was put on the job clearing the site and building camps and this work was carried on through the remainder of the year. About 1200 cubic yards of concrete was mixed, finishing the intake control, but no concrete was placed in the main dam. Mixing plant, railroad tracks, etc., were completed and work of placing concrete in the main dam will commence in the

first week of January 1923. From this time on the work should go ahead without serious interruption and it is hoped to complete the job by the first of November 1923. It may be possible to store a little water during the summer and the work is being prosecuted with this desirable end in view.

ELECTRICAL DEPARTMENT

The Electric Plant operated continuously through the year. Service given was satisfactory in all respects.

The McClure Plant was in service 362 days.

" Carp " " " " 365 "

" Hoist " " " " 362 "

" Au Train " " " " 365 "

" Maas " " " " 71 "

" Princeton " " " " 47 "

Au Train Plant, however, was operated mostly on short days, shutting down about 8 hrs. per day; this method giving slightly better efficiency and output and dispensing with one operator.

No additions were made to plants or transmission lines during the year.

Some repairs were made as follows:

New roof on Au Train power house; new roof on Operator's dwelling at Carp and Au Train; repairs on power house roof at Carp and McClure plants. Some repair work was done on the Au Train dam.

The total number of transmission line troubles was 19, as compared to 42 in 1921.

Total K.W.H. generated at McClure Plant practically same as 1921.

" " " " Carp " increase of 28%.

" " " " Hoist " " " 23%.

" " " " Au Train " " " 9%.

" " " by steam decrease " 28%.

" " " " all plants increase " 10%.

Transmission losses were 14.47%, as compared to 15.58% in 1921, an improvement of 1.1%.

Condition of water in storage at the close of the year is about as usual.

On account of the heavy snowfall last winter our water losses

during the spring break-up were umusually large. When the new storage dam on the Dead River is completed a considerable part of this will be saved.

The only serious trouble we have had is a puncture in one of the 5,000 K.V.A. transformers at the McClure Plant Substation. This unit is out of commission and now undergoing repairs.

The usual tables and graphic charts are appended.

SUMMARY OF OPERATING CONDITIONS - 1 9 2 2 .

Month	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Precipitation	0.74	4.26	2.25	3.39	3.26	4.50	3.79	1.45	4.51	1.35	3.08	1.09

Total Precipitation for 1922 (Ishpeming) - 33.67 inches.

Average " at Marquette - 32.8 " (46 years record)

CARP RIVER HYDRO-ELECTRIC PLANT

Drainage area above Intake Dam,	66.66 sq. mi.
Cubic feet Precipitation in 1922,	5,214,288,119
K. W. Hrs. generated at Carp River Plant in 1922,	15,304,900
Cubic feet water utilized (90 cu. ft. = 1 KWH)	1,377,441,000
" " " in Storage Basin Jan. 1, 1922,	273,920,000
" " " " " " Dec.31, "	243,637,640
" " " drawn from Storage Basin,	30,282,360
" " " wasted over Intake Dam in 1922,	890,442,000
Total run-off for the year 1922,	2,237,600,640
Run-off per sq. mile of drainage area,	33,567,300

	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
Total Precipitation,	30.11	26.53	38.4	36.83	25.46	31.05	29.50	27.40	30.38	33.67"
Second ft.per sq.mile,	1.03	.67	.93	1.29	.70	.79	.83	.73	.68	1.06

McCLURE HYDRO-ELECTRIC PLANT

Drainage area above Intake Dam,	140.52 sq. mi.
Cu. ft. Precipitation in 1922, (Ishpeming 33.67)	10,991,775,674
K. W. Hrs. generated at McClure Plant in 1922,	19,196,800
Cubic feet water utilized (125 cu. ft. = 1 KWH)	2,399,600,000
" " " wasted over Intake Dam in 1922,	4,451,825,800
Total run-off for the year 1922,	6,851,425,800
Run-off per sq. mile of drainage area,	48,757,650

	1920	1921	1922
Second ft. per sq. mile,	1.22	1.02	1.54

ELECTRIC POWER SYSTEM

SUMMARY OF OPERATIONS - 1922.

	KILOWATT HOURS GENERATED							Used by Auxiliaries	Delivered to Line	K. W. H. Sold	Losses	Cost Per K. W. H. (Incl.Depr.)
	McClure	Carp	Hoist	Au Train	Maas	Princeton	TOTAL					
Jan.	1,781,600	923,100	351,000	61,090	0	0	3,116,790	9,289	3,107,501	2,646,247	14.84%	$.00608
Feb.	1 541 000	1 136 800	396 000	55 660	0	0	3 129 460	9 151	3 120 309	2 661 442	14.70	.00591
March	1 333 800	1 152 100	453 000	161 570	0	0	3 100 470	7 521	3 092 949	2 581 225	16.54	.00591
April	785 600	1 221 300	696 000	455 360	0	0	3 158 260	7 440	3 150 820	2 649 911	15.89	.00566
May	460 200	1 553 600	793 000	493 210	0	0	3 300 010	8 252	3 291 758	2 811 672	14.58	.00599
June	1 298 900	1 450 900	528 000	360 730	0	0	3 638 530	8 032	3 630 498	3 092 760	14.81	.00554
July	1 993 700	1 161 900	554 000	229 020	0	0	3 938 620	8 428	3 930 192	3 365 625	14.36	.00565
Aug.	2 042 500	1 848 700	338 000	81 170	0	0	4 310 370	8 670	4 301 700	3 652 091	15.10	.00552
Sept.	1 858 300	1 548 200	230 000	106 890	309,100	0	4 052 490	28 452	4 024 038	3 442 968	14.43	.00760
Oct.	1 666 300	1 391 600	402 000	133 770	432 800	230 450	4 256 920	75 444	4 181 476	3 619 996	13.42	.00992
Nov.	2 301 300	756 100	520 000	194 590	193 600	188 050	4 153 640	47 942	4 105 698	3 558 860	13.32	.00864
Dec.	2 133 600	1 160 600	469 000	167 530	254 800	237 550	4 423 080	60 398	4 362 682	3 806 573	12.74	.00953
TOTALS	19,196,800	15,304,900	5,730,000	2,500,590	1,190,300	656,050	44,578,640	279,019	44,299,621	37,889,370	14.47%	$.00698

ELECTRICAL DEPARTMENT (Cont'd)

The following alternating current motors are installed and operating as needed:

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN. 1, 1923 TOTALS
CARP RIVER POWER HOUSE -				
Auxiliaries - 2 - 15 HP pump motors	30 HP.			
Water Supply Pump	1			
				31 HP.
ANGELINE MINE -				
Hoist	250			
Underground Haulage Set	150			
U.G.Centrifugal Pump (Sent to Hoist Dam)	100		100	
				400
CLIFFS SHAFT MINE -				
Shop	25			
No. 8 Crusher	125			
No. 5 Crushers - 2 - 25 HP motors	50			
Screens	15			
Top Tram	50			
Lower Tram #1	35			
Underground Haulage Set	100			
Hoist for "A" Shaft	500			
Underground Plunger Pump No. 1	180			
" Centrifugal Pump	250			
Compressor - Allis-Chalmers	175			
Hoist for "B" Shaft	500			
Underground Plunger Pump #2	200			
Laboratory Crusher	5			
Coal Crushing Plant	15			
" " " Exhaust Fan	½			
Cooling Water Pump for Compressors	10			
Ingersoll-Rand Compressor #1	400			
" " " #2	400			
Lower Tram #2		50		
Heating Plant Condensing Water Pump		2		
				3,087½
HARD ORE -				
Machine Shop	7½			
Carpenter Shop	25			
Blacksmith Shop Punch	3			
Winding Machine (Sent to Cl.Shaft Heat.Plant)	2		2	
Armature Banding Machine	2			
" " "	½			
" " "	1/8			
Lathe Grinder	1			
Portable Drill	¼			
" " - Large	¼			
Commutator Slotter	1/8			
Air Compressor	10			
Water Supply Pump	7½			
				57¾
BROWNSTONE SUBSTATION -				
Test Set	½			
Oil Filter Press	¼			
Battery Charging Motor-Generator Set	3			
				3¾
fwd.	3,630 HP.	52 HP.	102 HP.	3,580 HP.

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923 TOTALS
brt. fwd.	3,630 HP.	52 HP.	102 HP.	3,580 HP.
HARD ORE #3 SHAFT -				
Hoist (Sent to Hoist Dam)	25		25	
				0
HOLMES MINE -				
Air Compressor	340			
" " Cooling Water Pump	3			
Skip Hoist	400			
Cage "	400			
Underground Haulage Converter	150			
Machine Shop	7½			
Top Tram	25			
No. 8 Crusher	100			
No. 6 Crushers - 2 - 40 HP. motors	80			
Screens	20			
Laboratory Crusher	2			
Underground Plunger Pump	250			
" Centrifugal Pump	400			
				2,177½
LAKE MINE -				
Underground Haulage Set	215			
U.G.Plunger Pump (Stored at Gen.Storehouse)	75		75	
U.G.Centrifugal Pump (Sent to Boeing Mine)	125		125	
Coal Crushing Plant	15			
				230
SALISBURY MINE -				
Hoist	400			
Underground Centrifugal Pump	400			
" Plunger Pump	100			
" Ventilating Fan	7½			
Compressor Cooling Water Pump	2			
Surface Drainage Pump	30			
Compressor	150			
Water Supply Pump	5			
				1,094½
ATHENS MINE -				
Cage Hoist	400			
Compressor	325			
" Cooling Water Pump	3			
Auxiliary Compressor for Hoist Brakes	5			
Underground Ventilating Fan	15			
Sinking Pump - 1080' Station (Stored in Shop)	35		35	
" " - 2400' "	50			
Skip Hoist Set	850			
" " " Oil Pump	1			
Shop	10			
Underground Haulage Converter	150			
Skip Pit Pump	2			
Laboratory Crusher	5			
Underground Plunger Pump #1	400			
Top Tram - 2 - 50 HP. motors	100			
Carpenter Shop	20			
Underground Ventilating Fan	15			
" Plunger Pump #2	400			
U.G.Ventilating Fan (Sent to Gen.Storehouse)	40		40	
Ore Crusher	25			
Battery Charging Motor-Generator Set	¼			
U.G.Ventilating Fan (From Repair Shop)		40		
Ingersoll-Rand Compressor		450		
				3,266¼
fwd.	10,208¼ HP.	542 HP.	402 HP.	10,348¼ HP.

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN. 1,1923 TOTALS
brt. fwd.	10,208¼ HP.	542 HP.	402 HP.	10,348¼ HP.
MAAS MINE -				
Turbine Auxiliaries (Circulating Pump		40		
Turbine Auxiliaries (Injection "	25			
Turbine Auxiliaries (Exciter	33			
Underground Haulage Set	215			
Shop	10			
Underground Centrifugal Pump	350			
" Hoist	50			
" Plunger Pump #1	320			
Winze Pump - 4th Level	15			
Compressor Cooling Water Pump	5			
Skip Pit Hoist	15			
Top Tram - 2 - 50 HP. motors	100			
Coal Crushing Plant	15			
Underground Plunger Pump #2	250			
Ingersoll-Rand Compressor #1	400			
Small Air Compressor for U.G. Pumps	2			
Ingersoll-Rand Compressor #2	400			
Compressor Cooling Water Pump	3			
Rock Tram	50			
Skip Hoist	700			
Cage "	400			
Boiler Room Fan	½			
Skip Hoist Rheostat Pump	2			
				3,400½
MAAS CRUSHING PLANT				
Crusher	100			
Pan Conveyor	50			
Belt "	50			
				200
NEGAUNEE MINE				
Underground Haulage Set	215			
"Ilgner" Hoist Set	450			
Top Tram - 2 - 50 HP. motors	100			
Laboratory Crusher	5			
Auxiliary Compressor for Hoist Brakes	3			
U.G.Plunger Pumps - 2 - 300 HP. motors	600			
" Centrifugal Pump	350			
" Suction Pumps - 2 - 15 HP. motors	30			
Compressor Cooling Water Pump	3			
Nordberg Air Compressor	325			
Shop	15			
Skip Pit Pump	5			
Ore Crusher	25			
Ingersoll-Rand Compressor	400			
Commutator Grinder	1			
12th Level Plunger Pump	15			
11th " " Pumps - 2 - 75 HP.motors	150			
Exciters for U.G. Pump Motors (2)	40			
Hoist at #2 Shaft (Burned up)	25		25	
Signal System Motor-Generator Set	½			
				2,732½
SOUTH JACKSON CRUSHING PLANT				
Hoist	75			
Crusher	150			
Compressor	100			
				325
fwd.	16,851¼ HP.	582 HP.	427 HP.	17,006¼ HP.

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923 TOTALS
brt. fwd.	16,851¼ HP.	582 HP.	427 HP.	17,006¼ HP.
BARNES-HECKER MINE				
Cage Hoist	400			
Skip "	400			
Water Supply Pump	10			
Underground Haulage Converter	150			
" Centrifugal Pump - 2nd Level	400			
" " " - 3rd "	400			
" Plunger Pump	350			
Top Tram	50			
				2,160
LLOYD MINE				
Skip Hoist	400			
Cage "	400			
Top Tram - 2 - 40 HP. motors	80			
Ore Crusher	25			
Water Supply Pump installed Underground	50			
				955
MORRIS MINE				
Skip Hoist	400			
Cage "	400			
Shop	25			
Water Supply Pump	40			
" " "	50			
Ingersoll-Rand Air Compressor	250			
U.G.Plunger Pumps - 2 - 350 HP. motors	700			
7th Level Plnger Pump	100			
" " Centrifugal Pump	175			
Centrifugal Pump unwatering North Lake	40		40	
" " " " "	125			
Laboratory Crusher	5			
Carpenter Shop	25			
Underground Haulage Set	150		150	
Nordberg Air Compressor	325			
Compressor Cooling Water Pump	5			
Top Tram - 2 - 50 HP. motors	100			
Underground Haulage Set		150		
				2,875
SECTION 6 SHAFT				
Hoist	200			
Water Supply Pump	3			
				203
AUSTIN MINE				
Laboratory Crusher	3			
Hoist	200			
Top Tram	25			
				228
fwd.	23,312¼ HP.	732 HP.	617 HP.	23,427¼ HP.

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923 TOTALS
brt. fwd.	23,312¼ HP.	732 HP.	617 HP.	23,427¼ HP.
FRANCIS MINE				
Underground Ventilating Fan	7½			
Air Compressor	403			
Underground Centrifugal Pump	400			
Skip Hoist	400			
Compressor Cooling Water Pump	3			
Shop	5			
Top Tram	50			
Underground Haulage Converter	150			
Cage Hoist	400			
Underground Plunger Pump	350			
Rock Crusher (Stored at Francis)	25		25	
Ore Tram	37			
Underground Pump 6th Level (From Gwinn Mine)		35		
Ventilating Fan " " " " "		100		
				2,340½
GWINN MINE				
Skip Hoist	400			
Cage "	400			
Underground Centrifugal Pump	400			
" Plunger "	350			
Ore Tram	37			
Rock "	10			
Underground Haulage Set	150			
Shop	5			
9th Level Pump (To Francis Mine)	35		35	
11th Level Plunger Pump	50			
Ventilating Fan on Surface (To Francis Mine)	100		100	
				1,802
GWINN CRUSHING PLANT				
Crusher	85			
Pan Conveyor	50			
Belt "	40			
				175
GARDNER MINE				
Hoist (Sent to Stephenson Mine)	400		400	
Top Tram	25			
				25
MACKINAW MINE				
Hoist	400			
Compressor	325			
Shop	7½			
Water Supply Pump	7½			
Top Tram	25			
Underground Haulage Converter	150			
" Plunger Pump - Quintuplex	350			
" Triplex Pump	75			
Compressor Cooling Water Pump	3			
				1,343
PRINCETON MINE #2				
Hoist	200			
Top Tram - 2 - 50 HP. motors	100			
Underground Plunger Pump	150			
" Centrifugal Pump	125			
				575
PRINCETON MINE #3				
Hoist	75			
				75
fwd.	30,072¾ HP.	867HP.	1,177 HP.	29,762¾

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN. 1, 1923 TOTALS
brt. fwd.	30,072¾ HP.	867 HP.	1,177 HP.	29,762¾ HP.
STEPHENSON MINE				
Top Tram - Bessemer	50			
Aldrich 5th Level Plunger Pump	250			
Prescott " " " "	250			
5th Level Centrifugal Pump	275			
6th " " "	50			
" " Plunger "	50			
Top Tram - C. & N. W.	50			
" " - #2 Bell	50			
Rock Tram	25			
Skip Hoist (From Gardner Mine)		400		
Cage " (From General Storehouse)		400		
				1,850
PRINCETON CENTRAL POWER PLANT				
Turbine Auxiliaries (Circulating Pump	50			
(Injection "	25			
(Exciter	33			
Underground Haulage Set	215			
Air Compressor	625			
" " Cooling Water Pump	7½			
Boiler Room Fan	50			
Coal Handling Machinery	10			
" " "	5			
				1,020½
PRINCETON CENTRAL SHOPS				
Shop Motor	25			
Grinder Motor (Previously stored at Austin)		3		
				28
PRINCETON CENTRAL PUMP STATION				
Centrifugal Pump	100			
				100
McCLURE PLANT				
Water Supply Pump (Burned out)	2		2	
" " "		2		
				2
HOIST PLANT				
Exciter Motor-Generator Set	20			
				20
DEAD RIVER STORAGE DAM				
Centrifugal Pump for Hydraulic Work		100		
Water Supply Pump		5		
Concrete Mixer		10		
" Hoist		25		
Wood Saw		10		
				150
ISHPEMING HOSPITAL				
Passenger Elevator	7½			
Dumb Waiter	3			
Large Washer	2			
Small "	1			
Extractor	2			
Vacuum Cleaner	3			
" Pump	1			
Dumb Waiter spare on Vacuum Pump (To Hard Ore)	3		3	
				19½
fwd.	32,312¾ HP.	1,822 HP.	1,182 HP.	32,952¾ HP.

