MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

CLIFFS SHAFT MINE:

On January 18th. the crack in the #8 McCully crusher lengthened considerably. Repairs were made by installing two reinforcing bolts. On April 7th. the mine was closed down so that the necessary repairs could be made to the crusher and also to replace some badly decayed shaft timber. This crusher was in very poor condition. It was necessary to replace the concave section with a section from the old Jackson crusher stored at the Cliffs Shaft mine. After a close inspection of the main frame it was decided to repair instead of replacing it and the following repairs were made. The discharge spout and main frame were built up by electric welding and a steel band was added just below the dust collar to raise the collar up to its normal position. Repairs were completed on the 17th. and the crusher is now in good condition.

The pan sections of the picking belt which were badly worn were replaced with a spare set (which was on hand for this purpose) during the time the crusher was being repaired. On May 12th. the motor coupling on the picking belt in the crushing plant broke and it was replaced with a new one. A timber under the bearing was also replaced with steel. The pans on the picking belt were again repaired on October 8th. as they were worn out. A new set of pans, complete with the necessary chain and rollers, has been ordered for a spare.

A small crack developed in the discharge nozzle on the water cylinder of the #2 Prescott pump. Repairs were made by shrinking a band around the flange.

New doors were installed on the "A" shaft cage to replace the old ones which were badly warped. The new spare skip box was installed in the "A" shaft skip to replace the old one which has been in service from November 1934 to April 7, 1939.

A loaded top tram car between the crushing plant and "B" shaft got out of control on May 1st. and was badly wrecked. It was replaced with a spare car and the accident caused only a three hour delay.

On May 6th. the cushion cylinder on the Lilly hoist control air brake was changed to get better braking effect, and the overwind was completely overhauled on the "A" shaft hoist.

The intake on the #2 air compressor caved in. A new steel intake was built at the General Shops and installed in September.

The counterweight rope at "B" shaft wore a hole through the 12" counterweight pipe. The head sheave was moved 4" to the east and a plate patch was clamped over the hole.

A new double truck lump ore stocking car is being built at the General Shops to be used as a spare.

A new D.C. feeder cable was installed in "B" shaft to care for the additional haulage and slusher load and to reduce losses in this service. This cable is #4/0 Anhydrex concentric, 1500' long. Due to the continued increase in load it seems necessary to anticipate an increase in the size of the motor-generator set supplying this service. This should be on the order of a 250 kw unit.

A proposal was received from the Edison Storage Battery Company to supply a new type of this battery for use for one year without charge. This was so favorable that it was accepted, allowing us to make running tests under operating conditions without expense.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

TILDEN MINE:

All winter repairs were completed in March. Operations started on May 1st. and shipping was completed on November 18th.

The #3 locomotive which was at the General Shops for repairs was delivered at the mine on May 1st. The repairs consisted of new side plates in the fire box from just above the grate line down to the mud ring. These plates were welded in place and riveted to the mud ring.

It was necessary to make some changes to the receiving pocket at the crusher plant to dump the Athey wagon. A new model R.D.8 caterpillar and a 13 cubic yard Athey Truss Wheel Company trailer was purchased to haul the ore from the lower bench in the west pit. We also purchased a LaPlant-Choate Mfg. Company trail-builder to do some stripping. All of the above equipment operated very satisfactorily.

One of the 10" McCully fine reduction crushers, serial #8347, developed trouble on May 31st. On close inspection it was found to have a very bad crack in the base section. This was too far gone to repair by welding so it was replaced with a base section taken from the old Empire Mine crusher #8095, which is a duplicate machine. This change was started on June 2nd. and completed on June 7th.

The idler pulley on the head end of the belt conveyor broke on June 10th. A new pulley was made at the General Shops and installed without causing any delay in shipment of ore.

A new set of $5\frac{1}{2}$" concaves were installed in the Traylor crusher on August 6th. The old concaves were completely worn out and the product was too large for the 10" crushers to handle without slowing up production.

