

MECHANICAL DEPARTMENT
ANNUAL REPORT
YEAR 1951

ATHENS MINE:

During the spring months of the year the subsidence of the area around the miners' Dry building became more pronounced and by May it was evident that the building was becoming unsafe for use. Plans and specifications for a temporary 48' x 132' Dry Building were rushed and by June 18th MacDonal and Kaake, contractors, started foundations. By the end of August the building was enclosed. All plumbing and heating facilities were installed by company crews and the new Dry was occupied in September.

Major mechanical repairs consisted of replacement of Cage Hoist brake toggle in March and regrouting of hold down foundation bolts in April. The skip hoist spider on north side became loose on main shaft and was repaired.

Frequent checks of all surface machinery installations were made and adjustments made as required due to surface subsidence.

CAMBRIA-JACKSON MINE:

All mechanical equipment operated without major breakdown for the entire year. Underground maintenance men spent the bulk of their time on the winze belt conveying system. The Bathke Feeder which feeds the belt was designed for too fast a speed. This was corrected by changing the driving motor to D.C. and substituting slower gearing in the Falk Reducer. Operating speed of feeder at end of conversion was 11 F.P.M. A controlled torque coupling was installed on the feeder drive for protection against jamming as a result of head shaft and bearing failure previously.

Pump repair was of minor nature. An 8" Naylor spiralweld pipe column was installed in shaft from 4th level to surface to replace old pipe that was eroded to discard.

It is interesting to note that the 4th level pump sump was cleaned of 3000 tons of iron ore mud in February. This was the first time the sump had been cleaned since we took over the operation of this property from Republic Steel Corporation.

CLIFFS SHAFT MINE:

The surface equipment at this property is all quite obsolete and therefore must be frequently repaired to prevent production stoppages.

In the crusher building the revolving trommel drive was converted from flat belt to direct flexible coupling drive through Falk Speed Reducer, in January, to eliminate flat belt slippage due to frost accumulation. The McCully No. 8 crusher was an item of almost constant maintenance. First, the countershaft bearing cap casting broke and was replaced with new spare. The mantle nut threads on the standard shaft stripped and had to be built up and re-cut. A number of eccentrics were rebabbited.

A new double drum top tram hoist was designed in collaboration with Lake Shore Engineering Company and at the end of the year same was on foundation but not in service.

CLIFFS SHAFT MINE: (continued)

During June, July and August the old Morrow Shaft Collar was opened and reconditioned for use as ventilation outlet. Steel sets to ledge were fabricated in General Shops.

Master Mechanic William Lawer became incapacitated in April and by August his replacement, Fred Keskey, was permanently assigned to this position as it was evident that Bill Lawer would never be active again on the job.

A new Northwest Model 25 Crawler Crane was received in September to replace the old Bucyrus-Erie 10B which was transferred to General Storehouse Division.

In October, arrangements were made with Western-Knapp to design new surface flow sheet which would give better washing, picking, crushing and sizing control. Several flow sheet arrangements were made but it was decided not to spend money to carry through this proposed project but to incorporate same into master plan which includes a new hoisting shaft.

LLOYD MINE:

A new Wheatley 8 x 10 piston pump rated 484 GPM was installed on 8th level to pump to the 6th level. On 6th, the old Aldrich Triplex pump condition was getting so shaky that an Ingersoll-Rand 700 GPM - 1200' TDH Centrifugal pump was rented from Mather Mine "A" Shaft to act as standby until a Gould Centrifugal could be reconditioned.

The only serious pump trouble developed on August 31st when the Morris Mine Substation burned. There was a power outage for 10 hours. Dams were installed on 5th, 6th, and 7th levels. Power was restored just two hours ahead of maximum storage behind the dams.

The only new surface installation consisted of a 50 HP single drum electric hoist for handling heavy replacements to top tram. This hoist was one used at Mather "B" for lowering counterweight pipe.

The wrought steel intermediate shaft of winze hoist broke in June and was replaced with new high tensile shaft.

MAAS MINE:

Repairs to underground reciprocating pumps was the item of greatest mechanical expense. Even the newest Worthington Piston Pump gave trouble by breaking piston rod, stuffing box partition plate and cylinder liner.

In December a new Wheatley Piston Pump was installed on 7th level to handle the water to the 5th.

For safety reasons, a coupling brake was designed and installed on winze hoist.