MECHANICAL DEPARTMENT

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923 TOTALS
brt. fwd.	32,312¾ HP.	1,822 HP.	1,182 HP.	32,952¾ HP.
REPUBLIC MINE				
Screen at #9 Shaft	25			
Crusher	100			
Auxiliary Compressor for Hoist Brakes	5			
Pump in Engine House (Correction)	75	7½	75	
Centrifugal Pump in Engine House	20			
Coal Tram	7½			
Pump	20			
Machine Shop	5			
Pump - 4th Level	15			
" - 3rd "	50			
Pascoe Shaft Underground Pump	50			
#9 Shaft - Rock Tram	15			
Portable Hoist	7½			
Laboratory Crusher	3			
Picking Belt	5			
Rock Tram - 7th Level Pascoe Shaft	7½		7½	
Screen at Crusher	10			
Carpenter Shop	20			
#9 Shaft - 2 - 500 HP. motors	1,000			
Motor-Generator Set for Underground Haulage	30			
Underground Hoist	100			
9th Level Winze Hoist	50			
#9 Shaft Top Tram - 2 - 50 HP. motors	100			
Pump - 11th Level Pascoe Shaft	10			
				1,655½
TOTAL MINING DEPARTMENT	34,043¼ HP.	1,829½ HP.	1,264½ HP.	34,608¼ HP.
PIONEER FURNACE				
Motor-Generator Set	750			
Sawmill (8 motors)	445			
				1,195
L. S. & I. RY.				
Shops)				
Ore Dock & Pumps)				
Sawmill)	800			800
MUNISING WOODENWARE COMPANY				
Veneer Mill (13 motors)	695			695
ELECTRIC LIGHT & POWER CO., MUNISING				
City Pumping	125			125
GRAND ISLAND (Not previously reported)		10½		10½
REPUBLIC TOWNSHIP				
Water Supply Pump	25			25
GRAND TOTAL CONNECTED LOAD	36,883¼ HP.	1,840 HP.	1,264½	37,458¾ HP.

MECHANICAL DEPARTMENT

The following motors are not comected to our General Power System:

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923
SPIES MINE				
Hoist	200 HP.			
Triplex Underground Pump	50			
Crusher	50			
Air Compressor	200			
Grinder in Shop	3			
				503 HP.
MESABA RANGE				
BOEING MINE				
Sinking Hoist	35			
Air Compressor	200	25 (Correction)		
Underground Plunger Pump	100			
" Centrifugal Pump	125			
" Haulage Set	150			
Hoist	200			
Top Tram	50			
Compressor Cooling Water Pump	2			
Shop	10			
Sump Pump (Stored in Shop)	7½		7½	
Centrifugal Pump (From Crosby Mine)		85		
" " (" Lake ")		125		
				1,107 HP.
CROSBY MINE				
Hoist (Sent to Stephenson Mine)	75		75	
Air Compressor (Sent to D.R.Storage Dam)	50		50	
Plunger Pump	50			
Centrifugal Pump	85			
Shop (Sent to Hill-Trumbull Mine)	3		3	
Conveyor Belt	40			
Screen	20			
Picking Belt	3			
Log Washer	20			
Turbo (Sent to Hill-Trumbull)	20		20	
Chip Screen	3			
Tables	20			
U.G.Haulage Set (Sent to Gen'l Storehouse	150		150	
Feeder Motor	20			
Shop	5			
Centrifugal Pump (Sold to Boeing Mine)	85		85	
Sump Pump	5			
				271
HELMER MINE				
Pump (Stored at Boeing Mine)	20		20	
Hoist	200			
Sump Pump	5			
				205
fwd.	1,758½ HP.	235 HP.	410½	1,583 HP.

MECHANICAL DEPARTMENT

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	CONNECTED JAN.1,1923
brt. fwd.	1,758½ HP.	235 HP.	410½ HP.	1,583 HP.
WADE MINE				
Hoist	125			
Air Compressor	150			
" " Cooling Water Pump	2			
Underground Haulage Set	150			
Machine Shop	20	(Correction)	10	
Pump	50			
Centrifugal Pump	100			
Sump Pump	5			
Ventilating Fan	15			
Top Tram	50			
Locomotive Water Pump	5			
Clear " "	15			
				677
HILL-TRUMBULL MINE				
Log Washers 2 - 25 HP. motors	50		25	
Turbos 4 - 5 " "	20			
Picking Belt	2			
Chip Screens 2 - 2 " "	4			
Crusher	100			
Screen (Sent to Crosby Mine)	7½		7½	
Sand Pumps 2 - 10 HP. motors	20			
Prescott Plunger Pump	150	(Correction)	25	
Centrifugal Pump	150	"	25	
Conveyor (Stock)	50		50	
Tables	20			
Shops	30			
Punch & Shear Machine in Shop	5			
Band Saw in Carpenter Shop	5			
Compressor in Shop	50			
Log Washer		40		
Screen (From Crosby Mine)		20		
Conveyor		100		
Planer in Shop		3		
Variety Saw in Shop		5		
Forge Fan		2		
				701
TOTAL MESABA RANGE	3,109 HP.	405 HP.	553 HP.	2,961 HP.

MECHANICAL DEPARTMENT

ELECTRICAL DEPARTMENT (Cont'd)

The following motors are on hand (Dec. 31, 1922), but are not installed:

CLIFFS SHAFT MINE		
Top Tram (stator only)	50	
Signal System Motor-Generator Set	¼	
		50¼ HP.
GENERAL STOREHOUSE		
Spare Motor-Generator Set	15	
" from Republic concrete mixer	5	
" General Electric pump	50	
" Westinghouse Motor-Generator Set	220	
" Allis-Chalmers	30	
" from Stephenson pump	250	
" " " "	275	
" " Salisbury compressor	150	
" " McClure Plant centrifugal pump	50	
" " Lake Mine " "	20	
" " Hard Ore #3 Shaft 2 "	150	
" " " " " " plunger "	35	
" " Mackinaw Mine plunger pump	35	
" Auxiliary Air Compressor	2	
" Motor-Generator Set from Crosby Mine	150	
" General Electric	7½	
		1444½
NEGAUNEE MINE		
Flywheel Hoist Set		350
MORRIS-LLOYD MINE		
Underground Haulage Set Motor	150	
Winze Plunger Pump (stored)	50	
" Centrifugal " "	50	
" Triplex " "	50	
Ventilating Fan Motor from Barnes-Hecker	15	
		315
GWINN MINE		
Plunger Pump (From Holmes)		50
PRINCETON CENTRAL POWER PLANT		
Rock Crusher from Francis	25	
U.G. Centrifugal Pump from Princeton	50	
Top Tram	50	
		125
STEPHENSON MINE		
Layne & Bowler Pump #2		350
REPUBLIC MINE		
Spare	15	
"	10	
"	30	
"	7½	
		62½
ISHPEMING HOSPITAL		
Spare Dumb Waiter		3
DEAD RIVER STORAGE DAM		
Air Compressor		50
TOTAL		2,800¼ HP.

Motors destroyed by fire in 1922:

Negaunee Mine #2 Shaft - Hoist	25 HP.

Spare motors on Mesaba Range; on hand Dec. 31st, 1922:

BOEING MINE		
Sump Pump	7½	
Pump	20	
		27½ HP.
CROSBY MINE		
Pump	20	
"	3	
Sump Pump	3	
Pump	50	
		76
HILL-TRUMBULL MINE		
Conveyor	50	
Log Washer	25	
		75
WADE MINE		
Pump		5
TOTAL		183½ HP.

Total C.C.I.Co. load connected to General Power System -		34,608¼ H.P.
" Outside " " " " " " -		2,850⅛ "
		37,456¾ "
" connected load at Spies Mine -		503 "
" " " " Minnesota Mines -		2,961 "
Total Spare Motors on hand 12/31/22 - Ishpeming Dist. -		2,800¼ "
" " " " " " - Minnesota Mines -		183½ "
" Sold -		None
" Destroyed by Fire -		25 "

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ELECTRICAL DEPARTMENT (Cont'd)

The following direct current generators and exciters are installed and operating as needed:

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	JAN.1,1923 TOTALS
AU TRAIN WATER POWER PLANT				
Exciters (2)	34 KW.			34 KW.
CARP RIVER WATER POWER PLANT				
Exciters (2)	150			150
HOIST PLANT				
Exciter	17½			17½
McCLURE PLANT				
Exciters (2)	110			110
MAAS PLANT				
Motor Driven Exciter	22½			
Turbo "	22½			
Compressor Motor Exciters (2)	20			
				65
PRINCETON CENTRAL POWER PLANT				
Motor Driven Exciter	22½			
Turbo "	22½			
Compressor Exciter	12			
				57
REPUBLIC MINE				
Exciter in #5 Engine House	7½			
" " Water Power Plant	17			
				24½
CLIFFS SHAFT MINE				
Compressor Exciters (2)	20			20
HARD ORE & BROWNSTONE SUBSTATION				
Battery Charging Set	2			
Line Testing Set	½			
				2½
HOLMES MINE				
Compressor Exciter	10			10
ATHENS MINE				
Nordberg Compressor Exciter	10			
Flywheel Set Exciter	15			
Skip Hoist Generator	700			
Battery Charging Motor-Generator Set	½			
Ingersoll-Rand Compressor Exciter		10		
				735½
NEGAUNEE MINE				
Skip Hoist Generator	400			
Cage " "	150			
Flywheel Set Exciter	25			
Exciters for Underground Pump Motors (2)	28			
Ingersoll-Rand Compressor Exciter	10			
Nordberg " "	10			
Bell Signal Set	½			
				623½
fwd.	1,839½ KW.	10 KW.	0	1,849½ KW.

ELECTRICAL DEPARTMENT (Cont'd)

	INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	JAN.1,1923 TOTALS
brt. fwd.	1,839½ KW.	10 KW.	0	1,849½KW.
MORRIS MINE				
Ingersoll-Rand Compressor Exciter	12			
Nordberg " "	10			
				22
FRANCIS MINE				
Compressor Exciter	10			10
MACKINAW MINE				
Nordberg Compressor Exciter	10			10
TOTAL	1,881½ KW.	10 KW.	0	1,891½ KW.
Underground haulage generators:				
ANGELINE MINE				
Motor-Generator Set	100 KW.			100 KW.
CLIFFS SHAFT MINE				
Motor-Generator Set	100			100
HOLMES MINE				
Converter	100			100
LAKE MINE				
Motor-Generator Set	100			100
ATHENS MINE				
Converter	100			100
MAAS MINE				
Motor-Generator Set	100			100
NEGAUNEE MINE				
Motor-Generator Set	100			100
BARNES-HECKER MINE				
Rotary Converter	100			100
MORRIS-LLOYD MINE				
Motor-Generator Set	100			100
FRANCIS MINE				
Converter	100			100
GWINN MINE				
Motor-Generator Set	100			100
MACKINAW MINE				
Converter	100			100
PRINCETON CENTRAL POWER PLANT				
Motor-Generator Set	100			100
REPUBLIC MINE				
Battery Charging Set for Storage Battery Locomotives	20			20
TOTAL	1,320 KW	0	0	1,320 KW.

MECHANICAL DEPARTMENT

ELECTRICAL DEPARTMENT (Cont'd)

The following direct current motors are installed and operating as needed:

		INSTALLED TO JAN. 1, 1922	INSTALLED IN 1922	TAKEN OUT IN 1922	JAN.1,1923 TOTALS
AU TRAIN WATER POWER PLANT					
Governor Control Motors	(2)	¼ HP.			¼ HP.
CARP RIVER WATER POWER PLANT					
Rheostat Control	(2)	¼			
Governor "	(2)	¼			½
McCLURE PLANT					
Valve Control	(2)	2			
Rheostat "	(2)	½			2½
CLIFFS SHAFT MINE					
Portable Hoist Motor		10			10
HOLMES MINE					
Sturtevant Fans	(2)	3			3
ATHENS MINE					
Skip Hoist Motor		900			900
MAAS MINE					
Timber Hoist - 2nd level		10			
" " - 4th "		10			
Bilge Pump		5			25
NEGAUNEE MINE					
Skip Hoist Motor		500			
Cage " "		200			
Timber Hoist - 9th Level		10			
" " -10th "		10			
Fan Motor		15			735
MORRIS MINE					
Ventilating Fan		15			
Sturtevant "		1½			
Ore Loader		2			
" "		2			
" "		2			
" "		2			24½
GWINN MINE					
Hoist - 9th Level		15			
Ventilating Fan		15			
" "		15			45
PRINCETON MINE					
Bilge Pump		55			5
	TOTAL	1,750¾ HP.			1,750¾ HP.

Spare direct current motors on hand December 31st, 1922:

CLIFFS SHAFT MINE		
Motor		6½ HP.
MORRIS-LLOYD MINE		
Fan Motor from Barnes-Hecker	15	
Crane Motor	10	
		25
GWINN MINE		
Pump Motor		20
TOTAL		51½ HP.

Spare underground haulage generators on hand December 31st, 1922:

GENERAL STOREHOUSE	
Motor-Generator Set	150 K.W.
" " " from Crosby	125
MORRIS-LLOYD MINE	
Motor-Generator Set	100
TOTAL	375 K.W.

Spare generators and exciters on hand December 31st, 1922:

CLIFFS SHAFT MINE		
Signal Set		½ K.W.
GENERAL STOREHOUSE & HARD ORE		
Old Hoist Exciter	22	
Motor-Generator Set used for battery charging in Hard Ore Shop	10	
		32
NEGAUNEE MINE		
Skip Hoist armature only		500 H.P.
HOIST PLANT		
Spare Exciter		18 K.W.
TOTAL		50½ K.W.

ELECTRICAL DEPARTMENT (Cont'd)

MESABA RANGE

Exciters and generators installed up to December 31st, 1922:

BOEING MINE	
Compressor Exciter	6 K.W.

Underground haulage generators installed up to Dec. 31st, 1922:

BOEING MINE	
Motor-Generator Set	115 K.W.
CROSBY MINE	
Motor-Generator Set (Sent to Gen'l Storehouse)	
HILL-TRUMBULL MINE	
Motor-Generator Set	55
WADE MINE	
Rotary Converter	100
TOTAL	270 K.W.

Direct current motors installed up to December 31st, 1922:

BOEING MINE		
Fan	15	
"	15	
		30 H.P.
HILL-TRUMBULL MINE		
Feeder Motor		60
TOTAL		90 H.P.

Total Exciters and Generators installed	12/31/22	6 K.W.
" Underground Haulage Generators	" "	270 K.W.
" Direct Current Motors	" "	90 H.P.

ISHPEMING DISTRICT

Total D.C. Generators and Exciters installed to	12/31/22	1,891½ K.W.
" Underground Haulage Generators	" " "	1,320 K.W.
" Direct Current Motors	" " "	1,750¾ H.P.
Total Spare D.C. Generators and Exciters on hand	"	50½ K.W.
" " Underground Haulage Generators	" " "	375 K.W.
" " Direct Current Motors	" " "	51½ H.P.
Spare Direct Current Motor Armature	" " "	500 H.P.