A crack developed in the boom of the #31 shovel. This crack extended almost all the way around the boom. Repairs were made without causing any delay to shipments. The dipper sticks also broke on this shovel and were replaced with a spare set on hand. The old sticks are being rebuilt at the General Shops this winter.

ATHENS MINE:

A complete set of rubber lined idler sheaves were installed for both the skip and cage ropes.

A new stack was erected for the dry and shop heating plant. The old stack was put up on March 22, 1932 and discarded April 15, 1939 after about seven years service.

In November repairs were made to a crack on one of the underground pumps by shrinking a ring around the flange and electric welding the crack. About 400 feet of the 10" discharge pipe in the shaft is in very poor condition. It has been necessary to patch this pipe at several places by electric welding. New pipe has been ordered to replace the top 400 feet.

The cooling pond at the engine house has been rebuilt.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

ATHENS MINE: (Continued)

A No. 75 Maastoker was installed in the engine house heating boiler. This machine has a capacity of 2500 sq. ft. radiation and was purchased from Thomas Trevithick for $357.00 installed. A new stack which was built at the General Shops was installed on this boiler.

Necessary additional shovel cable was secured and the usual overhaul of the electric shovels was made.

MAAS MINE:

In January the 10" pump discharge line in the shaft started to give considerable trouble. After patching the line several times it was decided to inspect and test this pipe from surface to the pump house. It was found in good condition. On February 18, 19 and 20th. supporting clamps were installed and the line straightened. A broken flange near the bottom was removed and the pipe welded together at this point. The lower length, which was split about 24", was welded and appears to be in good condition. However, we have a spare length to replace this piece if it becomes nesessary.

On February 15th. the crankshaft on the Aldrich quintuplex pump broke doing considerable damage. It was necessary to get a new A frame. The repair parts for this pump were received on April 6th. and installed at once. A new forged steel crankshaft which was in stock replaced the broken cast steel one. A new pinion and gear purchased from the Farrell Machinery Company was installed to replace the old gears which were very badly worn. A new "A" frame was installed to replace the broken one. The babbitt in the main bearings was removed and renewed and all brass bushing and bearings were replaced where necessary. All plungers were packed with metallic packing which was made at the General Shops. The pump has been completely rebuilt and is in first class condition.

Weir tests on the plunger pumps since they were repaired show them to be pumping full capacity.

On April 8th. the 350 H.P. General Electric motor on the Alberger centrifugal pump burned out and was replaced with a duplicate rotor from a pump at the Negaunee Mine.

On May 8th. the gear on the skip hoist was found loose on the shaft. Repairs were started on May 19th. and completed May 22nd. This gear was taken off, a new key fitted and the gear was replaced and welded to the shaft.

A new motor was installed in the skip hoist motor to replace one that had several coils burned out.

A new set of intercooler tubes was installed in the #1 air compressor as the old tubes were in bad condition. The heating plant boiler developed a bad leak in the fire box and repairs were made by welding. Some repairs were made to the #7½ McCully crusher. The ring gear was raised ¼" and a new heavy dust collar was installed to stop the fine ore from getting into the ring gear. A new set of grizzly bars were installed to replace the old bars that were completely worn out.

The brake band on the cage hoist cracked and was repaired by electric welding.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

MAAS MINE: (Continued)

The skip hoist motor burned out and was repaired, with forced ventilation installed to keep the temperature within safe operating limits. Due to the per-s sistent heavy demand on this unit it was decided to secure a new rotor. This is now in operation.

The larry car equipment, consisting of three cars, was installed and after certain changes in apparatus on the control and replacement of solenoid brakes with larger units, it is now in satisfactory operation. Apparently this new and original equipment is meeting our conditions in a proper manner. It is thought that this may now be considered as proper for any future tramming conditions for stocking.

NEGAUNEE MINE:

Some bearing trouble was experienced with the ventilating fan on January 10th. The bearings were rebabbitted and put in good condition.