On surface the main pump discharge pipe lines were relocated to avoid relocation of C. & N.W. railroad tracks.

A top tram car was demolished by allowing same to run off end of stocking trestle at full speed. This was caused by drunken operator who was discharged.

MATHER MINE "A" SHAFT:

The largest mechanical installation at this property this year was the 7th level belt conveying system. By March the conveyor drift was sufficiently completed that

MATHER MINE "A" SHAFT: (continued)

installation of idler supports could begin. At the end of the year the 2500' center to center belt installation was complete and had been test run. At the load end the pan feeder and 36" x 42" Jaw Crusher had been installed. It is expected that this installation will be in service in January, 1952.

In the headframe, new 230 cu. ft. bottom dump "Jeto" skips were installed in both skip roads May 30th. The original Jeto was removed to be remodeled to latest style.

In May, a used 60" x 40" single drum Ottumwa electric hoist was installed at a location 125 ft. below 7th level preparatory to sinking the main shaft. Fabrication of accessory equipment such as sinking skip, etc. was done in General Shops and sinking began in earnest during July. At year's end the shaft work was complete.

During October and early November the inside of the headframe, from top to trestle deck, was cleaned and spray painted. Also, 85% of exterior of north stock pile trestle was painted. This work will continue next year.

Pumping troubles were of minor nature. On the 7th level a temporary pump station was made up with shaft motor pumps to relay water to the 6th.

The Allis-Chalmers Jaw Crusher in headframe gave trouble until the main bearings were equipped with tin base babbitt lined water cooled shells, the pitman cap rebabbitted, speed reduced 30% and an automatic lubrication system installed.

Eccentric bearing troubles were experienced on two occasions with Simplicity Shakeout Screen. The manufacturer worked the problem out with us and the trouble is now cleared up.

MATHER MINE "B" SHAFT:

The largest mechanical installation at this property this year was the surface belt conveyor stockpiling facilities. The structural portion of main north gallery was completed by Bethlehem Steel Company in January. The sheathing contractor moved in in late February and by the time his work was completed in early May our own crews had installed all the treated decking, the conveying equipment, etc. The first trial runs were made in late May and ore was officially run over the entire flow sheet and stocked from the elevated gallery June 19, 1951.

In October, Worden-Allen Company began erection of the 450' east lateral belt conveyor gallery. By the end of the year the sheathing contractor, American Steel Band Company, had 75% of the insulated enclosure in place.

The design of the final 1200' long west lateral belt conveyor gallery is proceeding and when this is installed in 1953 it will complete all necessary ore stockpiling facilities at this mine.

The most serious mechanical failure was the partial collapse of the clutched drum shell on the Nordberg Skip Hoist due to same being defective. Temporary repair was made and Nordberg agreed to make no-charge replacement. This occurred in March and at year's end we were still operating satisfactorily, however, the repaired drum shell does bobble due to excentricity.

The shop-made bottom dump skip design did not prove out due to bridging at the discharge opening and so was replaced with shop-made Kimberley style skip in March.

The Truscon steel building used to house sinking hoist was sold to Geological Department and moved off property. The old Nordberg compressor was scrapped except for motor which is stored at Negaunee Shaft.

MATHER MINE "B" SHAFT: (continued)

A 100,000 CFM Axivane Fan was installed on 6th level near "A" Shaft boundary. When placed in service in June, "13" Shaft became "down cast" and "A" Shaft "up cast."

Underground water has given no particular trouble. Excavation of main pump station on 10th level was begun in December. It is proposed to design for four pumps and only install one high lift plunger pump until development of the mine dictates when others will be required.

A new D-8 tractor was received in December and will not go into service until equipped with automatic lubrication system.

NEGAUNEE SHAFT:

Operations preliminary to shaft sinking were well under way at the beginning of the year. New steel sets were installed in the circular portion of the shaft, the erection of the "Kennedy" double drum skip hoist was going forward, the new engine house wing was being erected by MacDonald & Kaake, contractors.

Active shaft sinking began April 3rd after the old headframe was torn down and semi-permanent sinking headframe was erected. The "Kennedy" hoist was operated as A-C unit until the end of May when it was converted to D-C drive for operational reasons.

The new engine house wing was completed in July and during the ensuing months the old skip and cage hoists were removed and foundations poured for the 12' x 12' "Republic Hoist" which will serve as the permanent cage hoist.