ELECTRICAL DEPARTMENT (Cont'd)

Substation transformers installed up to Dec. 31st, 1922:

33,000/2300 Volts	NO.	K.V.A.	PHASE	TOTAL K.V.A	
Brownstone Substation	3	400	1	1,200	
Cliffs Shaft-Holmes Substation	3	500	1	1,500	
Morris-Lloyd Substation	3	590	1	1,770	
Barnes-Hecker "	3	250	1	750	
Republic "	3	400	1	1,200	
Maas "	6	590	1	3,540	
Princeton "	3	590	1	1,770	
Gwinn "	3	625	1	1,875	
Munising "	3	200	1	600	
McClure Plant	2	5,000	3	10,000	
Carp "	3	1,900	1	5,700	
Au Train "	1	1,250	3	1,250	
			TOTAL		31,155 K.V.A.
13,000/2300 Volts					
Maas Substation	1	1,250	3	1,250	
Hoist Plant	1	1,250	3	1,250	
			TOTAL		2,500 K.V.A.
6,600/2300 Volts					
Carp Plant	6	185	1	1,110	
Gwinn Substation	3	350	1	1,050	
Mackinaw "	3	350	1	1,050	
			TOTAL		3,210 K.V.A.
33,000/2300 Volts					
Spare at Cliffs Shaft Substation	1	500	1		500 K.V.A.

Transformers used for Underground Haulage installed to 12/31/22:

Athens Mine converter	3	35	1	105	
Francis " "	3	35	1	105	
Holmes " "	1	100	3	100	
Barnes-Hecker "	1	110	3	110	
Mackinaw Mine "	3	35	1	105	
			TOTAL		525 K.V.A.

MECHANICAL DEPARTMENT

Distribution Transformers installed up to Dec. 31st, 1922:

2300/220-110 Volts	NO.	K.V.A.	PHASE	TOTAL K.V.A.
ANGELINE MINE				
Top Tram	1	5	1	
" "	1	7½	1	
Hoist Control	1	7½	1	
				20
CLIFFS SHAFT MINE				
Office Lights	1	7½	1	
" "	1	15	1	
Laboratory	1	5	1	
"A" Shaft Hoist	1	7½	1	
"B" " "	1	10	1	
Coal Crusher	2 (7½)	15	1	
Pump House Lights	1	1	1	
Crusher House Lights	2 (1)	2	1	
Crushers	3 (10)	30	1	
				93
HARD ORE & BROWNSTONE				
Light & Power	1	15	1	
Light	1	¾	1	
Light & Power	1	7½	1	
Shop	1	30	1	
				53¼
HOLMES MINE				
Shop Power	3 (10)	30	1	
Engine House Lights & Power	1	5	1	
Skip Hoist Control	1	10	1	
Cage " "	1	10	1	
4th Level Pump House Lights	1	2	1	
Cage Bell Circuit	1	¾	1	
Skip " "	1	¾	1	
Shaft House Lights	1	¾	1	
Pump " "	1	¾	1	
Change " "	1	¾	1	
Shaft " "	1	½	1	
				61
LAKE MINE				
Engine House Lights	2 (5)	10	1	
Shaft Lights	1	¾	1	
				10¾
SALISBURY MINE				
Water Supply Pump	2 (2)	4	1	
Eng.House Lights & Circulating Pump	1	5	1	
" " " " "	1	2	1	
Ventilating Fan	2 (7½)	15	1	
Hoist Control	1	7½	1	
Lights	1	½	1	
				34
			fwd.	272

ELECTRICAL DEPARTMENT (Cont'd)

Distribution Transformers. (Cont'd)

	NO.		K.V.A.	PHASE	TOTAL K.V.A.
				brt. fwd.	272
ATHENS MINE					
Crusher	3	(7½)	22½	1	
Machine Shop	2	(10)	20	1	
Surface Lights & Lab. Hot Plates	3	(10)	30	1	
Pump House Lights	1		5	1	
" " "	1		2	1	
100 G.P.M. Pump	1		40	3	
Signal System	1		1	1	
Engine House Lights	1		5	1	
" " "	1		4	1	
					129½
MAAS MINE					
Lights & Injection Pump	3	(10)	30	1	
Coal Crusher & Shop	2	(10)	20	1	
Signal System	1		½	1	
Top Tram Control	1		2	1	
4th Level Pump	3	(5)	15	1	
3rd Level Pump House	2	(5)	10	1	
Bell Signall at 55 Winze	1		1	1	
Cage Hoist Control	1		10	1	
Skip " "	1		2	1	
" " "	1		3	1	
Rock Tram "	1		1	1	
Crusher Lighting	1		2	1	
					96½
NEGAUNEE MINE					
Shops Light & Power	1		7½	1	
" " " "	2	(10)	20	1	
Engine House Lights & Power	2	(10)	20	1	
" " " " "	1		5	1	
Signal System	1		½	1	
No. 2 Shaft	3	(10)	30	1	
Pump House Lights, etc.	3	(7½)	22½	1	
12th Level Pump	3	(5)	15	1	
Barn	1		5	1	
					125½
SOUTH JACKSON CRUSHING PLANT					
Hoist Brake	1		5	1	
Lights	1		2	1	
					7
BARNES-HECKER MINE					
Lights	1		5	1	
"	1		7½	1	
Top Tram Control	1		1	1	
Skip Hoist Control	1		10	1	
Cage " "	1		10	1	
Pump House Lights	1		1	1	
					34½
LLOYD MINE					
Lighting	1		3	1	
Cage Hoist Control	1		7½	1	
Skip " "	1		7½	1	
					18
				fwd.	683

MECHANICAL DEPARTMENT

Distribution Transformers. (Cont'd)

	NO.		K.V.A.	PHASE	TOTAL K.V.A.
			brt. fwd.		683
MORRIS MINE					
Cage Hoist Control & Lights	2	(5)	10	1	
Skip " "	1		7½	1	
Signal System Lights	1		½	1	
Shop & Lights	3	(10)	30	1	
North Lake Pump & Lights	1		2½	1	
					50½
SECTION 6 SHAFT					
Hoist Control	1		7½	1	
Lighting	2	(2)	4	1	
					11½
AUSTIN MINE					
Lighting	1		10	1	
Top Tram	2	(10)	20	1	
					30
FRANCIS MINE					
Cage Hoist Control	1		10	1	
Skip " "	1		10	1	
Compressor Circulating Pump	2	(2)	4	1	
Lighting	1		5	1	
Shop	2	(10)	20	1	
Pump House Lighting	1		½	1	
					49½
GWINN MINE					
Substation Lighting	1		1	1	
Cage Hoist Control	2	(5)	10	1	
Skip " "	1		7½	1	
Engine House Lights	1		10	1	
Shaft " "	1		1½	1	
					30
GARDNER MINE					
Hoist Control	1		10	1	
					10
MACKINAW MINE					
Machine Shop	2	(5)	10	1	
Hoist Control	1		7½	1	
Signal System	1		1	1	
					18½
PRINCETON MINE					
Top Tram Lights	1		3	1	
#2 Pump House Lights	1		2½	1	
					5½
PRINCETON CENTRAL POWER PLANT					
Coal Crusher	3	(7½)	22½	1	
Power Plant Lighting	1		10	1	
Injection Pump	2	(15)	30	1	
Boiler Room Fan	2	(10)	20	1	
					82½
PRINCETON CENTRAL SHOPS					
Power & Light	2	(10)	20	1	
					20
				fwd.	991

MECHANICAL DEPARTMENT

Distribution Transformers. (Cont'd)

	NO.		K.V.A.	PHASE	TOTAL K.V.A.
				brt. fwd.	991
PRINCETON DISTRICT LABORATORY					
Hot Plates	3	(10)	30	1	
					30
STEPHENSON MINE					
Rock Tram	3	(10)	30	1	
					30
REPUBLIC MINE					
G. E. Tram	2	(15)	30	1	
Lighting	3	(2)	6	1	
" & Pump	1		10	1	
" " "	1		10	1	
Engine House Lights	1		7½	1	
Hoist Control	1		25	1	
Top Tram Controls	2	(1)	2	1	
Office Lights	1		3	1	
Motor-Generator Set & Pumps	3	(7½)	22½	1	
Pascoe Shaft Hoist Control	1		7½	1	
#9 Shaft - 3rd and 4th Levels	3	(20)	60	1	
Power & Lights on Surface	3	(10)	30	1	
Water Power Plant Lights	1		1½	1	
Screen Motor & Lights	3	(3)	9	1	
Portable Hoist	1		10	1	
					234
AU TRAIN WATER POWER PLANT					
Power Plant Lights	1		1	1	
Operator's Dwelling Lights	1		2	1	
Power & Lights, Dixon Location	2	(5)	10	1	
" " " Grand Island	2	(5)	10	1	
					23
CARP RIVER WATER POWER PLANT					
Power & Light	1		10	1	
" " "	1		20	1	
Pump	2	(1)	2	1	
					32
McCLURE PLANT					
Power & Lights	2	(10)	20	1	
					20
			GRAND TOTAL		1,360 K.V.A.

ELECTRICAL DEPARTMENT (Cont'd)

Spare Transformers on hand Dec. 31st, 1922:

	NO.	K.V.A.	PHASE	TOTAL K.V.A.
GENERAL STOREHOUSE				
General Electric	1	15	1	
Fort Wayne	1	5	1	
Westinghouse	2 (15)	30	1	
Allis-Chalmers (Lake Mine)	1	7½	1	
General Electric " "	1	7½	1	
" "	2 (5)	10	1	
Sinking Pump Transformers	3 (100)	300	1	
General Electric	5 (15)	75	1	
				450
MORRIS-LLOYD MINE				
General Electric	1	15	1	
" "	1	15	1	
" "	1	15	1	
" "	1	15	1	
				60
GWINN MINE				
General Electric (Sump pump)	2 (3)	6	1	
				6
REPUBLIC MINE				
General Electric	3 (10)	30	1	
" "	1	4	1	
				34
		GRAND TOTAL		550 K.V.A.

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU.FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			CLIFFS SHAFT MINE		
1910	8 895	252 793	904 379 312	3 577	156 948 550
1911	8 095	246 334	898 424 112	3 647	165 101 640
1912	8 047	276 211	810 020 228	2 932	218 555 480
1913	8 027	295 105	833 987 419	2 826	276 582 240
1914	7 496	316 986	1 054 320 348	3 326	281 392 090
1915	5 181	347 955	889 280 382	2 555	283 489 900
1916	5 226	388 090	878 041 710	2 262	398 818 855
1917	4 500	377 177	885 993 944	2 349	345 847 725
1918	5 135	382 804	861 374 720	2 276	315 252 828
1919	3 494	377 901	907 895 024	2 402	298 889 689
1920	3 854	354 347	872 225 408	2 638	262 308 003
1921	2 094	67 454	273 648 228	4 057	274 901 402
1922	891	138 702	419 382 000	3 023	399 874 439
			HOLMES MINE		
1916	729	32 951	--- --- ---	- ---	--- --- ---
1917	739	90 225	425 227 500	4 712	--- --- ---
1918	700	130 295	368 456 686	2 840	--- --- ---
1919	947	173 178	521 145 000	3 009	(8 months) 25 471 515
1920	682	260 118	448 965 000	1 726	26 099 690
1921	832	191 147	275 057 000	1 439	38 456 053
1922	911	231 306	346 466 000	1 497	73 009 389

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			HARD ORE #3 HEATING PLANT		
1914	810				
1915	883				
1916	922				
1917	1,038				
1918	955				
1919	970				
1920	801				
1921	1,014				
1922	1,182				
			SALISBURY MINE		
1906	3 909	152 034	219 345 241	1 461	77 100 543
1907	3 892	139 986	215 971 327	1 551	86 056 044
1908	3 606	116 724	218 591 828	1 895	66 957 839
1909	3 537	99 140	218 841 412	2 228	61 699 506
1910	3 308	113 574	162 828 098	1 433	63 430 079
1911	3 158	111 272	148 067 843	1 330	61 654 458
1912	2 788	118 635	154 493 210	1 301	55 855 799
1913	848	125 178	120 039 019	958	51 358 400
1914	583	97 318	94 530 000	971	56 786 400
1915	522	27 150	164 776 200	---	53 503 200
1916	496	100 803	273 558 000	2 713	126 831 364
1917	445	104 082	188 563 500	1 811	104 560 277
1918	436	113 073	166 455 000	1 472	100 958 079
1919	617	115 764	228 578 500	1 974	144 138 375
1920	482	112 603	216 351 000	1 921	152 694 797
1921	157	21 228	43 087 500	70009	148 802 543
1922	3	--- ---	--- --- ---	- ---	168 957 807

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			ATHENS MINE		
1914	231	7 404	120 048 750	- ---	--- --- ---
1915	385	21 245	242 196 750	- ---	--- --- ---
1916	419	26 930	222 840 000	- ---	--- --- ---
1917	277	23 988	211 612 500	- ---	------- ---
1918	609	101 394	498 600 000	- ---	--- --- ---
1919	740	155 643	414 045 000	2 660	85 503 850
1920	593	214 601	505 035 000	2 353	82 794 824
1921	515	177 065	359 055 000	2 027	73 114 028
1922	683	193 711	456 615 000	2 357	86 235 707
			NEGAUNEE MINE		
1908	11 294	300 007	210 799 982	696	638 488 540
1909	9 088	316 072	263 322 702	911	623 789 512
1910	7 913	364 111	361 923 373	993	610 209 058
1911	7 805	368 352	599 630 043	1 627	634 100 040
1912	8 003	298 308	825 468 516	2 767	696 210 397
1913	7 647	368 956	741 224 169	2 008	789 153 091 (#2 Shaft)
1914	5 269	337 792	613 144 000	1 798	395 877 353
1915	1 703	404 020	363 242 060	933	--- --- ---
1916	1 223	526 237	474 099 050	900	--- --- ---
1917	1 414	548 083	455 525 250	831	780 000 000
1918	1 293	524 869	443 996 750	845	828 575 874
1919	1 320	525 894	591 104 600	1 185	603 198 543
1920	1 095	569 895	729 139 000	1 279	610 132 854
1921	838	258 967	306 315 000	1 183	597 401 853
1922	1 075	300 031	414 765 000	1 382	613 603 672

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			MAAS MINE		
1909	6 494	141 510	291 338 833	2 095	231 101 590
1910	8 219	196 052	541 169 843	2 760	209 688 862
1911	7 252	--- ---	646 245 479	- ---	--- --- ---
1912	6 502	55 603	355 459 673	- ---	--- --- ---
1913	8 903	287 784	915 881 473	3 182	--- --- --- (3 Months)
1914	6 819	213 423	720 319 949	- ---	8 336 357
1915	4 325	85 150	486 626 678	- ---	190 534 750
1916	8 062	272 802	763 134 066	2 797	363 273 050
1917	8 656	333 290	879 808 672	2 639	337 467 390
1918	9 351	312 634	935 128 335	2 991	510 265 180
1919	9 639	343 810	644 597 449	1 874	573 373 848
1920	5 097	351 521	571 224 659	1 625	513 176 403
1921	735	211 616	373 275 000	1 764	517 238 661
1922	628	219 776	458 010 000	2 083	516 431 109
			SOUTH JACKSON MINE		
1913	483	1 940	--- --- ---	- ---	--- --- ---
1914	0	15 281	--- --- ---	- ---	--- --- ---
1915	0	56 026	--- --- ---	- ---	--- --- ---
1916	0	0	(No ore taken out)	- ---	--- --- ---
1917	0	46 994	--- --- ---	- ---	--- --- ---
1918	0	15 879	13 203 000	931	--- --- ---
1919	0	56 840	--- --- ---	- ---	--- --- ---
1920	162	69 222	30 001 500	434	---- -- ---
1921	48	5 051	1 935 000	383	--- --- ---
1922	88	16 101	4 590 000	- ---	--- --- ---

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			BARNES-HECKER MINE		
1919	603	29 731	--- --- ---	- ---	(8 Months) 5 481 940
			(From Morris-Lloyd)		
1920	410	62 426	272 817 000	4 370	137 026 242
1921	120	3 712	38 406 000	1 034	585 904 565
1922	302	32 068	156 250 000	4 872	546 633 174
			MORRIS-LLOYD MINE		(Including Sec,6 Shaft)
1912	- ---	181 544	--- --- ---	- ---	--- --- ---
1913	726	209 667	--- --- ---	- ---	--- --- ---
1914	615	242 476	655 199 000	2 701	363 889 057
1915	533	298 816	722 622 750	2 418	322 295 660
1916	1 004	304 849	--- --- ---	- ---	320 074 400
1917	886	296 589	667 908 000	2 370	319 198 700
1918	959	299 360	681 964 000	2 378	315 454 220
1919	1 132	313 887	936 264 700	2 982	340 883 140
1920	971	283 400	802 852 000	2 832	311 061 125
1921	848	234 809	681 918 000	3 067	321 064 176
1922	931	241 065	596 225 500	2 473	276 149 791