Due to band wire trouble the skip hoist motor-generator set was out of commission in August for four days. Repairs were made at the General Shops. A new breeching was put on the heating boiler stack.

The motor on the motor-generator set driving the hoists, brake a band wire and a following fire nearly destroyed the motor. The mine was operated at limited capacity with the old set while repairs were made. This unit operated well for several months and then a weakness developed in the repaired unit. This was reported to the Westinghouse Elec. & Mfg. Company and in co-operation with our men was put in good condition. We billed and colledted for the extra repair expense from the Westinghouse Company.

LLOYD MINE:

An extra section of grizzly bars were added to the old set to get better separation of the ore.

An 8' rubber lined sheave for the top tram plant was badly warped and was replaced with one formerly used at the Stephenson Mine.

The idler stands were equipped with rubber lined sheaves.

An addition was built to the cooling pond to give us a little more capacity and better cooling effect on the water.

The increased load and condition of the haulage sets clearly indicates the necessity for a new haulage set in the near future. This is important and should be cared for without delay.

SPIES-VIRGIL MINE:

A little trouble developed on the #8 crusher as the fine ore was getting into the gears. The head was taken out and the shaft retreaded for a new type nut. The center opening in the main frame was built up to get a new and higher bearing for the dust collar, which stopped the fine ore from getting in on the gears. The motor was a little out of alignement and this was taken care of at the same time.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

SPIES-VIRGIL MINE: (Continued)

The compressor intercooler was leaking badly. This was replaced with a spare from Ishpeming. There were some leaks in the cylinder head gaskets, the gaskets being replaced with new ones.

The heating plant boiler was in poor condition. This boiler was scrapped and a 50 H.P. boiler from the Hill-Trumbull Mine was installed in the heating plant.

The top tram cars were in very poor condition. They were rebuilt and are now operating without any trouble.

The idler stands were equipped with 20" rubber lined sheaves.

The top 300 feet of 8" discharge pipe in the shaft was in poor condition. It was replaced and is now in good condition.

MACKINAW MINE:

This mine has not been in operation for the entire year. Pumping water was the only activity at this mine.

The main hoist drum spider spokes were cracked. Repairs were made and this should be satisfactory for some time.

GWINN DISTRICT:

A second booster pump was purchased for the Princeton location water supply and the booster pump station moved to a new location near the Escanaba River.

GENERAL:

The steam shovels operated very satisfactorily during the season, with very little trouble from break downs. There is considerable repairing to be done this winter to get them in condition for next season.

Further changes and developments have been made in the protective equipment for slusher motors and we now feel that a proper solution has been reached. The limited amount of serious trouble and delay in this apparatus and relatively low maintenance is worthy of note.

HILL-TRUMBULL MINE:

Repairs at the washing plant and on pit equipment were completed by May 1st. and ore operations started May 8th. The only heavy expenditure for new machinery was the caterpillar track equipment for the 350-ton steam shovel. This cost $10,000 but reduced the number of pit men from six to one.

Besides a new chemical laboratory at the washing plant, a new change house was installed for sixty men, consisting of a steel building 20' x 40' equipped with showers and lockers.

The washing plant completed operations October 23rd. with total concentrates as follows:

Hill	119,841
Trumbull	664 446
	784,287

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

HILL-TRUMBULL MINE: (Continued)

At the close of the ore season overhauling of mill equipment got under way immediately and requisitions made covering necessary repair material. The heavy production season filled the south dyke with tailings and the dragline was needed to rebuild the banks to normal height.

HOLMAN MINE:

This mine was idle until October, when it was decided to recondition tracks and lower the pit water ready to do some stripping. A 7000 G.P.M. pump from the Canisteo Mine was installed on a scow in the pit and started operating November 24th. Pumping continued to the end of the year.