At the end of the year all mechanical equipment in use for shaft sinking was working satisfactorily. Sinking in balance with cage and skip did not prove too satisfactory from safety and operational view point. Most of the sinking was done unbalanced with sinking cage.

Considerable trouble was experienced with the Falk herringbone gear set on the "Kennedy Hoist." Abnormal scuffing of teeth at pitch line is still being experienced and this condition is being watched carefully.

OHIO MINE:

Plans and specifications were prepared for shop-warehouse-office building during early spring. The successful contractor, Kielinen & Son, moved to job site in late May and by end of July his work was 95% complete. Our own plumbing crews handled the entire plumbing and heating installation.

In June, Straits Engineering Company moved in to handle general grading and installation of mill foundation. The mobil mill arrived in in August about the same time as the 54-B Electric Shovel and the four 22 ton Euclid Trucks.

At the end of October all equipment had been erected and test run. 2800 tons of material was crushed and placed in surge pile. Due to lateness of season it was decided not to operate the mill until next year. Our steel crew stayed on to enclose the mill in corrugated iron. Stripping will continue through the winter.

SPIES MINE:

Pumping acid water out of this mine was the major mechanical problem again this year. New all stainless steel centrifugal pumps were received and installed on the 4th and 6th levels. A new 6" rubber lined discharge column with stainless steel accessories was installed from 4th to 6th levels.

SPIES MINE: (continued)

By November all water was being handled with centrifugal pumps; a portion on automatic operation. We are gaining a lot of experience in handling this hot (110°F) acid mine water, but our problems would be much simpler if the Byron-Jackson Pump Company did not commit an error of some kind on every pump we have bought from them.

GENERAL SHOPS:

During the year a total of 4001 work orders were received and 3869 were processed. 68 all steel timber trucks were fabricated for the Mather Mine. Total pieces of underground steel supports produced were 35,457.

In February a 5 ton capacity Hyster mobile crane was placed in service in the General Shops area. New $\frac{1}{2}$ ton International Pickup trucks were assigned to Tom Guy, Chief Master Mechanic and John Fandrem, Carpenter Shop Foreman.

In August a new #3 Kearney & Trecker Universal Milling machine was received and placed in service in Machine Shop.

The addition to Electric and Hoist Repair Shops were completed and in service in May. This addition houses a new boiler plant that handles the heating load of all shops.

ARCHITECTURAL AND CONSTRUCTION DEPARTMENT:

During the year the following new projects were completed. Plans and specifications prepared by this department.

1. Addition to and remodeling of Cliffs Shaft Miners' Dry.
2. Addition to General Shops Electric and Hoist Repair Shops.
3. Addition to and remodeling of Negaunee Shaft Miners' Dry.
4. Relocation and remodeling of 60' x 80' Truscon Steel Building for Core Storage Depot for Geological Department.
5. Addition to No. 2 Warehouse in General Storehouse Area.

At the end of the year plans had been completed for remodeling of the Employment Office and construction work was 80% complete.

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COMPARATIVE TABLES

<u>CLIFFS SHAFT MINE:</u> <u>YEAR</u>	<u>TONS ORE AND ROCK HOISTED</u>	<u>CU. FT. AIR USED</u>	<u>CUBIC FT. AIR PER TON HOISTED</u>	<u>GALLONS OF WATER PUMPED</u>	<u>G.P.M.</u>
1942	733 970	1 223 325 000	1 666	339 185 356	643
1943	669 300	1 368 045 000	2 044	376 325 326	718
1944	614 214	1 459 890 000	2 376	448 361 410	851
1945	567 691	1 194 570 000	2 104	444 687 684	848
1946	415 426	968 670 000	2 331	397 294 033	751
1947	562 650	1 527 345 000	2 715	424 721 789	809
1948	603 745	1 607 625 000	2 663	382 905 017	726
1949	504 513	1 124 105 000	2 228	433 229 875	821
1950	679 751	1 619 055 000	2 381	407 263 395	776
1951	725 319	1 713 735 000	2 362	425 640 074	808

ATHENS MINE:

1942	699 590	1 351 440 000	1 931	204 533 558	387
1943	532 590	1 013 220 000	1 902	195 041 792	372
1944	443 576	900 765 000	2 030	162 835 951	308
1945	429 136	873 710 000	2 035	174 073 654	331
1946	376 417	745 605 000	1 990	168 139 933	317
1947	533 366	1 191 510 000	2 234	178 537 561	340
1948	527 876	1 183 970 000	2 243	169 128 786	320
1949	550 977	992 700 000	1 801	176 437 598	334
1950	611 162	1 161 045 000	1 899	199 518 654	380
1951	635 039	1 303 065 000	2 051	233 856 740	444

MAAS MINE:

1942	894 963	1 703 655 000	1 905	553 194 582	1 049
1943	782 074	1 916 100 000	2 450	575 868 620	1 098
1944	614 836	1 542 835 000	2 509	578 257 239	1 097
1945	572 652	1 205 145 000	2 104	555 380 166	1 058
1946	487 523	965 880 000	1 981	607 511 502	1 148
1947	721 051	1 506 960 000	2 090	571 767 866	1 090
1948	683 074	1 389 825 000	2 035	569 972 839	1 081
1949	621 946	1 233 540 000	1 983	550 080 422	1 043
1950	659 467	1 374 300 000	2 083	602 179 256	1 148
1951	722 803	1 442 025 000	1 995	587 940 301	1 118

NEGAUNEE MINE:

1942	1 128 737	1 432 260 000	1 268	345 945 101	656
1943	978 130	1 137 375 000	1 162	401 169 615	765
1944	760 871	1 165 140 000	1 531	375 706 897	713
1945	671 220	873 270 000	1 301	357 175 559	681
1946	418 232	542 025 000	1 295	360 778 626	682
1947	531 492	717 300 000	1 350	390 741 304	744
1948	386 215	743 625 000	1 925	402 657 133	757
1949	79 699	233 415 000	2 928	464 467 219	880
1950	0	82 755 000	-	635 580 650	1 212
1951	0	426 150 000	-	581 233 593	1 103

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COMPARATIVE TABLES

<u>CAMBRIA-JACKSON MINE:</u> <u>YEAR</u>	<u>TONS ORE AND ROCK HOISTED</u>	<u>CU. FT. AIR USED</u>	<u>CUBIC FT. AIR PER TON HOISTED</u>	<u>GALLONS OF WATER PUMPED</u>	<u>G.P.M.</u>
*1943	155 513	216 657 000	1 393	123 714 000	431
1944	286 761	410 875 000	1 432	196 252 831	372
1945	319 222	386 626 500	1 211	190 159 826	362
1946	303 881	374 013 000	1 230	159 192 131	300
1947	548 027	628 515 000	1 147	190 950 934	363
1948	496 083	548 896 500	1 106	171 964 375	325
1949	438 064	508 050 000	1 159	173 342 402	328
1950	452 035	545 206 500	1 206	197 474 896	376
1951	384 499	539 419 500	1 402	242 744 183	461

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

LLOYD MINE:

1942	588 749	588 451 000	999	39 486 100	74
1943	531 260	525 280 500	988	65 024 800	124
1944	391 057	436 293 000	1 115	51 625 550	97
1945	334 117	419 088 500	1 254	59 943 400	114
1946	243 836	264 838 500	1 086	51 014 600	84
1947	262 395	254 470 500	970	69 182 000	131
1948	128 672	285 111 000	2 216	48 334 500	91
1949	209 161	231 241 500	1 105	50 828 500	96
1950	234 748	354 888 000	1 511	100 272 000	191
1951	260 477	395 635 000	-	166 347 500	316

MATHER MINE "A" SHAFT:

1943	29 517	(First hoisting in September)			
1944	127 438	425 700 000	3 340	74 006 311	140
1945	258 028	378 600 000	1 467	134 384 517	256
1946	417 677	542 250 000	1 298	97 460 579	184
1947	817 145	1 144 800 000	1 401	133 005 294	253
1948	1 100 225	1 901 700 000	1 728	103 059 168	195
1949	1 154 538	1 207 350 000	1 045	91 876 158	174
1950	1 405 738	1 612 800 000	1 147	215 904 871	411
1951	1 312 451	1 753 200 000	1 335	266 832 027	507

MATHER MINE "B" SHAFT:

1950	99 832	(First hoisting in August)			
1951	632 596				

TILDEN MINE:

1942	235 207				
1943	139 991				
1944	214 824				
1945	197 476				
1946	101 968				
1947	168 669				
1948	140 692				
1949	88 503				
1950	107 465				
1951	103 022				