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			AUSTIN MINE		
1909	- ---	186 064	181 915 343	985	--- --- ---
1910	- ---	69 500	33 411 030	480	--- --- ---
1911	- ---	145 360	128 013 967	880	--- --- ---
1912	- ---	121 191	153 118 878	1 263	--- --- ---
1913	- ---	67 494	--- --- ---	- ---	--- --- ---
1914			(Mine idle entire year.)		
1915			(Mine idle entire year)		
1916	- ---	23 697	--- --- ---	- ---	--- --- ---
1917	- ---	54 167	--- --- ---	- ---	--- --- ---
1918	- ---	759	(Mine flooded in January.)		
1919	- ---	19 212	--- --- ---	- ---	--- --- ---
1920			(Mine idle entire year.)		
1921			(Mine idle entire year.)		
1922	- ---	56 429	126 617 590	2 243	--- --- ---
			FRANCIS MINE		
1917	1 223	21 420	353 070 000	- ---	66 723 400
1918	796	65 739	565 920 000	- ---	49 625 600
1919	499	102 651	291 060 000 (Air used in Francis & Gwinn Mines.)	0 ---	45 865 547
1920	479	93 548	420 340 000 (Air used in Francis & Gwinn Mines.)	- ---	45 855 040
1921	344	80 104	258 042 600	- ---	39 415 502
1922	403	108 249	264 570 000	2 444	45 016 618
			GARDNER & MACKINAW MINES		
1917	443	29 235	323 595 000	- ---	--- --- ---
1918	553	37 883	388 395 000	- ---	--- --- ---
1919	412	93 501	325 845 000	3 485	26 941 948
1920	387	139 057	367 830 000	2 645	36 770 855
1921	6	- ---	--- --- ---	- ---	43 912 856
1922	0	- ---	--- --- ---	- ---	55 783 895

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF OF WATER PUMPED
			GWINN MINE		
1910	5 116	--- ---	143 309 920	-c---	--- --- ---
1911	3 400	2 548	136 216 025	- ---	--- --- ---
1912			(Mine idle entire year)		
1913	1 583	14 376	--- --- ---	- ---	--- --- ---
1914	1 400	95 510	--- --- ---	- ---	90 245 720
1915	807	151 474	--- --- ---	- ---	131 676 720
1916	871	186 839	--- --- ---	- ---	131 783 700
1917	976	191 080	--- --- ---	- ---	148 022 900
1918n	844	177 051	--- --- ---	- ---	168 172 800
1919	1 132	154 002	--- --- ---	- ---	199 404 200
1920	921	115 497	(Air supplied by Francis Mine) (Air supplied by Francis Mine)		165 004 020
1921	386	48 216	--- --- ---	- ---	111 928 220
1922	15	42	18 629 865 (Air supplied by C.P.P.)	- ---	102 326 460
			PRINCETON MINE		
1910	2 582	126 047	226 054 113	1 793	138 556 000
1911	570	100 150	171 032 509	1 707	--- --- ---
1912	184	22 639	48 083 876	2 123	107 537 270
1913	467	74 297	--- --- ---	- ---	108 366 555
1914	64	772	--- --- ---	- ---	99 939 295
1915	87	2 833	--- --- ---	- ---	94 629 250
1916	105	2 636	--- --- ---	- ---	136 569 170
1917	101	734	--- --- ---	- ---	109 949 035
1918	334	182 760	--- --- ---	- ---	112 926 605
1919	468	219 230	--- --- ---	- ---	131 496 940
1920	476	184 912	--- --- ---	- ---	129 512 469
1921	275	105 674	--- --- ---	- ---	111 468 005
1922	0	108	18 629 865 (Air supplied by C.P.P.	- ---	116 542 468

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	& ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			PRINCETON CENTRAL POWER PLANT (Output)		
1910	6 101		697 710 181		
1911	7 493		819 304 399		
1912	4 104		661 681 550		
1913	2 360		--- --- ---		
1914	5 900		--- --- ---		
1915	7 092		--- --- ---		
1916	5 322		1 375 169 052		
1917	2 121		1 051 739 302		
1918	6 279		971 385 234		
1919	3 614		1 236 341 627		
1920	2 598		1 264 675 500		
1921	3 754		839 610 000		
1922	1 630		620 995 500		
			PRINCETON PUMPING STATION		
1910	545				142 284 450
1911	497				153 854 205
1912	569				158 661 990
1913	633				172 438 180
1914	675				184 799 040
1915	794				202 554 240
1916	814				224 152 095
1917	986				275 717 100
1918	917				262 232 600
1919	920				237 147 315
1920	890				233 913 900
1921	259				309 992 940
1922	71				313 859 370

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			STEPHENSON MINE		
1912	4 856	241 931	460 478 796	1 903	886 471 232
1913	3 420	283 146	--- --- ---	- ---	1 028 287 849
1914	2 281	238 739	--- --- ---	- ---	772 327 870
1915	2 220	230 575	--- --- ---	- ---	763 638 450
1916	1 658	327 395	--- --- ---	- ---	785 501 510 (11 months)
1917	3 073	256 756	--- --- ---	- ---	961 713 000
1918	1 560		(Mine flooded in December 1917)		
1919	724	1 662			
1920	2 064	205 366			1 381 633 440
1921	2 163	219 145			1 215 685 840
1922	1 876	221 559	413 913 500	1 868	1 258 504 848
			CROSBY MINE		
1912	1 515	116 818	------- ---	-----	--- --- ---
1913	3 305 (10 Mo.)	207 728 (8 mo.)	--- --- ---	- ---	--- --- ---
1914	2 151	23 221	--- --- ---	- ---	--- --- ---
1915	250	-- ---	--- --- ---	- ---	--- --- ---
1916	2 069	127 373	--- --- ---	- ---	--- --- ---
1917	2 504	300 142	--- --- ---	- ---	--- --- ---
1918	3 097	255 787	--- --- ---	- ---	--- --- ---
1919	2 578	208 449	--- --- ---	- ---	--- --- ---
1920	1 280	263 478	--- --- ---	- ---	------- ---
1921	72	89 754	--- --- ---	- ---	--- --- ---
1922	362	-- ---	--- --- ---	- ---	--- --- ---
			HELMER MINE		
1919	1 274	71 867	--- --- ---	- ---	--- --- ---
1920	(See Wade) (Wade-Helmer)	42 159	--- --- ---	- ---	--- --- ---
1921	855 (Wade-Helmer)	70 578	--- --- ---	- ---	--- --- ---
1922	5	-- ---	--- --- ---	- ---	--- --- ---

MECHANICAL DEPARTMENT

COMPARATIVE TABLES

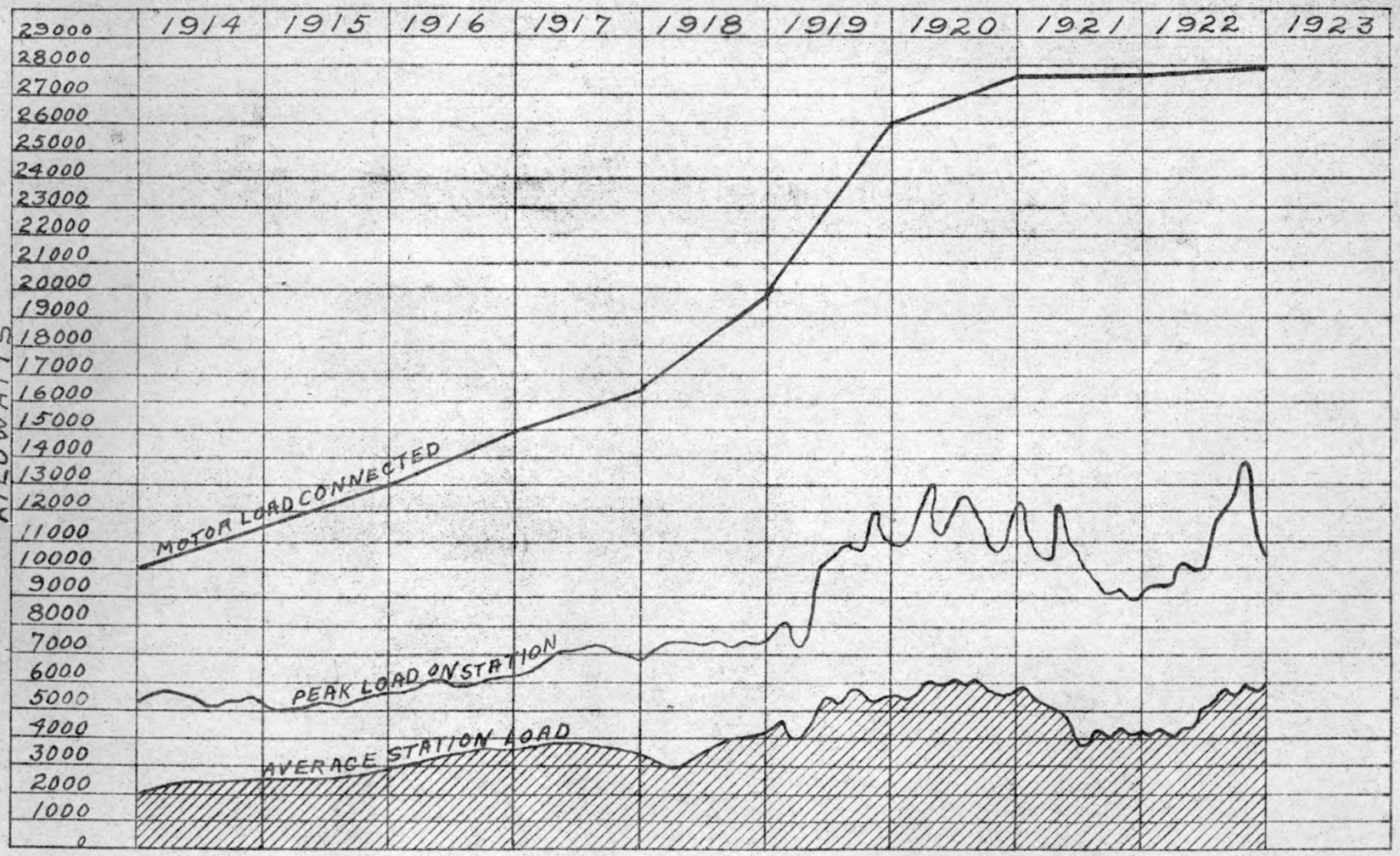
YEAR	TONS COAL BURNED	TONS ORE & ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED
			BOEING MINE		
1920	491	34 428	--- --- ---	- ---	--- --- ---
1921	212	26 190	--- --- ---	- ---	--- --- ---
1922	132	266 862	--- -------	- ---	--- --- ---
			HILL-TRUMBULL		
1921	4 983	333 595	--- --- ---	- ---	--- --- ---
1922		352 651	--- --- ---	- ---	--- --- ---
			MEADOW MINE		
1919	3 247	101 113	49 352 710	488	--- --- ---
1920	3 840	77 152	-- --- ---	---	--- --- ---
1921	2 319	34 701	-- --- ---	---	--- --- ---
1922	- ---	-- ---	-- --- ---	---	--- --- ---
			WADE MINE		
1919	5 516	238 644	-- --- ----	----	--- --- ---
1920	4 095	200 254	-- --- ----	----	--- --- ---
1921	855 (Wade-Helmer*)	70 578	(See Helmer Mine)		
1922	5	-- ---	-- --- ----	----	--- --- ---
			REPUBLIC MINE		
1918	6 780	172 955	1 141 454 000	6 605	--- --- ---
1919	5 709	185 383	1 228 202 000	6 625	34 770 380
1920	3 972	181 058	1 347 129 000	7 440	35 559 650
1921	1 436	79 761	954 242 000	11 964	35 132 398
1922	1 302	113 108	1 112 788 000	9 838	41 620 635
			SPIES MINE		
1919	962	71 000	--- --- ---	- ---	--- --- ---
1920	377	93 519	--- --- ---	- ---	--- --- ---
1921	350	46 878	87 360 300	- ---	--- --- ---
1922	192	5 432	--- --- ---	- ---	--- --- ---

COMPARATIVE TABLES (Cont'd)

Note:-

Angeline Mine	- Abandoned in 1921. Pump removed Feb. 16th.
Cliffs Shaft Mine	- Mining operations resumed June 26th.
Holmes Mine	- Full time operation June 5th.
Lake Mine	- Abandoned in 1921. Pumps removed Feb. 16th to 24th.
Salisbury Mine	- Idle entire year.
Athens Mine	- Full time operation June 5th.
Maas Mine	- " " " " "
Negaunee Mine	- " " " " "
Barnes-Hecker Mine	- " " " " "
Morris-Lloyd Mine	- " " " " " Furnished air to Barnes-Hecker Mine.
Austin Mine	- Mining operations resumed June 1st.
Francis Mine	- Full time operation June 5th.
Gardner-Mackinaw	- Idle entire year.
Gwinn Mine	- " " "
Princeton Mine	- " " "
Stephenson Mine	- Full time operation June 5th.
Boeing Mine	- Started up November 16th.
Crosby Mine	- Abandoned.
Meadow Mine	- Abandoned in 1921.
Wade-Helmer Mine	- Idle entire year.
Republic Mine	- Full time operation June 5th.
Spies Mine	- Idle entire year, with exception of development work.