The No. 32 4-yd. shovel was shipped from the Canisteo Mine to the Brown pit and started stripping November 27th, completing the job in December with three new 15-ton Euclid trucks recently purchased for the Hill-Trumbull Mine. The trucks were returned to the Hill-Trumbull for additional winter stripping to continue into 1940.

CANISTEO MINE:

In April a contract was made with Congdon Brothers for our company to operate the pit for this year and the following equipment was purchased.

1 D-8 Caterpillar tractor complete with angledozer
1 Model 99 motor grader
6 Euclid 15-ton trucks equipped with 150 H.P. Cummins deisel engines

The first two trucks were received May 9th. and the last of the six on May 22nd. This fleet was busy all season either on stripping or hauling ore to ramp in pit, where it was loaded in 30-yd. cars and hauled to washing plant with the steam locomotives.

Ore operations started June 23rd. and were completed October 13th. Total tons of concentrates was 217,088.

To eliminate the long crude ore haul to washing plant it was decided to pile the rock in the pit and move the washing plant about 2 miles near the pit bank, with a belt conveyor bringing the ore from pit bottom to top of washing plant. The Worden-Allen Co. was given a contract to raze the washing plant and to rebuild it on foundations poured at the new location during October and November. Work of tearing down the plant was completed in December and moving was completed ready for re-erection to start in January 1940.

A new three flight 36" conveyor layout totalling over 1,000 feet long was laid out and the necessary steel machinery purchased from the Link-Belt Company.

Due to the fill required by the Great Northern Ry. Co. to complete concentrates tracks at new washing plant site it was necessary to abandon the company tracks into the pit. Before these were removed in December the 80-ton 40" x 42" jaw crusher was hauled to pit location and set on its foundation. The remainder of the screening and crushing plant in pit will be erected with the 3/4-yard gas shovel.

After trying for 10 years to get a satisfactory water supply well for location and shops a 3" pipe line was run from Coleraine and completed in November.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

Total connected load at Mesaba Range mines December 31, 1939	5,327-3/4	H.P.
" " " " Spies-Virgil " " " "	1,435	"
" " " " Ishpeming District mines Dec. 31, 1939	26,520	"
Total spare motors on hand at Ishpeming District Dec. 31, 1939	7,824-3/4	H.P.
" " " " " " Mesaba Range Mines " " "	2,273-3/4	"
" " " " " " Spies-Virgil Mine " " "	150	"

D. C. GENERATORS AND MOTORS

Total underground haulage generators - Ishpeming District	1,495	K.W.
" exciters and generators - " "	2,424-3/4	"
" motors - " "	5,144-1/2	H.P.
Spare D.C. genefators " "	500	K.W.
" U.G. haulage generators " "	100	"
" D.C. motors " "	195	H.P.
" " exciters " "	52	K.W.

Mesaba Range Mines

Total haulage generators	80	K.W.
" exciters and generators	1,246	"
" D.C. motors	1,203-1/4	H.P.
Spare D. C. motors	40	"

Spies-Virgil Mine

Total haulage generators	100	K.W.
" exciters	10	"
Spare haulage generators	100	"
Total D. C. motors	68	H.P.

Total mine transformers	280	2,588	K.V.A.