- - - 0 0 - - -


KILOWATTS
29000
28000
27000
26000
25000
24000
23000
22000
21000
20000
19000
18000
17000
16000
15000
14000
13000
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11000
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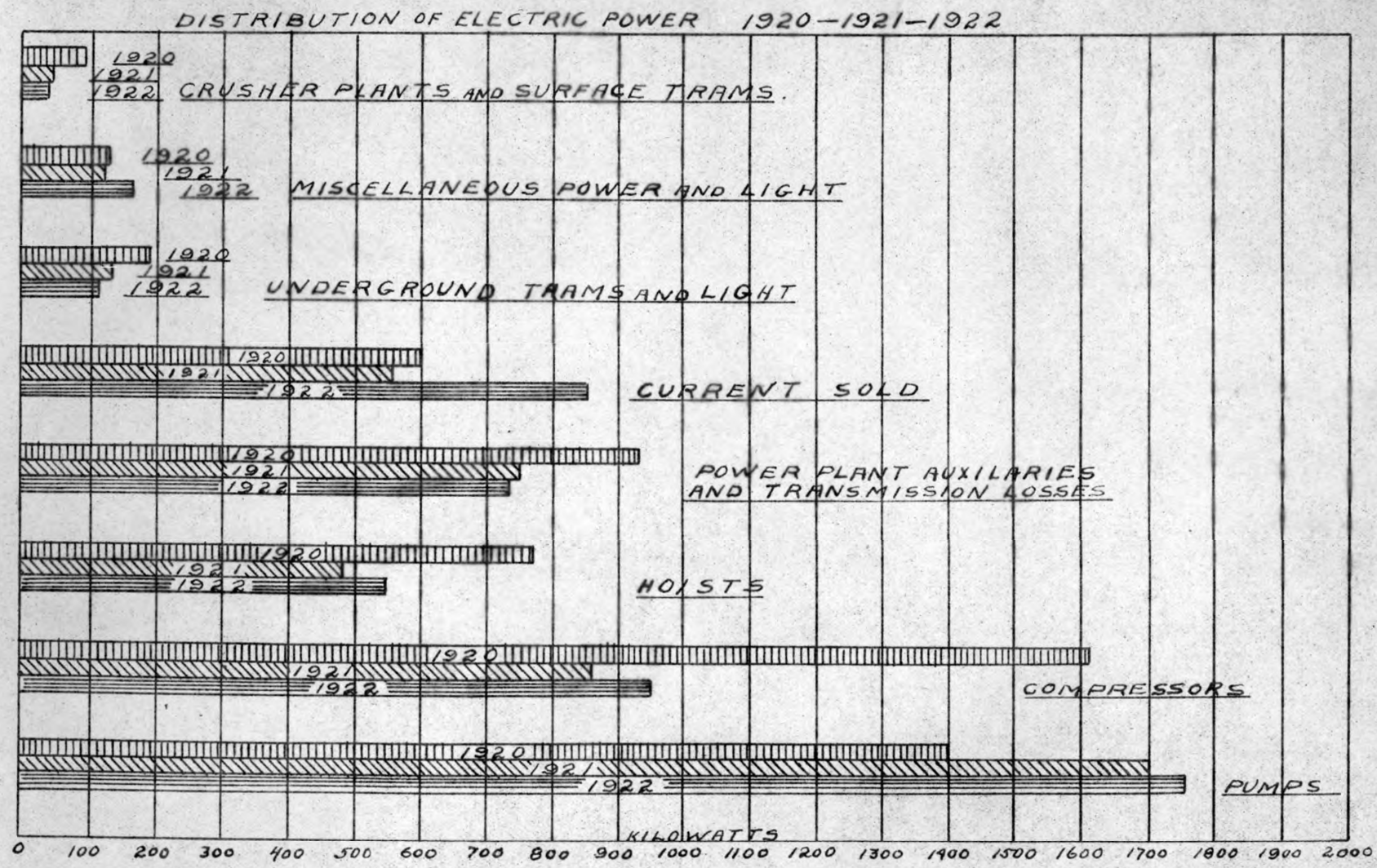
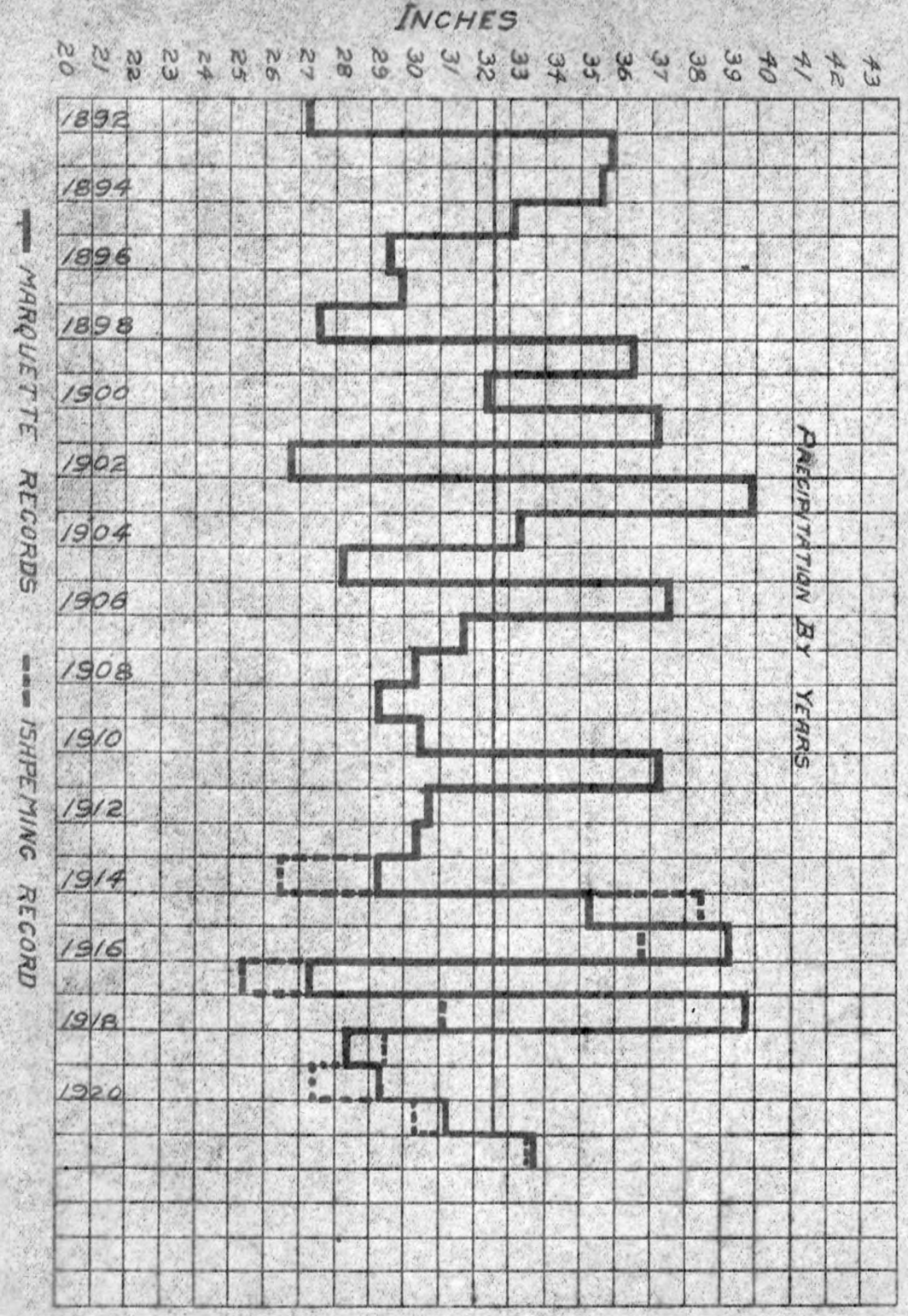
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
MOTOR LOAD CONNECTED
PEAK LOAD ON STATION
AVERAGE STATION LOAD



MECHANICAL DEPARTMENT 476


INCHES
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1892
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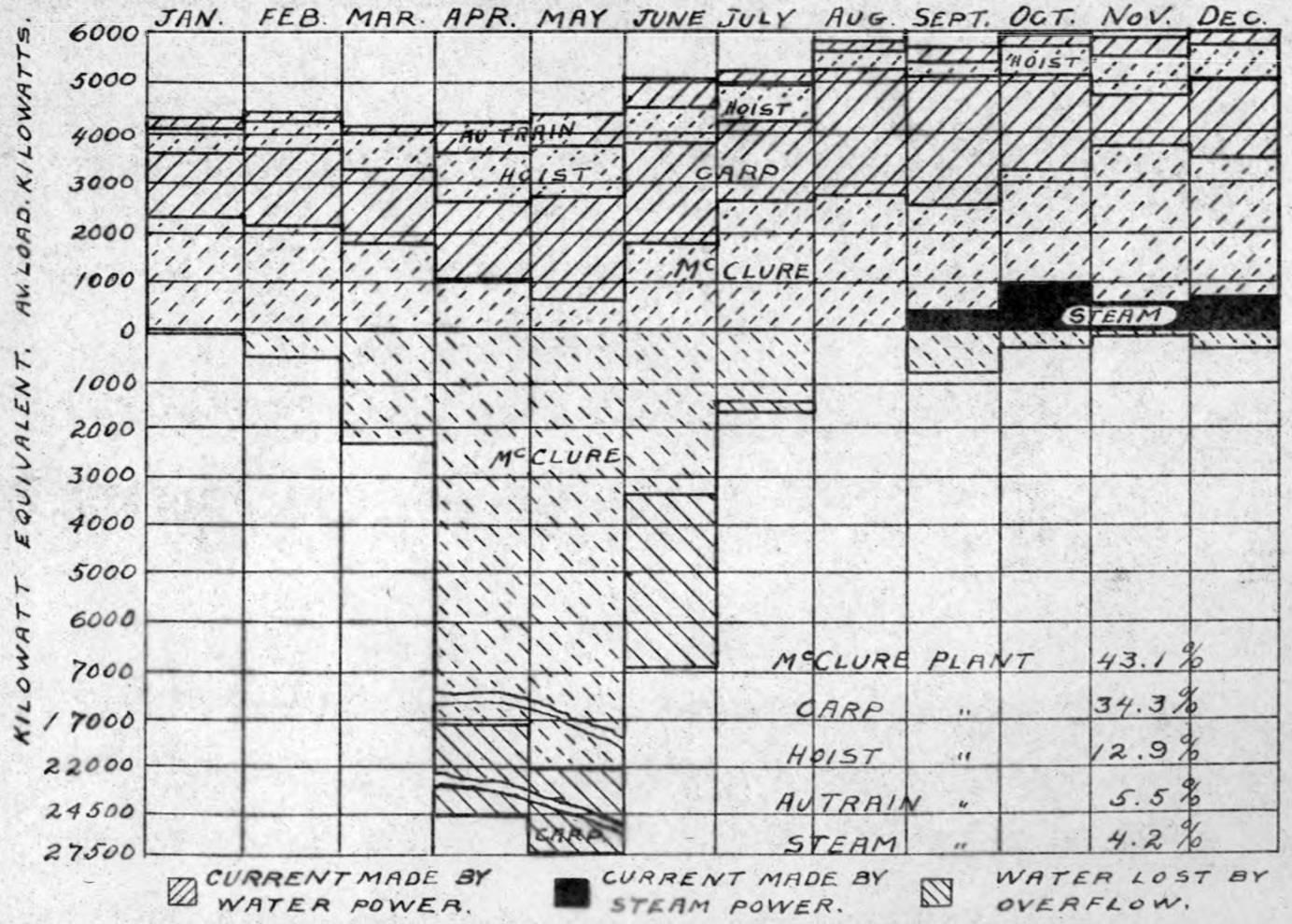
1918
1920
PRECIPITATION BY YEARS
MARQUETTE RECORDS
ISHPEMING RECORD

1922


JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
KILOWATT EQUIVALENT. AV. LOAD. K/LOWATTS.
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5000
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AU TRAIN
HOIST
CARP
McCLURE
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McCLURE
HOIST
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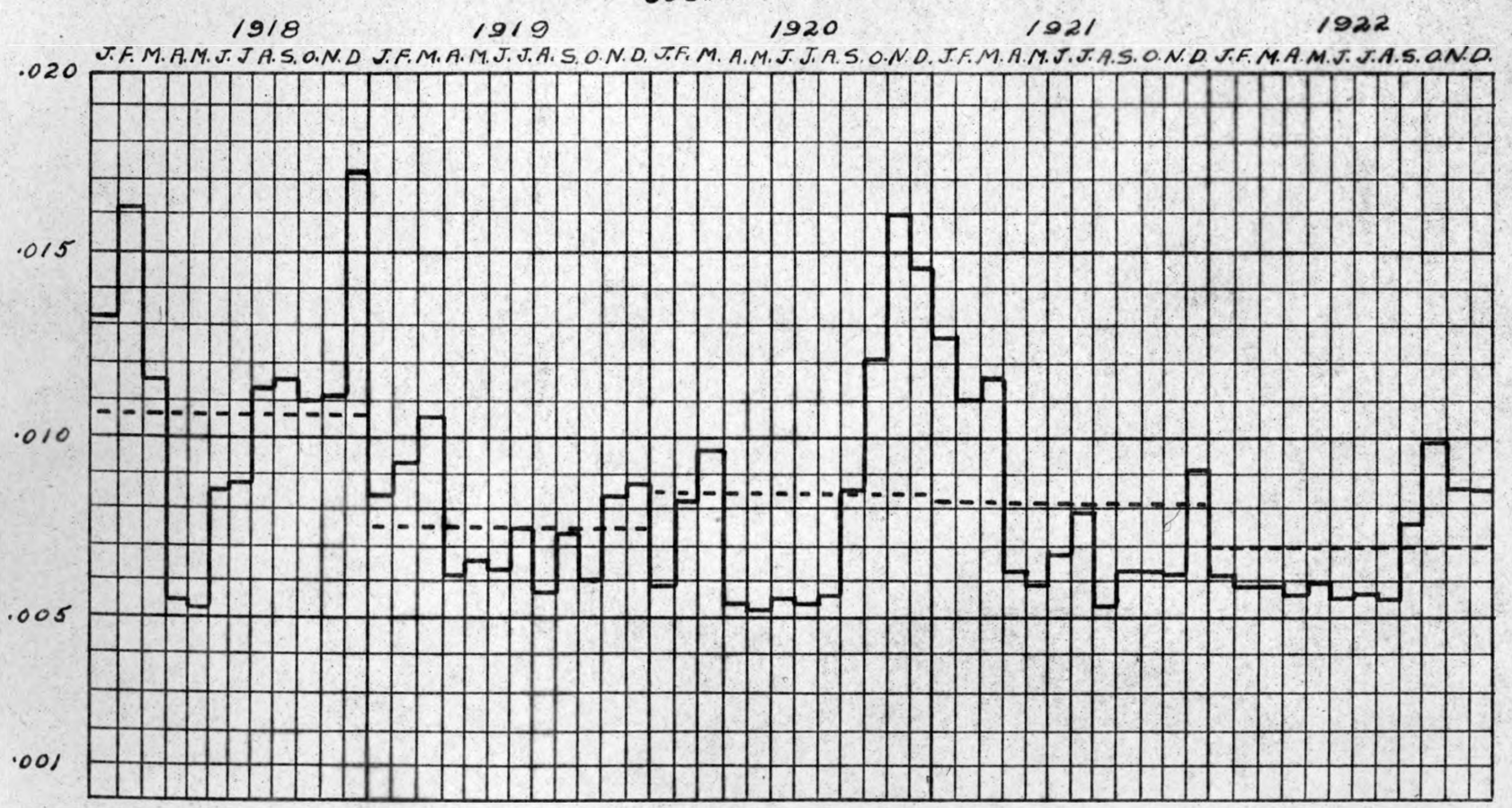
McCLURE PLANT 43.1%
CARP " 34.3%
HOIST " 12.9%
AUTRAIN " 5.5%
STEAM " 4.2%
CURRENT MADE BY WATER POWER.
CURRENT MADE BY STEAM POWER.
WATER LOST BY OVERFLOW.

COST DIAGRAM



MECHANICAL DEPARTMENT

ANNUAL REPORT

OF THE (1922)

SAFETY DEPARTMENT

The work of the Safety Department for the year 1922 is herewith reported under the following subjects: fatal, serious and slight accidents; safety inspection; special safety measures; safety conditions at the mines; first aid and mine rescue work and training; and statistical tables. Safety inspection work was directed by William Conibear, first aid and mine rescue by J. H. Williams, and clerical work by Miss Elsie Baker.

Fatal Accident Record

The opportunity to report a year without the loss of a life vanished December 26th, because on that day John Vaughn, a timberman, died at the Negaunee Hospital from injuries that were sustained December 7th, when he fell down a raise at the Athens Mine. This accident occurred while Vaughn was repairing the top of a raise, which had crushed beneath heavy ground. The end cribbing had been pushed into the raise, on the ladder side, by the legs of the set of timber over the top of the raise. A new set of timber had been placed over the raise and the chute compartment had been covered to prevent an employee from falling into it. Before new end pieces of cribbing could be put in the raise, it was necessary to support the back cribbing of the raise. Vaughn got a short piece of plank to spike longitudinally to this back cribbing. He first drove large spikes into the plank at both ends and with the assistance of a miner spiked it to the cribbing at the top of the raise. He then started down the raise in the ladderway with an axe to spike the lower end of the plank and accidentally slipped. He dropped the axe in an effort to save himself from falling, but fell to the bottom of the raise, a distance of 80 feet. He landed on his feet, fracturing both legs between ankle and knee and breaking his shoulder. The fractures were successfully reduced and it was thought that he would recover.

However, embolism set in, which resulted in death seventeen days later.

Vaughn was an old employee of the Company, aged 59 years, and was a single man, who lived with his sister. The accident was classified trade risk by the Central Safety Committee.

Comparative Fatality Record

On the basis of 300 working days per man there were employed last year approximately 2,040 men. This is less than were employed the year previous, when the number averaged 2,237. The fatality rate for 1922 is a trifle less than one-half of one per cent per 1000 men employed, the rate being .49. The lowest rate prior to last year is that of 1920, which was 1.21.

Special safety activities have been in progress twelve years, from 1911 to 1922, inclusive. During this time the Company lost 85 men by accidents. There were 34,957 men employed, which gives an average annual fatality rate of 2.40 per 1000 men. The average number of men employed annually on the basis of 300 days per man was 2,913. The average number of fatalities annually was 7.06. In the 12 years from 1899 to 1912, inclusive, there were 23,358 men employed and 115 fatalities were sustained, which resulted in an average annual fatality rate of 4.90. The average number of men employed each year was 1,946 and the average number of fatalities was 9.58.

Comparing the first six year period of the work of the Safety Department, 1911 to 1916, with the second period, 1917 to 1922, the fatality rates are respectively 2.79 and 2.14 per 1000 men employed. The reduction for the 12 year period was 50% and the reduction for the past six years over the six year period prior to it is 23%.

TABLE I

Classification of fatal accidents 1911 to 1922, inclusive,
By the Central Safety Committee.

I. Trade Risk		41
II. Negligence of Company:		
Violation of Rules	4	
Failure to Provide Safety Devices	4	
Improper Method of Dowing Work	3	
Failure to Instruct Men	1	
Failure to Provide Tools	1	
		13

III. Negligence of Workmen:

A. Injured Men:	Improper Method of Work	6	
	Carelessness	5	
	Violation of Rules	4	
	Failure to Use Tools or Appliances	2	
	Failure to Use Safety Devices	1	
			18
B. Other Workmen:	Improper Method of Work	8	
	Violation of Rules	3	
	Carelessness	2	
			13
			85.

TABLE II.

Showing number of fatalities and rates per 1000 employees for twelve years prior to safety work and also for twelve years of Safety Work.

Year	Fatalities	Rate	Year	Fatalities	Rate
1899	4	3.41	1911	5	1.89
1900	4	2.80	1912	4	1.71
1901	9	6.83	1913	11	4.12
1902	8	5.38	1914	10	4.10
1903	8	5.15	1915	5	2.15
1904	4	2.97	1916	8	2.61
1905	12	6.54	1917	6	1.73
1906	10	4.13	1918	13	3.45
1907	17	5.97	1919	11	2.79
1908	6	2.52	1920	5	1.21
1909	13	5.15	1921	6	2.60
1910	20	6.88	1922	1	.49
	115	4.88		85	2.40
Tons of ore mined per fatality		178,833.			378,777.

Serious and Slight Accidents

It does not take more than a superficial examination of the causes of the non-fatal accidents which are occurring to appreciate that very frequently the safety margin between a slight and serious accident, or between a serious and fatal accident, is so close that a person may not unreasonably conclude that the factor of luck is the most important element in the work of accident prevention. While it is true that the narrow escape from being a fatal or serious accident occurs in years when the rates for these kind of accidents have been high as well as when they have been low, yet occasionally reports are received which indicate that if the "might have been accidents" had really occurred the

losses sustained would have caused a serious apprehension as to the effectiveness of our safety work. The serious accidents herein described illustrate this fact.

A total of 344 serious and slight accidents were reported for the year. The rate per 1000 men employed is 168 as compared with 156 accidents per 1000 employed in 1921. In Table No. 111. is given the Company's record since 1913, when the State Compensation Law went into effect. These figures indicate there is no gradual reduction in the frequency of accidents, although our record compares favorably with the entire metal mining industry of the United States, as shown in Table No. 1V. 252 of the accidents were classified trade risk by the Central Safety Committee. These amount to 73% of the total and are 9% less than the rate for 1921, which was 82%.

The number of accidents that occur annually by workmen squeezing hand or foot between chunks of ore or pieces of timber, by straining or wrenching body due to lifting heavy weights, by being struck by glancing material or tools, etc. are very high, and it must be confessed that a study of these accidents by the Central Safety Committee is not productive of safety practices that give much encouragement that we may expect there will be a noticeable reduction in the future. When men work under the many difficult conditions that may be found in iron ore mines there can be no other reasonable conclusion that many of these accidents are trade risks and must be accepted as characteristic of the work.

The most serious accidents are as follows:

James Ravello, a miner employed at the Holmes mine, was blasted at 11:50 a. m., January 17th, while returning to his working place to investigate the result of blasting a number of holes. Immediately after the holes had exploded he went back in a drift that was full of smoke and gas. He missed the passageway to his contract and was just approaching the entrance to another contract when a hole in the contract exploded. If he had approached a few feet closer, he probably would have been instantly killed.

Ravello was an old employee and an able workman. He had been examined on the rules and regulations, but was known as a man who was apt to be insubor-

dinate and obstinate. He returned to work March 1st but has since left the employment of the Company. The accident was classified preventable.

Alfred Hendrickson, a trammer employed at the Cliffs-Shaft mine, was injured November 11th. He was cutting several lengths of fuse, leaning over a box of detonators that he had placed nearby with the cover of the box taken off. The detonators exploded, and the only conclusion that could be reached was the assumption that hot carbon may have dropped from his carbide lamp into the caps.

Hendrickson was not supposed to do this work, as it is the duty of the miners to do all blasting, and furthermore they are not supposed to prepare dynamite or detonators for blasting with a lighted lamp in a hat. The accident was classified preventable.

Use of explosives represents a danger so obvious that workmen have no reason for not being careful when handling them. The manufactures supply dynamite and detonators in retainers that make transporation easy and safe, and our Company has provided the necessary working tools for using them with safety and each employee is given instructions regarding the danger involved if unsafe practices are followed. Our accident record of recent years has not been barren of results but these two accidents are indicative of what might be sustained if the educational work of the Company is not maintained.

Tony Denofrio, a Cliffs-Shaft mine trammer, fell from a ladder October 30th, He was carrying a rope over his shoulder and fell a distance of 16 feet, receiving contusions of chest, ribs and back. He is not a very capable man and has a mentality far below the average workman. The accident was classified preventable.

Isaac Pihlaja, a Cliffs-Shaft miner, was injured September 19th, by a large piece of ore rolling down dirt pile. He received a badly fractured leg, which will disqualify him many months. He started with the Company in 1915 and is regarded as an able workman. It was classified a preventable accident.

John Hill, a miner employed at the Maas mine, was injured September 22nd and had not returned to work at the close of the year. While trimming

ground, a loose slab suddenly gave way and fell against his leg, causing a compound fracture. The accident was classified preventable.

Arthur Beatty, a Morris-Lloyd miner, was injured February 18th, by a covering board falling from the back. The place was crushing slowly and the ground had been trimmed ten minutes before the accident occurred. He lost ninety days. The accident was classified trade risk.

John Hill, a miner employed at the Francis mine, was injured August 22nd, by a slab of ore falling from the side of a drift, bruising his right foot, thigh and hip. He lost sixty days. The accident was classified trade risk.

John Tramantino, a Francis mine miner, was injured September 15th, by a slab of ore falling from the center of a drift heading. He was trimming the ground when the accident occurred. He lost sixty days. The accident was classified trade risk.

Anshelm Carlson, a Republic mine trammer, was injured September 20th, by a chunk of ore rolling down ore pile. He suffered a fractured leg and lost 180 days. The accident was classified preventable.

Adolph Peterson, a Republic mine laborer, was caught between the two cars, July 22nd, which caused lacerated wounds of right knee, that has incapacitated him since then. Peterson is 59 years of age and has worked at the Republic mine since 1880. The accident was classified preventable.

Carl Sather, a Stephenson mine carpenter, was injured January 21st, when repairing a top tram trestle. A chunk of ore fell from the top tram car as it was being hauled back to the shaft. He lost 68 days. The accident was classified preventable.

Battista Maffasanti, a Stephenson mine miner, was injured May 11th, by a chunk of ore falling from the heading of a drift, striking him on the left leg and right hip. He received a cash payment for the injury and returned to his native home in Italy. The accident was classified trade risk.

Battista Volpi, a Stephenson mine miner, was placing a piece of lagging on top of set of timber and in some manner fractured his shoulder. He was injured June 8th, and lost two months. The accident was classified trade risk.

Edwin Lind was injured October 24th, while unloading a carload of pipes at the Dead River Storage Dam. A pipe fell and fractured his hand. He had not returned to work the first of the year. The accident was classified trade risk.

Jacob Kangas, a miner, was very seriously injured at the Holmes mine November 24th by falling 60 feet in a raise. He and his partner were working at the top of a raise that had been put up from the 3rd level to the 2nd level. Kangas' lamp and hat fell in the raise and while looking for them on a lower sub-level, fell in the raise. It is not known just how it occurred as he was in too serious a condition to tell what happened except to remark that he slipped. Both legs were badly fractured and he is not entirely out of danger at this time of writing. The accident was classified preventable.

TABLE III

Table giving the average number of employees, the number of serious accidents, the total number of accidents and the rates per 1000 men employed for the years 1913 to 1922, inclusive.

Year	Average Number of Employees.	Number of Serious Accid.	Rate per 1000 Employees	All Accidents	Rate per 1000 Employees.
1913	2621	201	80	628	244
1914	2435	179	82	443	182
1915	2308	155	67	427	185
1916	3063	263	86	592	193
1917	3457	264	76	639	184
1918	3765	230	61	590	156
1919	3938	241	61	670	170
1920	4125	220	54	708	171
1921	2237	145	64	350	156
1922*	2040	160	78	344	168

*1922 figures are subject to slight revision.

TABLE IV

Comparative accident record per 1000 men employed in the metal mines of the United States and the Company.

Year	Company	U.S. Metal Mines.
1913	244	179
1914	182	211
1915	185	248
1916	193	250
1917	184	240
1918	156	237
1919	170	233
1920	171	242
1921	156	
1922	168	

Safety Inspection

The mines that were operating in Marquette County last year were inspected by the Safety Inspector, Workmen Committees, a Foreman Committee and a Committee on Mechanical and Surface Equipment.

Safety Inspector

The Safety Inspector visited the local mines once to three times each month of the year. Due to the curtailment in operations on the Mesaba Range and the Spies mine there was no safety inspection made of those properties. He represented the Company at the National Safety Council's Annual Meeting, which was held in September at Detroit, and also attended the Lake Superior Safety Conference, which was held in October at Duluth. He accompanied the Committees whose work is outlined as follows.

Workmen Committees

Committees of workmen were appointed in May and June by the mining captains to make safety inspection reports of the mines that were operating, of which there were eight, namely, the Holmes, Morris-Lloyd, Negaunee, Maas, Athens, Francis, Stephenson and Republic. At the Barnes-Hecker mine mining consisted entirely of raising and drifting, and as there were only a few contracts working no inspection by a committee was made. The Princeton mine closed just at the time the inspection tour was in progress and the Austin had not yet been reopened.

Since 1911, 459 workmen have served upon these committees. There were

but two mines that were operated continously during this period and which have always been inspected by workmen committees, the Morris-Lloyd and Negaunee mines. Inspections have been made regularly of the Lake and Cliffs-Shaft mines until last year when both were idle. The Salisbury mine has been inspected by fourteen committees and all the other mines by committees that vary in number, depending upon the operation of a mine.

The reports of the Workmen's Committee for last year offer no safety recommendations with the exception that the Francis mine Committee called attention to the limited number of shower baths that were provided in the dry house and the Athens mine Committee reported poor ventilation. Both of these conditions were remedied.

Foremen Committees

The three shift bosses chosen by the Central Safety Committee to serve on this Committee were Richard Cattran of the Negaunee mine, Edward Harper of the Holmes mine and Edward Mandley of the Cliffs-Shaft mine. The mines were inspected during a nine day period in October and nine recommendations were reported.

Committee on Mechanical and Surface Equipment

This Committee was appointed by the Central Safety Committee and consisted of George H. Gill, mechanic, Holmes mine, Heber Wilson, surface foreman, Stephenson mine and C. N. Stites, electrician, Republic mine. An inspection of the surface equipment of the mines in Marquette County was made from September 12th to September 15th. Sixty-one recommendations were submitted by this Committee.

Central Safety Committee

The Central Safety Committee held twelve meetings last year. The classifications of accidents and other matters of importance which were discussed are outlined in this report.

TABLE V

The following table gives the number of foremen and workmen by mines, who have served on Safety Inspection Committees since the beginning of Safety Work.

Mine	Foremen	Workmen.
Athens	3	9

Austin	1	12
Cliffs-Shaft	8	45
Francis	1	12
Gardner-Mackinaw	1	6
Gwinn	3	33
Holmes	4	15
Lake	6	45
Maas	7	36
Morris-Lloyd	6	48
Negaunee	10	48
Princeton	3	21
Republic	5	30
Salisbury	5	36
Stephenson	6	42
Miscellaneous	6	21
	75	459

Rules and Regulations

The Maas mine electrician and his assistant were injured March 15th and the Hill-Trumbull mine electrician was injured June 16th, while working on switch boards that did not have the electric current entirely cut off. The Secretary of the Central Safety Committee was instructed to advise Mr. Standford, Chief Electrician, to instruct his men about working on live wires, and under no circumstances must the rule prohibiting such work be violated. Mr. Standford gave each of the electricians written instructions to this effect and received from them an acknowledgment of the order in writing.

Copies of the Rules and Regulations were given to new employees and to those men who were transferred from one mine to another and did not possess copies. 573 copies were distributed, 370 in the English language, 140 Finnish and 73 Italian.

As a result of the blasting of a trammer at the Cliffs-Shaft mine, previously described, it was decided by the Central Safety Committee that miners must be warned not to prepare explosives for charging with a lighted lamp carried in a hat. The mining captains were informed of this rule and notices were placed in the bulletin boards to give it more publicity.

The Safety Inspector has occasionally observed violations of safety rules the past year that seemed to be inexcusable but the reason has usually been that there are men who think that there are times when their work is so urgent that they can afford to take a chance in order to get results in less time than could be accomplished by observing the rules. This is very apt to be the case

with a new cage rider, although the old experienced man will be found who is willing to take a chance. The Inspector has an opportunity to meet these men regularly and he makes it a part of his duty to impress upon them the importance of their work as it affects the safety of practically every man who is taken underground. They are told that the Company expects that they shall have the same thought and exercise the same amount of care for their own safety as they do for their fellow-workmen.

Examination of Employees on Rules and Regulations

The Committee on Examination of Employees on Rules and Regulations visited the local mines twice last year, and a total of 93 men were examined. Since this method of interesting employees in their safety was started, 484 men have been before this committee. Classified by occupations, they are as follows:

TABLE VI.

Miners	281
Foremen	59
Surface Laborers	43
Motormen	30
Timbermen	27
Cage Riders	13
Shaftmen	5
Electricians, mechanics, etc.	21
Miscellaneous	5
	484

No employee who appeared before this Committee was found deficient in understanding the rules so as to make him an unsafe workman. Occasionally, a man will be found who states that he would return to investigate a missed hole in less time than that stipulated in the Rule Book. With this exception, the Rules and Regulations seem to be very thoroughly understood. From time to time notices have been posted on the bulletin boards calling attention of miners to the fact that workmen have stated that they would return to a missed hole in less than 30 minutes, and warning them that this practice is dangerous and must not be done.

Notices are posted several weeks prior to an examination and later, the names of the men who were examined are posted. It is the object to extend the work over as long a period as possible in order to maintain the interest of old

employees and to get the new men in line with the Company's safety policy. Periodical trips of the Committee to the mine offices is a reminder to the clerks that all employees must receive copies of the Rules when they start to work. It brings to the foremen and mining captains that there is no abatement in the Company's work, and thus helps to maintain their interest also. Mr. Moulton, Captain Rough and the Safety Inspector were members of this Committee, and all were present at the examinations, which are held in the offices. of the mining captains.

Bureau of Mines

Mr. C. L. Colburn, representing the Bureau of Mines and the National Safety Council, was here the week of July 15th. He took underground photographs at the Negaunee and Cliffs-Shaft mines, with the object of illustrating unsafe methods of doing work. These photographs were distributed to the mining members of the National Safety Council, and represents such unsafe practices as a cage rider riding in a cage with a truck of timber and the cage door open, miners working under cracked ground, miners working over unprotected openings, etc.

The Bureau of Mines and the Mining Section of the National Safety Council have asked to be furnished with a brief description of every mine accident. Each operator contributing this data will be given a serial number and will be furnished quarterly with a report showing a comparative accident record of all the companies that contributed the desired data. Each company will know its own serial number and will be in a position to know how it compares with the other companies. Accidents will be classified according to mining methods, etc. That this information will assist us in the work of reducing our accidents may be questioned, but it was thought we could at least give them the information and thus exhibit a spirt of cooperation.

The Safety Department prepares annually for the Bureau of Mines a report of all the accidents occurring at the mines of the Company. A separate report is made for each mine, giving the number of men employed, days operated, the number of fatal, serious and slight accidents, etc. These accident reports are made out in triplicate, one copy remaining at the Ishpeming office and two

copies forwarded to the Cleveland Office.

Ventilation

The ventilation conditions in all the mines have been fairly satisfactory throughout the year with the exception of the Francis and the Athens mines, where it is variable. The installation of a large fan in each of these mines and the movement of a large volume of air, which followed with the operation, does not necessarily solve the problem of providing good air at all times in all working places. Without the use of air tight doors in main haulage roads to divert sufficient air up into the sub levels, that are isolated or at high elevations above the main levels, there will be found places where ventilation is poor. When extremely cold weather prevails in winter the operation of a large fan is apt to freeze the downcast shaft, which would stop mining operations entirely, and hence it is necessary to stop the operation of the fan unless it is reversible. This condition exists in winter at the Francis mine and the fan is operated several hours a day only.