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

COMPARATIVE TABLES

YEAR	TONS COAL BURNED	TONS ORE AND ROCK HOISTED	CU. FT. AIR USED	CUBIC FT. AIR PER TON HOISTED	GALLONS OF WATER PUMPED	G.P.M.
CLIFFS SHAFT MINE						
1930	716	444,511	896,693,000	2,017	446,650,100	
1931	560	315 492	592 506 000	1 878	350 061 000	
1932	611	92 125	188 127 000	2 042	369 057 075	
1933	495	61 623	160 033 500	2 596	362 896 379	
1934	373	235 639	394 168 500	1 672	348 670 324	
1935	869	288 053	516 140 000	1 791	366 504 523	692
1936	920	484 310	907 194 600	1 873	389 395 743	739
1937	804	579 759	1 102 635 000	1 901	370 765 799	705
1938	754	352 983	735 452 000	2 083	362 700 824	689
1939	748	415 682	790 875 000	1 902	363 540 036	693
ATHENS MINE						
1930	657	384,801	1 160 650 000	2 756	121,785,145	
1931	621	254 660	686 750 000	2 696	136 215 501	
1932	578	77 639	209 925 000	2 703	205 070 447	
1933	546	49 506	152 235 000	3 075	194 073 179	
1934	672	166 412	334 485 000	2 009	179 244 454	
1935	653	205 863	527 355 000	2 561	154 911 562	292
1936	718	318 604	698 985 700	2 193	134 999 491	255
1937	671	455 512	884 565 000	1 941	134 521 343	257
1938	655	276 800	643 005 000	2 322	165 316 266	313
1939	694	416 225	819 405 000	1 968	173 774 003	331
MAAS MINE						
1930	606	443,504	1,374,390,000	3,098	577,702,994	
1931	618	332 206	756 405 000	2 076	585 922 823	
1932	585	97 295	210 825 000	2 166	576 727 573	
1933	662	143 845	367 560 000	2 555	554 157 402	
1934	747	294 372	601 920 000	2 044	550 020 020	
1935	804	370 399	686 520 000	1 853	597 349 626	1,129
1936	950	549 615	897 919 800	1 634	674 397 310	1 279
1937	812	784 328	1 251 710 000	1 595	686 467 622	1 307
1938	748	438 359	742 635 000	1 694	752 268 448	1 429
1939	930	528 389	1 005 165 000	1 902	726 916 014	1 386
NEGAUNEE MINE						
1930	1,254	597 364	1,044,270,000	1,748	556,227,893	
1931	885	346 533	620 641 000	1 791	482 294 599	
1932	1 092	86 650	209 970 000	2 423	477 360 416	
1933	708	65 661	166 050 000	2 528	448 928 213	
1934	819	240 808	437 985 000	1 818	435 724 897	
1935	891	311 446	481 680 000	1 546	485 600 207	918
1936		530 844	737 716 000	1 389	483 287 423	916
1937	851	839 283	1 096 200 000	1 306	562 290 818	976
1938	751	439 588	771 210 000	1 754	534 118 975	1,015
1939	826	577 510	1 026 945 000	1 778	532 642 228	1 015

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1939

COMPARATIVE TABLES: (Continued)

YEAR	TONS COAL BURNED	TONS ORE AND ROCK HOISTED	CU. FT. AIR USED	CUBIC FEET AIR PER TON HOISTED	GALLONS OF WATER PUMPED	G.P.M.
TILDEN MINE						
1930	498	287,043				
1931	244	137 010				
1932	38	19 957				
1933	164	94 194				
1934	325	167 688				
1935	394	190 511				
1936	901	291 341				
1937	790	305 418				
1938	186	85 889				
1939	313	170 276				
LLOYD MINE						
1933	96	4 554				
1934	127	136 951	145,926,000	1,065		
1935	224	248 410	289 426 500	1 165		
1936	413	377 572	383 994 000	1 017		
1937	334	545 274	559 512 000	999		
1938	350	286 864	293 247 000	1 022		
1939		323 639	275 042 000	843		
GARDINER-MACKINAW MINE						
1930	316	129,321	621,450,000	4,805	56,528,157	
1931	152	80 801	489 240 000	6 054	172 438 518	
1932	106	24 781	126 495 000	5 122	119 155 845	
1933	40	3 944	49 770 000	12 619	103 051 726	
1934	269	79 187	291 510 000	3 681	82 416 531	
1935	306	138 507	446 625 000	3 224	72 964 993	136
1936	331	185 954	692 415 000	3 723	67 049 662	126
1937	369	172 823	547 515 000	3 168	61 135 735	114
1938	170	48 824	256 234 500	5 248	44 633 865	90
1939	8	0	2 295 000		125 447 426	239