At the Republic mine the air in a newly opened level is usually very hot and light until a raise is put up to the level above, which requires about four months time. In the long drift of the Morris-Lloyd mine, now being developed, smoke and fumes are sucked out from the headings and discharged in the haulage drift where there is not sufficient movement or volume of air to absorb them readily. The danger of men being overcome is not as great but it does not represent a satisfactory solution of the situation. A raise is being put up to the level above to improve this condition.

Superintendents Eaton and Bush and the Safety Inspector were appointed by the Central Safety Committee to act as a Committee on Ventilation. It will be the work of this Committee to formulate plans for providing good ventilation and reducing mine fire hazards. It is recognized that each mine represents a fire problem in itself and that a careful study should be made of the air currents of the Company's mines with the object of providing adequate fire protection. Rules and Regulations to govern the fighting of a mine fire will be made for each mine and instructions will be printed and given to those men upon whom the responsibility of fighting a fire must be assumed. With these objects in view, the mine engineers are to map the air currents, as they now exist, and again check them in the summer/at time

those mines where the ventilation is natural. Where the ventilation is under mechanical control, there is little or no variation with respect to the main air current. This work is already in progress and when the maps are completed the Committee will make a study of them and report to the Central Safety Committee such recommendations as it will have to offer with respect to fire doors, bulkhead material, etc.

This work is of great importance as no effort should be overlooked to increase the safety of miners in time of fire. It is in harmony with the work of other large corporations like the Anaconda Copper Company, Calument and Arizona Copper Company and the Oliver Iron Mining Company.

Operation of Cages

Two instances of overwinding cages were reported last year. The first was at the Republic mine when the engineer hoisted a full load ofmen from the collar of the shaft to within a short distance of the top sheave, but the Lily over-winding device tripped the hoist and the cage stopped. The men were badly frightened, but as the cage doors were closed not one of them fortunately had a chance to jump from the cage. It was the first load of men to be lowered in the mine that day and the engineer absent-mindedly hoisted instead of lowered, when he had received a signal to lower to the 7th level. He was transferred to another position.

The second case was at the Stephenson mine, which occurred shortly after the electric cage hoist was installed in November. The engineer hoisted a pump man from the 6th level to the sheave. Barring a severe strain of the rope, there was no damage done. This man was taken off the hoist.

Both of these engineers were old, experienced men at hoisting and neither of them could give a satisfactory explanation for these events.

Shaft sinking with a cage was started at the Spies mine, and a Committee, consisting of Supterintendent Stakel and Captain Rough, were designated by the Central Safety Committee to inspect the cage and shaft and to see that all the rules and regulations were adopted and enforced. The cage used is the one that was used in sinking the Athens mine shaft.

Safety Conditions at the Mines

A brief summary of the working conditions at the mines, having in mind the principal causes of accidents, may be of interest. No two ore bodies are exactly alike with respect to size and conditions under which the ore must be mined, and consequently while there are many hazards that are common to all mines, yet at each mine there are trade risks that stand out prominently as characteristic of that mine rather than the industry as a whole. A mine in the development stage differs from a safety view point from a mine in which the extraction of the ore body is well advanced. Geographic locations of a mine account for many accidents, because the labor employed is not as skillful as is available elsewhere. I shall attempt to outline briefly these conditions as they appear to exist at our local mines.

A study of all of the accidents since 1911 indicates that falls of ground is the chief cause of slight, serious and fatal accidents. It is also true that in proportion to the number occurring more of the accidents of this cause are classified trade risk than that of any other cause. Since 1899, the Company has lost 206 men by fatal accidents and of this number 87 or 42% were classified trade risk. Since 1911, we have suffered 5,446 non-fatal accidents of which 1,138 or 21% were regarded trade risk injuries. The severity of these accidents may be realized by noting that the fatality proportion is twice that of the proportion for non-fatality accidents. Comparing the record for the past six years with the record for the previous six years, we find that the proportion of falls of ground for both periods is the same, 21% of the total number of accidents that have occurred.

In making my inspection tours I have rarely found a place where I would have been afraid to work or one that I would have considered unsafe. Occasionally such a place may be found, due to mining conditions that cannot be avoided and when such a place is found no time is lost on the part of the captains and bosses to utilize skillful labor and all necessary material to overcome the danger. As a rule, accidents do not occur in such places because the miners are on guard against the danger that is evident. Accidents by falls of ground are due in part to the tendency of many miners to assume that once they have trimmed the back of a drift or stope that they have done all that is

necessary to make the place safe until they have removed the broken ore and erected timber. It is not an unusual incident to witness a captain or foreman calling the attention of a gang of miners to the conditions of the side or back of the place where they work and to hear the men reply that it is safe because they have already tested it, but when instruction was given to test it again, ground has fallen away without much effort. Small chunks of ground do not apparently represent danger to many miners, when, as a matter of fact, very many accidents are caused by stray chunks falling from back, off the top of timber and between lagging, etc. Unless a foreman is present to witness the accident, when it occurs, it is usually a question of taking the word of the injured man or his partner as to the condition that existed, and upon this information the accident is classified.

In our hard ore mines, the Cliffs-Shaft and the Republic, it is most important that the back of the stopes be kept free from fractured ground. The fall of a very small chunk of ore or rock may cause a fatal accident, as was the case when the last fatality occurred at the Cliffs-Shaft mine in March, 1921. The foreman of this mine carry large carbide lamps, having reflectors that are kept polished. These men are always on the alert inspecting loose ground. Captain Olds also gives this work very careful attention, and I find that both he and his bosses are reluctant to accept a miner's word as to the condition of the back of a stope, but prefer to see the ground tested before they are contented to let it pass as satisfactory. The Captain is continuously warning his bosses, as well as the miners, that this part of the work must never be neglected or slighted. In the Republic mine the nature of the ground is such that it is not unusual to erect props to safeguard the back. The stopes are rarely vertical and as they are advanced from one level to another level, the miners are found working directly under a new back with the old ground gradually receeding, and the danger that results by exposure to air and the shaking by blasting is thus eliminated.

At the Negaunee, Stephenson and Holmes mines, a large number of the miners are working in sub-level stopes directly under a heavy gob that usually caves rapidly in a uniform condition. There is danger however of stray pieces

falling from the timber and where it does not cave rapidly it is often necessary to use fore-poles. A number of ~~xx~~ contracts in the Francis and Morris-Lloyd mines are working under similar conditions. Accidents may occur also by falls of ground from the side of a drift or stope but there is not present the danger that exists when many contracts are to be found working in stopes that carry a heavy overburden of ore or rock, as existed when sub-levels were mined having a thickness of 14 or 16 feet.

There has been considerable development of new ground in the Athens and Morris-Lloyd mines. At the Athens the ore is very treacherous in places, breaking off in large slabs from slips or faces that are slippery. The hanging rock is comparatively soft and these conditions demand that close attention be given to timbering in order to insure the safety of the miners. At the Morris-Lloyd the ground stands almost vertical and is fairly hard and once properly trimmed provides safe working conditions. The Maas mine covers a large territory in which mining conditions are variable. The upper portion of ground is heavy and crushes in massive bulk that necessitates heavy timbering on sub-levels. On the 3rd level and its subs the ground is crushing, but the conditions somewhat resembles those of the Negaunee mine, which are more satisfactory from a safety standpoint.

A prolific source of accidents is found when men load ore or rock in stopes or drifts. These accidents are caused by chunks rolling down pile, by pieces of ore or steel flying when large chunks are being broken, by straining parts of the body when lifting heavy loads, by getting fingers or hands squeezed between chunks and car or between large chunks, etc. etc. The Republic and Cliffs-Shaft mines head the list in the number of these accidents, and they have caused much anxiety to the superintendents and foremen. No limit can be placed upon the size of the chunks that a man may lift, nor can the physical condition of a trammer for this strenuous labor be determined unless the Company resorts to the physical examination of its employees by a physician. At the Republic mine the piles of broken ground extend into the stopes and the trammers load the cars between pillars that afford no opportunity to trim piles. The situation is the exact opposite at the Cliffs-Shaft mine where the ore piles are

always in the open and can be trimmed when they become too steep for safe mucking. Soft ore mines are not exempt from accidents by these causes and when they do occur they are usually less excusable. There is too often a tendency to advance sollar boards in the bottom of a pile without due regard to the danger that may occur by the pile sliding or chunks rolling down. No recommendations can be advanced that will eliminate these hazards and we must depend upon foreman constantly instructing trammers to use good judgment and see to it that this is done.

Accidents by workmen falling down shaft, raise or stope, by falling off sollars, staging or platforms are not as frequent as in former years but even yet they occur too often in spite of the many practical safety devices that have been installed for there prevention. The fatal accident at the Athens mine and the very serious one at the Holmes mine, which have been described, illustrate this fact. They were the most costly accidents recorded last year and stand out very strikingly that these dangers are common to all our mines and that we must neglect no practical measures to avoid them. The protection of raises is one of the most important safety measures that can be maintained and requires daily supervision by the underground foremen to keep the rules and regulations enforced. The crushing of ground and the opening of new sub-levels are causes that contribute to unprotected raises, and are but two illustrations to indicate what is going on constantly in the mines to make possible unsafe openings. Practically every man in a mine has to climb raises and it is very important that ladder-roads be kept in safe condition, but there is no danger in or about our mines that require more carefullness on the part of workmen than that of climbing in shaft, raise or stope and no safety device can be found that will take the place of what so frequently is termed the personal element.

Accidents caused by tramming ore to chutes and by haulage from chutes to shaft stations are not unusual and occur at all mines. In the soft ore mines caving ground plays havoc with tracks and reduces standard-size drifts to small openings through which sub-level cars must be pushed under difficulties that cannot be eliminated, unless the drifts are reopened and too often the amount

of ore to be mined does not warrant doing the repair work involved. Main level haulage is less subject to changes but danger is found in coupling cars, loading ore at chutes, riding trains to shaft stations, etc. If locomotive crews and fillers are careful the number of accidents by these causes can be reduced so that they will not be proportionally large. The rules and regulations for the operation of locomotives are applicable at all mines with the exception that at the Republic mine storage locomotives are used and there is not room for two men to ride on a locomotive and the brakeman must ride on the rear end of the train.

Transportation of timber from cage to sub-level headings in soft ore mines is a large labor factor and contributes largely to the total number of accidents. The method of doing this work is practically identical at all mines. Accidents are caused by timber rolling down piles, off trucks, slipping from hands, etc. A survey of the tortuous and narrow drifts that may be found on the sub-levels of the various mines and the heavy pieces of timber that must be dragged through them is all that is necessary to demonstrate why men are continually getting hurt doing this work. The injuries sustained are bruise, strains and sprains and, as a general rule, they do not incapacitate the men from work very long.

First Aid Work

Ten new first aid teams were organized last year, eight at the mines that were in operation in January, one at the Cliffs-Shaft mine in August and one at the Barnes-Hecker mine in September. Training was carried on monthly and a total of 102 practice periods were held in which 89 men took part.

Accidents are receiving prompt and efficient first aid treatment at the mines and there is no excuse for an exception to this rule because trained men and first aid supplies are available to meet any emergency that might arise. Infection cases are occurring but they cannot be prevented when men disregard slight accidents. Although a few are not excusable it frequently happens that a workman will have his finger penetrated by a broken strand of a wire rope when hoisting timber. At the time it occurred, he is aware of it but there is no visible evidence of his injury and in a few hours he may have forgotten it

entirely and would be unable to locate the exact spot for treatment. He is surprised in a couple of days to find his finger swelling but calls to memory the fact that he had it punctured by the wire rope.

First aid supplies are always furnished to the Company's work that is in progress away from the mines, such as diamond drill explorations, water power construction work, etc.

Mine Rescue Work

Rescue apparatus was used on two occasions at the mines last year. On January 20th fire was discovered at the Maas mine at 10:00 p. m., when nobody was employed at the mine excepting the pumpmen. Smoke was first discovered by a Negaunee mine pumpman, who telephoned to the hoisting engineer, and the alarm was given to the proper officials. It appears that a Maas mine repair crew, working after 5:00 p. m., failed to cut off the current of trolley wire on the first level, and due to a short circuit it started a fire in the back of the main drift, a short distance from the Negaunee mine boundary line. There is a door at the boundary line, which was closed, but there was sufficient opening to permit a limited amount of smoke to pass into the Negaunee mine. A crew of men, equipped with oxygen apparatus, went down the Maas shaft and found that the smoke had accumulated in the drift about 100 feet back of the fire, toward the Maas shaft side, so that it was necessary to penetrate it in order to reach the fire. It required about four hours of fighting, using fire extinguishers and water under pressure before it was extinguished. Later two explorating crews inspected the workings of the Maas and Negaunee mines and reported that it was safe for the miners to work the next morning. Without the apparatus, fighting the fire would not have been a safe task.

The apparatus was again used in November by a crew of men when an attempt was made to tap the water and sand overburden in the Stephenson mine, on a sub-level, where it was thought that the smoke and gas that would result by blasting would be too dangerous for men to do this work without the equipment. It might have been done safely by the miners without the equipment but it was decided not to take any chance of having them knocked out.

SAFETY DEPARTMENT.

TABLE VII

Showing Total number of First Aid Men Trained.

1912-1922.

Number	trained	495
"	received certificates or entitled to them	368
"	left service of Company	87
"	deceased	7
"	now in employ of Company	313

TABLE VIII.

Showing total number of Mine Rescue Men Trained.

1912-1922.

Number	trained	328
"	left service of Company	90
"	disqualified	66
"	deceased	4
"	now in employ of Company	168

TABLE IX

Showing Cost of First Aid and Mine Rescue Supplies and Repairs.

First Aid Supplies.

Roller Bandages	$ 83.37
First Aid Packets	19.20
Adhesive Plaster	12.60
Handy Fold Gauze	53.51
Iodine and Vaseline	9.30
Leather Finger Cots	24.54
	$206.27

10 Paul Regenerators	$30.00
200 Draeger "	550.00
Freight	11.89
9 Cylinders Oxygen	44.10
1 Gal. Glycerine	2.00
2 Breathing Bags	49.00
25 Rubber Mouth Bits	20.00
12 Injectors	18.00
12 Rubber Diaphrams for Reducing Valves	3.00
Postage	.56
	$728.55

TABLE X

Number of accidents, number classified preventable & percentage preventable, 1912-1922.

Year	Number of Accidents	Preventable Accidents	Percentage Preventable.
1912	207	51	25
1913	316	77	24
1914	443	118	37
1915	427	97	23
1916	592	120	20
1917	639	149	23
1918	590	124	21
1919	670	159	22
1920	708	132	19
1921	351	63	18
1922	344	90	26

TABLE XI

Comparison of Fatality Rates for Coal Mines, Metal Mines, etc.
(Based on 300 working days per man.)

Year	U.S. Coal Mines	U.S. Metal Mines	Minn. Metal Mines	Mich. Metal Mines	Marquette* County	C.C.I. Company.
1911	4.97	4.45	5.46	4.28	5.42	1.89
1912	4.46	4.09	3.15	3.22	3.32	1.71
1913	4.70	3.72	3.16	3.12	2.46	4.12
1914	4.66	3.92	2.93	3.97	5.00	4.10
1915	4.44	3.89	2.71	3.74	4.09	2.16
1916	3.94	3.62	2.59	3.76	4.27	2.61
1917	4.25	4.44	3.04	3.40	3.03	1.73
1918	3.94	3.57	3.25	3.31	..42	3.45
1919	3.03	3.43	3.09	2.84	4.20	2.79
1920	2.94	3.16	2.62	1.62	3.06	1.21
1921					0.00	2.60
1922					1.66	.49
Average	4.13	3.82	3.20	3.33	3.07	2.40

*Exclusive Cleveland-Cliffs Company.

TABLE XII

Classification of Non-Fatal Accidents

1921 and 1922

	1921	1922.
A. Fall of Ground or Timber.		
1. By fall from back or side (drift, raise or stope)	76	70
3. By fall of stray chunk or stick down raise or stope	2	8
4. By run of mud or sand.	0	3
5. By lagging, sprag, or timber falling from back or side	1	1
T o t a l -	79	82
B. Shaft Accidents.		
1. By falling down shaft.		1
8. By miscellaneous accidents.		2
T o t a l -		3
C. Use of Explosives.		
1. By explosion of powder, detonator, etc. T o t a l -	1	2
D. Mine and Railroad Cars.		
1. By being caught between cars or motor and drift.	4	4
2. By riding or attempting to ride cars.	1	0
3. By squeezing finger, hand or foot between box and truck, car and drift, chute, etc.	9	13
4. By being run over by railroad car or haulage car.	1	0
5. By cars falling back or off track.	6	1
8. By being struck by car handle, car rebounding, etc.	0	1
9. By being struck by motor or car.	0	1
10. By miscellaneous causes.	4	3
	25	23
E. Miscellaneous.		
1. By falling down raise, stope or mill.	1	2
2. By falling from ladder, trestle or stage.	4	7
3. By falling with machine or tripod, drill breaking, etc.	5	0
4. By squeezing finger, hand or foot between pieces of timber, chunks of ore, etc.	45	48
5. By straining or wrenching arm, back, side or leg by lifting, etc.	41	46
6. By chunk rolling down dirtpile, stockpile, off car, etc.	27	27
7. By being struck by glancing dirt, tool or timber, etc.	38	21
8. By being struck by pick, shovel, hammer, timber, etc.	13	18
9. By tools or material falling or slipping from hand, staging or platform, etc.	15	17
10. By running nail into hand, foot or leg.	6	7
11. By stumblind or slipping causing a fall, etc.	16	13
12. By catching finger, hand or foot in blocks, gears, brakes, struck by windlass, parts of machinery, etc.	10	13
13. By wrench or tong slipping causing a fall, etc.	1	0
14. By blood poison or infection from various causes.	5	2
15. By contact with electric wire.	1	3
16. By being scalded or burnt.	2	0
17. By blistering hand.	3	0
18. By sliver in finger, etc.	5	4
19. By miscellaneous underground causes.	1	2
20. By miscellaneous surface accidents.	1	3
	240	233
GRAND TOTAL ----	345	343

SAFETY DEPARTMENT.

TABLE XIII

Classification of Causes of Fatal Accidents.

From Dec. 1st, 1898 to Jan. 1st, 1923.

A. Fall of ground or timber.		
1. By fall from back or side (Drift, raise or stope.)	74	
2. By fall of chunk of ore from chute.	1	
3. By fall of stray chunk or stick down raise or stope.	1	
4. By run of mud or sand.	10	
5. By run of ore in stope.	1	
T o t a l -		87
B. Shaft Accidents.		
1. By falling down shaft.	17	
2. By rock or timber falling down shaft	3	
3. By being struck or caught by cage, skip, bucket or tool	6	
4. By falling from cage, skip or bucket.	8	
5. By falling from ladder in shaft.	6	
6. By being carried or pushed into shaft by car.	3	
7. By attempting to jump on or off cage, skip or bucket.	3	
8. By being struck by crosshead.	5	
T o t a l -		49
C. Use of Explosives.		
1. By explosion of powder.	15	
2. By premature blast.	3	
3. By fall of ground or timber due to blast.	3	
4. By being overcome by gas.	2	
5. By erysipelas resulting from blast.	1	
T o t a l -		24
D. Mine and Railroad Cars.		
1. By being caught by haulage cars.	14	
2. By riding or attempting to ride cars.	3	
3. By falling with car from trestle.	3	
4. By being run over by railroad car.	4	
T o t a l -		24
E. Miscellaneous Causes.		
1. By falling in raise or pocket.	4	
2. By falling from ladder, trestle or stage.	6	
3. By falling with machine or tripod.	2	
4. By being caught under pump rod.	2	
5. By (supposing to have) coming in contact with trolley wire	2	
6. By asphyxiation due to mine fires.	3	
7. By being ruptured.	1	
8. By being pulled into sheave.	1	
10. By contact with electric wire.	1	
T o t a l -		22
G r a n d T o t a l -		206.

Average Percent of Accidents by Causes.

A. 42.20% B. 23.80%. C. 11.65% D. 11.65% E.10.70%.

SAFETY DEPARTMENT.

TABLE XLV.

Classification of Fatal and Minor Accidents.

For the Year 1922.

By the CENTRAL SAFETY COMMITTEE

I. TRADE RISKS, (INCIDENTAL & NON-PREVENTABLE)		T o t a l -	252
II. NEGLIGENCE OF COMPANY:			
	2. Failure to Use Proper Tools or Appliances Provided.	1	
	3. Violation of Rules.	1	
	6. Failure to Provide Safety Devices.	0	
	7. Failure to Provide Proper Tools, Appliances or Place to Work.	4	
		T o t a l -	6
III. NEGLIGENCE OF WORKMEN:			
A. Injured Men:	1. Failed to Use Safety Devices Provided.	1	
	2. Failed to Use Proper Tools or Appliances Provided	3	
	3. Violation of Rules.	0	
	4. Improper Act or Selection of Improper Method of Doing Work. (By Workman.)	28	
	5. Carelessness. (By Workman.)	48	
B. Other Work man:	3. Violation of Rules.	0	
	4. Improper Act or Selection of Improper Method of Doing Work. (By Workman.)	1	
	5. Carelessness. (By Workman.)	5	
		T o t a l -	86
		G r a n d T o t a l -	344.

SAFETY DEPARTMENT.

Expenses of the Safety Department for 1922.

TABLE XV.

Supplies

Office, printing, etc.	$ 24.77	
Mine Rescue and First Aid	16.01	
Total -		$ 40.78

Traveling

Inspector	$ 473.64	
Mine Rescue Foreman	192.93	
Committees	96.54	
Total -		$ 763.11
Salaries		6086.00
Grand Total -		$ 6889.89.

Respectfully submitted,

William Consiseur
Safety Inspector.

ANNUAL REPORT

OF THE PENSION DEPARTMENT

FOR THE YEAR 1922

* * * * *

PENSION SYSTEM:

The year 1922 completed the fourteenth year of the operation of the Pension System.

The following pensions were granted during the year:

No.	Name.	Mine.	Date Pension began.	Monthly Payment.
152	Ole A. Rye	Various	Jan. 1, 1922	$ 42.96
153	Charles Letcher	Stephenson	May 1, 1922	18.83
154	Andrew Erickson	Lake	Apr. 1, 1922	21.40
155	Victor Carlson	Cliffs-Shaft	Apr. 1, 1922	26.78
156	A. P. Wahlstrom	Miscellaneous	July 1, 1922	19.45
157	Charles Carlson	Holmes	July 1, 1922	23.92
158	Sivert Hoff	Cliffs-Shaft	June 1, 1922	28.25
159	Charles Sundin	Salisbury	July 1, 1922	23.54

The following Old Age Pensions ceased during the year:

No. 81	Cyrille Tourville	Pension began August 1, 1918. Died February 26, 1922.
No. 90	Mangus Anderson	Pension began November 1, 1919. Died January 6, 1922.
No. 95	John Trembath	Pension began January 1, 1920. Died January 7, 1922.
No.157	Charles Carlson	Pension began July 1, 1922. Died September 1, 1922.

PENSION DEPARTMENT.

PENSION SYSTEM: (Continued)

	1921	1922
Number of pensions granted during the year	48	8
Number of deaths	3	4
Number of Old Age Pensions in force on Dec. 31st	95	99
Average Annual Pension	$ 296.72	$ 297.84

There were no additions to the Furnace Department Roll during the year. Joseph DeVet, Sr., employed at the Kipling Plant, applied for his pension and the application was granted but when the Kipling Plant re-opened, he asked that his application be withdrawn and that he be permitted to return to work. His request was granted.

There are three pensioners on the Furnace Department Roll. The average annual pension for these three men is $372.68.

Total amount paid to Old Age Pensioners, 1908 to 1922 inclusive:

Mining Department	$ 126,239.50	
Furnace Department	4,511.37	
Total -		$ 130,750.87

Total amount paid to Widows and Orphans, 1908 to 1922 inclusive:

Mining Department	21,905.00	
Furnace Department	900.00	
Total -		$ 22,805.00
Total Pension Payments -		$ 153,555.87

The Pensions paid in 1922 were as follows:

Old Age Pensions	29,063.85	
Widows and Orphans	168.00	
Total - Mining Dept. -		$ 29,231.85

The estimated possible Old Age Pensions for the Mining Department for 1922 was $ 32,000.00.

PENSION DEPARTMENT.

PENSION SYSTEM: (Continued)

On September 14, 1920 the Board of Directors authorized that pensions be granted to men employed at the Republic Mine, the pensions to be computed and awarded under the same terms as provided for in the provisions of the regular pension system, the pension fund for the payment of the pensions at the Republic Mine to be made up of one-half of one percent of each monthly pay roll and an appropriation of $8,000.00 per year during the continued operation of the Republic Mine. The balance on hand in the Republic Mine Pension Fund to draw interest at the rate of 6%.

The following men were put on the Republic Mine Pension Roll, during 1922:

No.	Name	Date Pension began.	Monthly Payment.
14	John Jacobson	July 1, 1922	$ 33.44
15	John Powers	Nov. 1, 1922	23.08

There were no deaths among the Republic Mine pensioners during the year.

There are fourteen pensioners on the Republic Mine Roll. The average annual pension is $ 435.96.

The payments made from October 1st, 1920 to December 31st, 1922 are as follows:

1920	$ 278.61
1921	3427.97
1922	5672.84
	$ 9379.42

The estimated possible pensions for the year 1922 - $ 5531.00

PENSION DEPARTMENT.

PENSION SYSTEM: (Continued)

At the present time the pensioners on the Mining Department Roll live in the following localities:

Ishpeming	73	Pelkie, Baraga County	1
Negaunee	7	Long Beach, Calif.	2
Marquette	1	Kingsbury, Calif.	1
Gwinn	3	Oak Park, Ill.	1
Detroit	3	Springfield, Mass.	1
Flint	1	Virginia, Minn.	1
Newberry	1	Canada	2
St. Igance	1	Italy	1

All the Republic pensioners are living at Republic, with the exception of John M. Erickson, who resides in Evanston, Ill.

One of the Furnace Department pensioners lives at Marquette, one at Negaunee and one at Skandia, Michigan.

There were no additions to the Railroad Department pension roll during the year, the number on the roll remaining at two. One lives at Negaunee and the other at Marquette, Michigan.

PENSION DEPARTMENT.

PENSION SYSTEM: (Continued)

Pension payments for the years 1908 to 1922 inclusive are as follows:

Mining Department:

Year	Old Age	Widows & 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	4339.37
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	21856.64	14.00	21870.64
1922	29063.85	168.00	29231.85
Totals	$126239.50	$ 21905.00	$ 148144.50

PENSION DEPARTMENT

PENSION SYSTEM: (Continued)

Pension payments for the years 1910 to 1922 inclusive are as follows:

Furnace Department:

Year	Old Age	Widows & Orphans.	Total
1910	111.75		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		268.20
1918	268.20		268.20
1919	130.55		130.55
1920	223.80		223.80
1921	781.63		781.63
1922	1118.04		1118.04
Totals	$ 4511.37	$ 900.00	$ 5411.37

PENSION DEPARTMENT.

PENSION SYSTEM: (Continued)

At the end of 1921 there was some question as to the manner of keeping the accounts of the Pension Fund, and a careful estimate was made for a period of 15 years, this report being submitted on Jan. 21st, 1922. There were two estimates made:

1. Showing the sum necessary as a principal sum to pay off all pensions on the roll at the end of 1921, pensions to continue until their death.

2. Provided for the adding on of new names to the Pension Roll, as has been done during the past 15 years, the estimate showing the amounts required to provide pensions and those men already on the Pension Roll with the addition of those who became of pensionable age, subsequent to that time.

The estimated amount of pensions, for the year 1922, adding in the new men who might be pensioned that year, was $32,000.00. The actual amount of Old Age Pensions paid was $29,063.85. I believe that the estimates made are on the side of safety and are conservative of what pensions will cost for the Mining Department.

PENSION FUND

BALANCE BY COMPANIES AND DEPARTMENTS

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	Total to December, 1922		
	Reserve Set Up	Payments	Balance
MINE DEPARTMENT			
The Cleveland-Cliffs Iron Co.	193,638.52	135,829.91	57,808.61
The Negaunee Mine Co.	25,641.68	12,286.59	13,355.09
The Athens Iron Mining Co.	7,278.14		7,278.14
Republic Mine	30,769.68	9,379.42	21,390.26
Total Mine Department	257,328.02	157,495.92	99,832.10
FURNACE DEPARTMENT			
The Cleveland-Cliffs Iron Co.	40,689.29	5,411.37	35,277.92
LAND DEPARTMENT			
The Cleveland-Cliffs Iron Co.	12,149.79		12,149.79
Bunker Hill Mining Co.	1.07		1.07
Munising Railway Co.	5.63		5.63
Michigamme Company	9.98		9.98
Total Land Department	12,166.47		12,166.47
LUMBERING DEPARTMENT			
The Cleveland-Cliffs Iron Co.	24,718.23	5.00	24,713.23
PLUS INTEREST			
The Cleveland-Cliffs Iron Co.	50,593.33		
Republic Mine	2,396.72		
Total Interest	52,990.05		52,990.05
TOTAL PENSION FUND			224,979.77

SUMMARY

The Cleveland-Cliffs Iron Co.	- Pension Fund	201,192.79
Republic Mine	- Pension Fund	23,786.98
TOTAL PENSION FUNDS		224,979.77

NOTE: Reserve set up on Mesaba-Cliffs Iron Mining Co. from June 1919 to October 1922 cancelled in December, 1922.

PENSION DEPARTMENT

WORKMEN'S COMPENSATION:

The work of the Compensation Department has continued in the care of Mr. T. H. Bargh as Cashier since December 1912, beginning three months after the Michigan Law went into effect. Special effort has been made to see all injured men as soon as possible after the injury has occurred, and generally this has made it possible to effect a settlement readily. In the majority of cases the first compensation payment is ready at the time the agreement is presented to the injured employee, which materially aids in effecting a settlement and the securing of the man's signature to the settlement blank furnished us by the Department of Labor & Industry at Lansing. Because of this the men are generally well satisfied with the working of the compensation laws.

During the year we have had several conferences with members of the Department of Labor & Industry, concerning certain cases of serious injury or disability. One case was continued from 1921, as reported during that year. Alfred Franzen was accidentally killed at the Maas Mine on September 8, 1921. Accident Report #299. Mrs. Matilda Holmberg, who was his first cousin, had been his housekeeper for about 30 years and made claim for compensation as a member of his family. A hearing was held at Marquette on December 12th with Mr. Ray Durham, Deputy Commissioner, in charge, our side of the case being presented by Mr. Thomas Clancey. Following the hearing Mr. Durham rendered a decision in favor of Mrs. Holmberg from which an appeal was made to the full Board at Lansing.

A hearing was held at Marquette on Feb. 1st, before Commissioners Kennedy and Gloster. Following the hearing a decision was rendered supporting the decision of Mr. Durham. An appeal was taken to the Supreme Court of Michigan which was held in July 1922, and the Supreme Court held that Mrs. Holmberg, as first cousin of Franzen and having lived as a member of his family during a long period, she was wholly dependent upon him for support and she was awarded full compensation at the rate of $14.00 per week for 300 weeks.

PENSION DEPARTMENT.

WORKMEN'S COMPENSATION: (Continued)

During the year there have been the following cases discussed with different members of the Board, when in Marquette:

Battista Dellangelo - Stephenson Mine Accident Report #508. Injured on Feb. 1st, 1921. After consultation with the members of the Board, Dellangelo returned to work on Feb. 13th and has continued at work since that period.

Victor Salminen - Gwinn Mine Accident Report #259. March 3d, 1921. He suffered a severe fracture of his leg which left it about one inch shorter than the other. The Deputy Commissioner, Mr. S. G. Beattie, directed Salminen that it would be necessary for him to try to do some work, but for several months following this direction he was not willing to make any attempt. Correspondence in his case was continued with the Department of Labor & Industry and a hearing was held on Feb. 15th, before Mr. Ferguson, Deputy Commissioner, who re-affirmed statements made by Mr. Beattie early in the year and directed that a proper shoe, with thick sole, be secured and that he attempt to do some work. At this time Salminen discussed his desire to go on a farm in Ohio. A suitable shoe was secured for him, as directed by the Commissioner, and as he would never be able to do his former work as a Miner, a settlement was made with him, as directed by the Department of Labor & Industry, permitting him to go to Ohio the latter part of October.

Angelo Visinoni - Princeton Mine Accident Report #55. Nov. 30, 1920. This man had an injury to the back of his hand which did not heal up and it was thought that he was purposely ill-treating his hand. A hearing was held on April 15th before Deputy Commissioner S. G. Beattie, and the Comissioner decided that compensation was due up to that time and that arrangements be made to have him examined by another physician. Arrangements were made to have him examined by Dr. Kanavel at Wesley Hospital, Chicago. During the process of the examination, while the Doctor was temporarily absent, Visinoni disappeared and has not been seen by any of us since that time. We have later learned that he was wanted for a forgery case and presume that we will have no further claim for compensation.